POSITION PAPER ON

THE SOLID WASTE MANAGEMENT SECTOR

IN INDIA

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Department of Economic Affairs

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INDEX

1. Executive Summary

The ever increasing urban population has put tremendous pressure on the budgetary resources of States/ULBs underscoring the necessity of private sector participation in urban development. The unbundling of services and technological innovations have opened up these areas to private sector participation.

As per estimates, 115000 MT of solid waste is generated daily in the country. Yearly increase is about 5% annually.ULBs spend about Rs. 500 to Rs.1500 per ton on solid waste collection, transportation, treatment and disposal.However, hardly any amount is spent on scientific disposal of waste.

The responsibility under the MWS Rules, 2000 lies with the ULBs and the concerned Departments of Municipal affairs/urban development and collectors are overall responsible to enforce the provisions of these rules. The deadline as per Supreme Court Judgment was 31st December, 2003.

Complete compliance within 31st Dec 2003 remains a distant dream. Many cities and towns have not even initiated measures whereas some cities have moved forward.

GOI have provided assistance to the tune of Rs.2500 crores under 12th Finance Commission for SWM.IncomeTax relief has also been provided to waste mgt agencies and Tax free municipal bonds have been permitted by GOI.Technical Advisory Group on SWM has been constituted and Technical Manual on SWM has been prepared.

The 11th Five Year Plan has envisaged an investment of Rs.2212 crores for SWM.

The Municipal Corporations and City Governments create and maintain assets with funds provided by central and state Grants, funds internally generated by local Governments through taxes and tariffs, capital markets etc.The Central Government should take up the role of a regulator by addressing financial sector and related regulatory issues. The State Governments should also respond by enacting Model Municipal Laws to enable PPP, setting up regulatory authorities and creating cadre of professionals at ULBs and state level.

Given the lack of in-house capability of municipal authorities and paucity of resources, it is desirable to outsource certain services and resort to PPP/NGO participation in providing SWM services.

Private Sector Participation in SWM: The private sector has been involved in door-to door collection of solid waste, street sweeping in a limited way, secondary storage and transportation and for treatment and disposal of waste.

Cities which have pioneered in PPPs in SWM include Bangalore, Chennai, Hyderabad, Ahemdabad, Surat, Guwahati, Mumbai, Jaipur etc.

There are serious barriers to private sector participation in urban Infrastructure as the financial status of ULBs except for a minority, is precarious. Urban sector is seen as a very high-risk sector and also because of institutional complexity due to multiplicity of agencies involved in service delivery.Further, there is lack of regulatory or policy enabling framework for PPPs barring few exceptions and lack of bankable and financially sustainable projects considering the opportunities and risks involved. There is also a need to rationalize tariff and user charges.

JNNURM has thrown up opportunities for expanding PPPs in urban sector.JNNURM grants can be used for viability gap funding, good debt-equity structure etc.

MUNCIPAL SOLID WASTE MGT- challenges for Urban Local Bodies:

- Funds: to establish and operate integrated MSW management facilities

-Technical Expertise: to set up and operate MSW management facilities

-Commercial competence: to engage the private partner transparently-e.g. Inviting ''Expression of Interest'', ''Request for Proposal' and evaluating the proposal technically and financially

-Finding appropriate Land along with buffer zone for MSW management

With proper monitoring, PPP ensures innovation, efficiency and improved level of services, together with compliance to environment Health and safety.PPP allows for involvement of user and other stakeholders and inculcates the habit of user charges through service delivery.

The capital support to ULBs under JNNURM is intended to reduce the capital expenditure required for creation of integrated MSW facility. The private sector with initial subsidy will charge lesser Tipping fee. There is a need to honour concession agreement in letter and spirit.

The Way Forward: There is a need to create a National Mission to ensure that the Municipal authorities perform their obligatory functions regularly in compliance with MSW Rules 2000 within a pre-determined timeframe.

Further, there is a need for formulation of State Policy for implementation of MSW Rules, 2000 for expeditious allotment of land on nominal lease rental basis. The policy may ensure that Government Parks, gardens and farmlands give preference to the use of compost produced by ULBs within the state. The Garbage should be supplied free of cost to waste to energy plant or compost plant if no tipping fee is demanded by the developer. States and ULBs must encourage the concept of tipping fee for private sector participation in SWM. State Governments should take responsibility for all permissions/clearances being the partner. The onus of getting

clearances should not fall on Private sector. There is need to develop contract management capacity in the public sector and encourage cluster approach for a group of municipalities to select a common operator for economies of scale.

2. INTRODUCTION

While Indian urban growth has mushroomed, provision of urban services and amenities has fallen short, with the resultant urban sprawl giving rise to increased urban poverty, widespread slums and environmental degradation. Accelerating the flow of resources into urban infrastructure and services is therefore critical to India's agenda of economic growth, poverty reduction and urban renewal. Budgetary funds would only cover about a third of the massive investment needs, underscoring the necessity of private sector participation in urban development.

The unbundling of services and technological innovations, particularly in the areas of sanitation and water supply and SWM has opened up these areas to the private sector. Also, global trends show that the private sector has been able to mobilize funds necessary to finance infrastructure projects and that it is willing to accept risks provided the institutional environment meets certain minimum standards and the projects are properly structured.

3. SOLID WASTE MANAGEMENT- EXISTING SCENARIO

Urban solid waste includes household garbage and rubbish, street sweeping, construction and demolition debris, sanitation residues, trade and industrial refuse and bio-medical solid waste (CPCB, 2000). Solid waste management (SWM) has three basic components, namely, collection, transportation and disposal. The objective of SWM is to reduce the quantity of solid waste disposed off on land by recovery of materials and energy from solid waste in a cost effective and environment friendly manner.

The increasing pace of urbanization coupled with an increase in per capita waste generation driven by changing urban consumption patterns in view of economic growth and improved living standards is exerting significant additional pressures on already stretched Municipal Solid

Waste Management (MSWM) systems across cities in India. This challenge is further aggravated by the lack of adequate capacity, institutional, financial capabilities and skilled resources in collection, transportation, processing and final disposal.

Solid Waste Mgt is one among the basic essential services provided by municipal authorities to keep the urban centres clean. However, it is among the most poorly rendered services in the basket--the systems applied are unscientific, outdated and inefficient; population coverage is low; and the poor are marginalized. Waste is littered all over leading to insanitary living conditions. Municipal laws governing the urban local bodies do not have adequate provisions to deal effectively with ever-growing problem of solid waste management. With rapid urbanization, situation is becoming critical.[1]

It is estimated that about 115000 MT of municipal solid waste is generated daily in the country. (Present figure is 1, 60,000 MT per day) Per capita waste generation in cities varies from 0.2 kg to 0.6 kg per day depending upon the size of population. An assessment has been made that per capita waste generation is increasing by about 1.3% per year. With growth of urban population ranging between 3 to 3.5% per annum, the annual increase in overall quantity of solid waste is assessed at about 5%. The solid waste generated by the million plus cities varies from 1200 metric tones per day in cities like Ahmedabad and Pune to a maximum of 5000-5500 metric tones per day in cities like Delhi and Mumbai. The per capita solid waste generation varies from 300 gm in Bangalore to 500-550 gm in Mumbai and Delhi.[2]

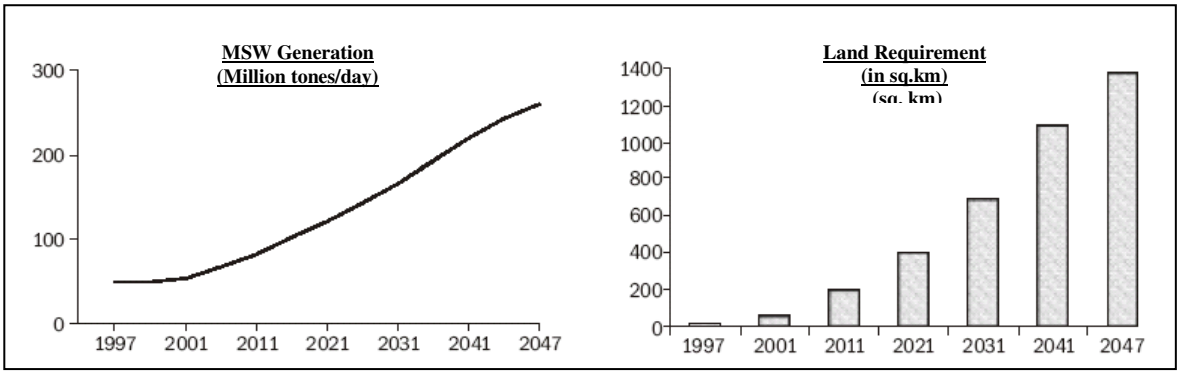
[1] (P.U.Asnani)

[2] Background paper for NDC meeting on Urbanization

As is clear, the large cities (Class I and above) account for nearly three-fourths of the waste generated in urban areas. The annual increase mentioned above, translates to an estimated 260 million tonnes of waste generation annually by 2047. This enormous increase in MSW will have significant impacts in terms of land required for disposing this waste as well as on methane emissions. It is estimated that if the waste is not disposed off in a systematic manner, more than 1400 sq. km of land would be required in the country by the end of 2047 for its disposal. (Refer Exhibit 1)

Type of cities (2005)	MT/day	% of total waste
The 7 mega cities	21,100	18.35
The 28 metro cities	19,643	17.08
The 388 class I towns	42,635	37.07
Total	**83,378**	**72.50**

Exhibit 1 Waste generation trend and implications for Land requirement



The collection efficiency ranges between 70 to 90% in major metro cities, whereas in several smaller cities it is below 50%.It has been estimated that the ULBs spend about Rs 500 to Rs 1500 per tonne on solid waste collection, transportation, treatment and disposal. About 60-70% of this amount is spent on collection, 20-30% on transportation, and hardly any fund is spent on Treatment and disposal of waste[3].

[3] Ernest and Young presentation,CII Urban Conclave,November,2008

On an average, 91% of MSW are dumped in landfills (CPCB 2000). However, a very minor portion of these is scientifically dumped in sanitary landfills according to standards prescribed by concerned agencies. Sanitary Landfill is primarily a slow process which requires scientific treatments over long periods of time. Average 5% to 6% wastes are disposed using various composting methods

Landfill sites have not yet been identified by many municipalities and in several municipalities, the landfill sites have been exhausted and the respective local bodies do not have resources to acquire new land. Due to lack of disposal sites, even collection efficiency is affected.

SWM is part of public health and sanitation, and according to the Indian Constitution, it falls under the state list. Since the activity is non-exclusive, non-rivalled, and essential, the responsibility for providing the service lies within the public domain. As this activity is of local nature, it is entrusted to the ULBs.The ULB undertakes the task of solid waste service delivery with its own staff, equipment and funds. In a few cases part of the said work is contracted out to private enterprizes.The management of municipal solid waste is one of the most important obligatory functions of the urban local bodies, which is closely associated with urban environmental conditions. [4]

The 74th Constitutional amendment gives constitutional recognition for local self Government institutions specifying the powers and responsibilities.

Very few ULBs in the country have prepared long-term action plans for effective SWM in their respective cities. For obtaining a long-term economic solution, planning of the system on long-term sustainable basis is very essential. The Ministry of Environment and Forest (MOEF), GOI, has notified Municipal Solid Waste (Management and Handling) Rules, 2000 to tackle this problem. The increase in quantity of Municipal solid Waste generation with increase in urban population is quite obvious. Efforts towards waste recycle, reuse, and resource recovery for

[4] Paper by IPE(P) Ltd for 12th FC

reduction in waste and adoption of more advanced technological measures for effective and economical disposal of municipal solid waste is the need of the hour.

There have been no efforts in the past to create community awareness, either about the likely perils due to poor waste management or the simple steps that every citizen can take, which will help in reducing waste generation and promote effective management of solid waste generated.

Drawbacks of the present system:

-No storage of waste at source

-No system of primary collection from doorsteps

-Irregular street sweeping

-Waste storage depots have been a problem

-Transportation of waste is not satisfactory

-Processing of waste: only a few cities have been practicing this

-Disposal of waste is a neglected area of SWM services and the current practices are grossly unscientific [5]

Technologies available for processing, Treatment and disposal of waste

-Composting

-Vermi Composting

[5] P.U.Asnani

-Waste to Energy

-Anaerobic Digestion and biomethanation

-Production of Refuge Derived Fuel (RDF) or Pelletization

-Incineration

-Pyrolysis/Gasification,Plasma Pyrolysis Vitrification(PPV)/Plasma Arc Process

Biomedical Waste

Of the 1,60,000 MT of Solid Waste generated per day in the country, 2% is biomedical waste. This is governed by Bio-medical waste (Mgt and Handling Rules 1998.Most of the larger hospitals, nursing homes and other Health Care facilities are concentrated around cities and towns. Rural areas are serviced through primary and community health care centres.It is well established that bigger the healthcare facility, the more bio-medical waste it generates. At present India which generates about 1 million tons of biomedical waste per day, has hardly 100 established common biomedical waste Treatment facilities in different parts of the country most of which are in and around bigger cities and Towns. Biomedical waste treatment is generally on PPP mode.

E-WASTE

E-waste is a collective terminology for the entire stream of electronic equipment such as TVs, refrigerators, telephones, air conditioners, computers, mobile phones etc. that has reached its

end of life (EOL) for its current user. Such devices are generally considered toxic when disassembled or incinerated and are typically targeted for hazardous disposal or are slated for recovery and reuse. As a result, the E-waste industry is emerging with markets that need to be assessed for growth potential.

Market Size: World-wide, the UN estimates that between 20 and 50 million tons of e-waste is generated every year and approximately 12 million tons of this comes from Asian countries. It is estimated that the global market for electronic waste will rise at an average annual growth rate of 8.8 per cent from USD 7.2 billion in 2004 to USD 11 billion in 2009 (source: Electronic Waste Recovery Business).

Although much of the e-waste comes from developed countries in India, much of it also originates from within India. As of March 2009, approximately ***400,000 tons of e-waste was roduced in India***; 19,000 tons of this comes from Mumbai, the largest e-waste generator in India (source: Toxics Link).

Growth prospects: E-waste has been mounting rapidly with the rise of the information society as the rate of obsolescence of electronic equipment is rising. E-waste is the fastest growing segment of the MSW stream. E-waste equals 1% of solid waste on average in developed countries and is expected to grow to 2 % by 2010. In developing countries, like India, E-waste as a percentage of solid waste can range from 0.01 % to 1 %. Globally, computer sales continue to grow at 10 % plus rates annually. Sales of DVD players are doubling year over year. Yet the lifecycle of these products are shortening, shrinking to 10 years for a television set to 2 or 3 years for a computer. As a result, a high percentage of electronics are ending up in the waste stream releasing dangerous toxins into the environment.

Concern for India: After China imposed a ban on the import of e-waste in 2002; there is a concern that India may emerge as one of the largest dumping grounds for the developed world. Once the electronic equipment, mostly computers, turns obsolete in the West, they are mostly exported as e-waste into the South Asian market. The E-waste related laws in India includes (i) Hazardous Waste (Management and Handling) Amended Rules, 2003: In Schedule 1, waste

generated from the electronic industry is considered as hazardous waste, and (ii) DGFT (EXIM policy 2002-07): Second hand personal computers/laptops are not permitted for import under EPCG scheme under the provisions of para 5.1 of the EXIM policy, even for service providers. Second hand photocopiers machines, air conditioners, diesel generating sets, etc, can also not be imported even if these are less than ten years old.

However, the classification of e-waste as hazardous in Indian legislation is still unclear as its status depends upon the extent of presence of hazardous constituents in it and there are no specific laws or guidelines for e-waste. Hence, there is an impressive need for stringent norms and regulations for handling e-waste in India.

International responses to E-waste: In **US;** California passed the "Electronic Waste Recycling Act of 2003" (SB20), USA's first comprehensive electronics recycling law, establishing a funding system for the collection & recycling of certain electronic wastes, the **EU parliament** passed a directive that requires producers to take responsibility for recovery & recycling of E-waste, **In Japan**; since 2001, manufacturers have had to recycle appliances, TVs, refrigerators, and ACs and charge a recycling fee to consumers.

4. Policy Framework

4.1 Regulatory Aspects in MSW Management:

The establishments providing wastes like industries, hospitals are required to follow the relevant Rules under the Environment Protection Act 1986 as follows:

Hazardous Waste (Mgt and handling Rules),1989

Bio-medical Waste (Management and Handling Rules) 1998

A PIL was filed by Almitra H.Patel and others in the Supreme Court of India in 1996 alleging that GOI, State governments, and ULBs have failed to discharge their obligatory duty to manage Municipal Solid Waste appropriately. The Supreme Court set up an Expert committee which submitted its report to the Supreme Court in March 1999 making detailed recommendations which were circulated to all class-I cities and various stakeholders for implementation.

To ensure compliance, the principal recommendations of the Supreme Court appointed committee have been incorporated in the **Municipal Solid Waste (Management and Handling Rules 2000) notified by Ministry of Environment and Forests in September, 2000**.To improve the system, the following seven directions were given:

(i) Prohibit littering on the streets by ensuring storage of waste at source in two bins: one for biodegradable waste and another for recycle material.

(ii) Primary collection of biodegradable and non-bio-dedegradable waste from the doorsteps at pre-informed time on a day-to day basis using containerized tricycles/handcart/pick-up vans.

(iii) Street sweeping covering all the residential and commercial areas on all the days of the week irrespective of Sundays and holidays.

(iv) Abolition of open waste storage depots.

(v) Transportation of waste in covered vehicles on a day-to-day basis.

(vi) Treatment of biodegradable waste using composting or waste to energy technologies meeting the standards laid down.

(vii) Minimize the waste going to the landfill and dispose of only rejects from the treatment plants and inert material at the landfills as per the standards laid down in the rules.

The entire responsibility of implementation as well as development of required infrastructure lies with Municipal authorities. They are directed to obtain authorization from the state Pollution Control Boards/committees for setting up waste processing and disposal facilities and furnish annual report of compliance.

Complete Compliance within 31st Dec. 2003 remains a distant dream. Many cities and towns have not even initiated measures whereas some cities have moved forward on their own or under pressure of Supreme Court, respective State Governments, pollution control boards etc. There is no consolidated official data available about the status of compliance of MSW Rules in the country though all the states are expected to submit their annual reports.

However, there is a definite awareness among local bodies as well as policy makers to solid waste management system. There has been some progress in the right direction during the last few years in India.

Let us be conscious of the fact that scientific waste management is no longer moral or corporate social responsibility--it is legal obligation on the waste generating establishment both public and private. The legal obligation has motivated the Private sector to see business in Waste management sector. The estimated business potential in India is Rs. 32000 crores (as per M/s Ramky Enviro Engineers Ltd).The Environment Protection Act, 1986(Sec 15) provide for imprisonment upto 5 years and fine upto one lakh or both. The three Rules referred above are the relevant Rules issued under the Environment Protection Act only.

4.2. Government of India's initiatives for Solid waste Management:

The Municipal Waste Rules of 1999 were complemented by a Manual on Municipal Solid Waste Management which was developed by the CPHEEO in 2000 under aegis of the MOUD. This manual was prepared by an Expert Group and lays down guidelines and procedures for

ULBs to improve SWM in their cities. The MOEF had constituted an Expert Group for preparation of guidelines for SWM in religious towns/cities in India (2004). Under directions from the Hon'ble Supreme Court, a Technology Advisory Group (TAG) was set up to improve SWM in the country and oversee implementation of innovative technologies of waste management in the country. The report of the Technology Advisory group was submitted in 2005. Further, Model Municipal bye-laws have been framed/circulated for ULBs for adoption. Income tax relief has also been provided to waste mgt agencies.Taxfree municipal bonds have been permitted by GOI.

4.3 GOI, Ministry of Urban Development have formulated benchmarks for SWM which are as under:

Proposed Indicator	Benchmark
Household level coverage of Solid Waste Management services	***100%***
Efficiency of collection of municipal solid waste	100%
Extent of segregation of municipal solid waste	100%
Extent of municipal solid waste recovered/recycled	80%
Extent of scientific disposal of municipal solid waste	***100%***
Extent of cost recovery in solid waste management services	100%
Efficiency in redressal of customer complaints	80%
Efficiency in collection of user charges	90%
Extent of processing and treatment of MSW	100%

The Financial Assistance available for Energy from Urban and Industrial waste are in the following categories: Municipal Solid waste, other wastes-cattle dung, vegetable market waste, slaughter house waste, agricultural residues, Biogas generated at sewerage treatment plants,

Small scale decentralized projects in urban areas, Industrial wastes and affluents,rearch and development.

Further, Provisions in the Electricity Act 2003 provide for targets for RE power, preferential tariff by State regulators, open access to grid for RE power and decontrol of captive generation. Fiscal Incentives have also been provided in the form of exemptions in income tax, custom and excise duties.

5. INVESTMENT

The Urban Development Ministry had formulated a Waste Management Scheme for class-I cities/Towns indicating a need of nearly Rs.2500 crores and posed to the 12th Finance Commission for devolution of funds to ULBs.PPP was suggested as an integral part of the scheme in order to leverage funds and add efficiencies.

The 12th Finance Commission had taken a very considered view for improving urban infrastructure and allotted Rs.5000 crores for supplementing the resources of the ULBs in the country. Out of this amount, 50% was earmarked for improving SWM SERVICES. This amount is to be spent by March 2010.

The steering committee report on Urban Development for **11th Plan** estimates an investment of Rs.1292.37 billion for achieving population coverage of 100% with drinking water supply, Sanitation and **SWM**, and drainage facilities in urban areas.

During the 11th Five Year Plan it has been proposed to achieve the following coverage targets:

Urban Water Supply	100% population coverage
Urban Sewerage and Sanitation	100% coverage (which includes 70% population to be provided with sewerage and sewage treatment and 30% population with low cost sanitation, septic tanks etc).
Solid Waste Management	100% population coverage with appropriate Solid Waste Management facilities.
Drainage	100% population coverage to provide sustainable drainage system in towns / cities wherever needed to help checking flooding of urban centres due to rainfall and spread of sewage over streets.

In light of Millennium Development Goals (MDGs), of which India is one of the signatories, the above targets are required to be achieved.

The total fund requirement assessed to achieve 11th Five Year Plan targets in respect of urban water supply, sewerage and sanitation, drainage and solid waste management is as under:

(**Rs. In crore**)

Sl.No.	*Sub-Sector*	Estimated Amount
(i)	Urban water supply	53,666
(ii)	Urban sewerage & sewage treatment	53,168
(iii)	Urban drainage	20,173

(iv)	**Solid waste management**	**2,212**
(v)	Management Information system (MIS)	8.4
(vi)	R & D and PHE training	10
	Total	**1,29,237.4**

Say Rs. 1,29,237 crores

However, the availability of the fund is to the tune of Rs.40,000 crores

For bridging the gap between the fund requirement and actual available funds for achieving the envisaged 11th Five Year Plan targets the following are envisaged:

To meet the requirements as per norms, there exists a gap of Rs. 89,237 crore (1,29,237-40,000) . However, if we compare the gross outlay of Rs. 20,079 crore provided during the 10th Five Year Plan in State as well as Central sector, a huge outlay is needed for the sector. This necessitates the possibility of exploring additional funding for the water supply and sanitation sector. Possible sources of funding for bridging the gap may be as proposed below:-

(a) Central Sector outlay : The central sector outlay may be stepped up from the present Rs.40,000 crore (under JNNURM/UIDSSMT) to around Rs.70,000 crore under the ongoing central programme of JNNURM and UIDSSMT so that great thrust could be given to water supply and sanitation sector in the urban areas.

(b) State Sector Outlay: Likewise the State sector outlay which stands at Rs.18,749 crore during the 10th Plan may be stepped up to around Rs.35,000 crore.

(c) Institutional Financing : Funds may be mobilized through national financial institutions such as LIC, HUDCO, IL&FS etc to the tune of Rs.10,000 crore.

(d) Additional assistance from external support agencies (ESA): Through external funding agencies viz. World Bank, JICA, ADB and other Bilateral Agencies to the tune of about Rs.10,000 crore.

(e) FDI and Private Sector: In addition, through foreign direct investment and private sector funds upto Rs.4,237 crore may be mobilized to support the sectoral activities.

The Ministry of Urban Development has recently written to Ministry of Finance to provide funds to the extent of Rs. 800 crores for providing capital and interest subsidy of Rs.700 crores for setting up of 1000 compost plants, Rs. 60 crores as transport subsidy and Rs.40 crores as promotional subsidy.

6. PPP FRAMEWORK/INITIATIVES

Eight years have passed since the notification of MSW Rules 2000 and time limit for implementation of the rules has run out in December 2003.Yet, there are cities, which have not initiated any measures at all. Given the lack of in-house capability of municipal authorities and paucity of resources, it is desirable to outsource certain services and resort to private sector/NGO participation in providing SWM services.

In developed countries, environmental concerns rather than energy recovery is the prime motivator for waste-to -energy facilities, which help in treating and disposing of wastes. Energy in the form of bio-gas, heat or power is seen as a bonus, which improves the viability of such projects. While biomethanation, refuge derived fuel and incineration are the most common technologies, pyrolysis and gasification are also emerging as preferred options. A common feature in most of the developed countries is that the entire waste management system is being

handled as a profitable venture by private sector or NGOs with tipping fee for treatment of waste being one of the major revenue streams. The major benefits of recovery of energy from urban wastes is to bring about reduction in the quantity of waste by 60% to 90%; reduction in demand for land as well as cost for transportation of wastes to far-away landfill sites; and net reduction in environmental pollution, besides generation of substantial quantity of energy. The treatment and processing of wastes in Indian cities requires a mix of technologies and composting alone cannot be the favoured option. With a view to facilitate use of compost as manure, composting either through biomethanation or aerobic processes should be considered only in case of source segregated biodegradable organic fraction and not for the mixed waste.Besides,requirement of land can also be an issue in the selection of technological options for waste processing and treatment.

Possible Instruments for Developing PPP Projects are:

1. **Construction Grant**: It reduces the initial capital cost to the developer and is usually spread over the construction period. It is disbursed based on progress of the Project. It is directed towards encouraging private investment in infrastructure. In projects where construction grant is given, it is generally a bid parameter.

2. **Minimum Revenue Grant:** Govt/ULB promises to compensate the concessionaire if the actual revenue falls below projected revenue. In return, the concessionaire promises to share a part of the surplus, if actual revenue is more than the projected revenue.

3. **Operational Grant:** It is paid during the operation of the asset to meet the revenue and expenditure gap. It is generally given when the user charges are not adequate to cover the operating cost or need to be kept low for social considerations.

4. **Annuity Payment Mechanism:** The private party funds the capital expenditure gap and operational expenditure. User charges, if applicable, are collected by the Government. Once

Construction is complete, Government pays a fixed periodic payment to private party to compensate for expenditure.

Experience the world over has shown that private sector participation (PSP) results in cost savings and improvement in efficiency and effectiveness in service delivery mainly due to financial and managerial autonomy and accountability in private sector operations. Besides, it brings in new investment and better technologies. (P.U.Asnani)

In India by and large municipal authorities are providing solid waste management services. Of late, experiments to privatize certain solid waste management services are picking up and demonstrated improvement in the level of services in a cost effective manner. Private sector participation has been attempted in door-to door collection, street sweeping, secondary collection of waste, transportation of waste, composting of waste and power generation from waste and final disposal of waste at the engineered landfill.

The present capacity of municipalities in India to manage the privatization process is, however, extremely limited. There is need for developing in-house financial and managerial capability to award contracts to private sector and monitoring services provided by the private operator since the onus of ensuring proper service delivery and compliance of standards lies with the local bodies.[6]

Service contract: are generally given for (i) door-to door collection of waste in the morning hours. The activity is labour intensive and is undertaken by small time contractor or NGOs at a low cost. Cities of Bangalore, Ahmedabad, Nagpur, North Dum Dum, New Barackpore (West Bengal) and few wards in Jaipur are some examples. Different models are adopted in different cities. At some places, contracts are given to private operators for doorstep collection and

[6] P.U.Asnani

transportation based on wards allocated to each contractor. In some cases, door-to door collection are awarded to NGOs only against monthly payment(for example,Vejalpur,Gujarat).In some towns contracts are given to some contractors/NGOs to collect the waste from door-to door but the contractor is expected to collect the user fee from citizens as prescribed by local bodies.

(ii) **Street Sweeping**: are less common. They are generally given to cover un-served and newly developed areas. Payments are made per km area served on the basis of unit area fixed for street sweeping.Surat was the first street to award the contract for brushing the streets at night after the plague in 1994.Following this, Hyderabad has successfully outsourced the sweeping of 75% of its streets. The Models generally available for collection, transportation and cleaning are Mgt Contract, Service Contract and BOOT.

(iii) **Development of Transfer Station and Transportation**: Municipal authorities enter into secondary storage and/or transportation contracts to avoid investing in vehicles and equipment and to avail of a more efficient system. In such an arrangement, the private firm provides container and/or vehicles with drivers as well as fuel. The onus of maintaining the fleet of vehicles also lies with them. Such contractors are either paid per trip to the treatment/disposal site or per tonne of waste transported (examples can be found in Ahmedabad, Surat and Mumbai).The models generally available for transfer station and transportation are BOOT/DBFOT.

BOOT and DBO Contracts for Treatment of Waste: Generally, municipal authorities in our towns and cities are not equipped to handle treatment and disposal of waste, which are highly technical operations. Private sector participation is preferred and is generally picking up. BOT and BOOT are the most common models of concession agreements in vogue in the country today. Cities such as Kolkata, Hyderabad, Vijayawada, Ahmedabad, Trivandum, Thane and Jaipur are examples of such contracts for the construction of compost plants or waste to energy

plants. In most such cases, the municipal authority provides land on token lease rent basis and free garbage at the plant site.

Cities such as Mysore, Calicut, kochi, Shillong and Puri have adopted the design, build and operate (DBO) model for setting up compost plant. Under this arrangement, the municipal authorities provide funds, land, and garbage whereas the private authority is responsible for designing, building and operating the facility. The ownership of the plant remains with the municipality. The private firm is given time-bound contracts on mutually agreed terms and conditions. [7](P.U.Asnani)

Globally, scientific management is done on Tipping fees. The World experience demonstrates Tipping Fee as a sustainable model.

Privatization of disposal of Waste: In case of disposal of waste, Management contracts and DBFOT Models are the emerging Models. The concept of tipping fee is gaining acceptance with a beginning made by Municipal Corporation of Bangalore.

Integrated solid waste Management on PPP basis being done in Asansol Durgapur, West Bengal, Coimbatore City Municipal Corporation,Guwahati Municipal Corporation, Hyderabad Municipal Corporation,Mudurai Municipal Corporation are generally on BOOT or its variant.

Thus, various services being provided on PPP basis under SWM are Door to door collection, street sweeping, storage and Transportation, Development of Transfer Station, waste processing, integrated treatment and Disposal and Integrated Solid waste management .The typology of PPP Models are as under:

[7] P.U.Asnani

	Private Sector Participation in SWM in India	
1.	Collection & Transportation & Cleaning	MC/Service contract /BOOT
2.	Development of Transfer Station/ MRTS & Transportation	BOOT/DBFOT
3.	Waste Processing facility	BOOT/DBFOT/BOO
4.	Development of Sanitary Landfill & Post Closure Maintenance	Management contract (MC) /DBFOT
5	Integrated MSWM system (with combination of above)	Mostly on BOOT

However, new PPP Models are emerging in Dehradun i.e.collection, transportation and treatment of waste on lease/affermage models of PPP wherein capital finance would be by Government and working capital finance, O&M of the plant will be done by the private operator. However, the authority to earn and generate revenue shall vest with the private operator.

It has been observed that Tipping fee/MT of waste for C&T is in the range of **Rs. 500 -1500** in India. For instance:

- Collection & Transportation – (2 zones in Delhi) – 9 yrs on BOT – MCD pays Rs. 600/- per MT to concessionaire
- Collection & Transportation – (Amritsar City) – 12 yrs on BOOT – MC pays Rs. 500/- per MT to concessionaire
- Collection & Transportation – (Ambattur City) – 9 yrs on BOT – ULB pays Rs. 750/- per MT to concessionaire

7. Challenges to PPPs in Urban Infrastructure Development

The urban sector requires huge investments in urban infrastructure and new management models that promote efficient, effective and good quality basic urban services on a sustainable basis should be introduced. The twin objectives of accelerating urban infrastructure investments and quickly scaling-up new performance-based management models can be achieved through well conceived, structured and transparently-executed public-private partnerships (PPP).

Based on the past trends of private urban infrastructure investments, it is safe to assume that there are serious barriers for private sector investments in urban infrastructure in India. A quick review of the relevant literature indicates a number of reasons for reluctance on the part of the private sector to assume commercial risks in majority of the urban sub-sectors.

1. Most of the urban sector investments involve third tier of governments, which increase the perceived political risks for private sector investments.

2. Except for a minority of municipalities, the general financial status of most municipalities is precarious.

3. All put together, the urban infrastructure sector is seen as a very high-risk sector, leading to anemic inflows of private capital.

4. Urban sector project development and execution are largely done at the state or urban local body (ULB) level.

5. Instititutional complexity in service delivery –reflected in multiple agencies-(PHEDS, Boards and municipalities etc), overlapping functions, lack of clarity of roles and responsibilities

6. Inappropriately targeted subsidy

7. Lack of customer orientation

8. The challenge lies in disaggregating the requirements of urbanisation, systematically identifying PPP products, structuring them, fulfilling the requirements in terms of the technical studies and managing a competitive bid process for award

9. Challenge lies in creating a shelf of projects. A shelf of projects is not merely a list of projects, it is a systematic and exhaustive method of identifying project by the user deptt against a set criteria. There is rigor and discipline in the methodology and it fleshes out regulatory, policy and institutional arrangements required.

10. Utilities require baseline studies; price determination either through a regulatory or independent process and standards of quality built into the SBDs (Standard bidding documents) would provide the necessary contractual commitments or ensure a non discriminatory bid process

11. There is a need for standardization.

Standardization accelerates PPP process

(i) Process becomes replicable

(ii) Approval process gets streamlined

SBDs and MCAs facilitate the bid process by ease of approval by deptts, but also have the national and international best practices built into it.

12. While several states have an infrastructure fund, a dedicated urban fund for technical studies, bid process management, VGF, long tenor loan for the urban sector is typically an important requirement

13. While Policy and regulatory issues are stressed, a breaking issue is the capacity building of the ULBs and urban development agencies for PPP.Most often the absence of capacity is the greatest impediment to PPP

7.1 Constraints in Urban PPP Development

- Poor capacity to structure projects and execute contracts for city/state governments
- Little progress on preparing bankable and financially sustainable projects considering the opportunity and Risk involved
- Need to rationalize Tariff and user charges
- Complexity in unbundling urban service delivery
- There is complete lack of availability for long term funds

7.2 Opportunities for Expanding PPPs in Urban Infrastructure Development through JNNURM:

JNNURM was launched to cope up with the massive problems that have emerged as a result of rapid urban growth. It had become imperative to draw up a coherent urbanization policy/strategy to implement projects in select cities in mission mode.

Mission Strategy:

(i) Planned urban perspective frameworks for a period of 20-25 years (five yearly updates) indicating policies, programmes and strategies of meeting fund requirements would be prepared by every identified city.
(ii) Cities/Urban Agglomerations/Parastatals will be required to prepare Detailed Project Reports for undertaking Projects under identified areas.
(iii)Private sector Participation in development, management and financing of Urban Infrastructure would be clearly delineated
(iv) Funds for the identified cities would be released to the designated State Nodal Agency, which in turn would leverage, to the extent feasible, additional resources from the financial institutions/private sector/capital market

Mission Objectives

(a) Focused attention to integrated development of infrastructural services in the cities covered under the mission.
(b) Secure effective linkages between asset creation and asset Management so that the infrastructural services created in the cities are not only maintained efficiently but also become self-sustaining over time.
(c)Ensure adequate investment of funds to fulfill deficiencies in the urban infrastructural services.
(d) Planned development of identified cities including peri-urban areas, out growth, urban corridors, so that urbanization takes place in a dispersed manner.
(e) Scale up delivery of civic amenities and provision of utilities with emphasis on universal access to urban poor
(f) To take up urban renewal programme, i.e., re-development of inner (old) cities areas to reduce congestion.

- With the launch of the reform-driven and part-grant financed JNNURM, both the macro-environment as well as project-level micro environment is becoming more and more congenial for PPPs in the urban sector
- Many of the JNNURM-supported reforms are expected to create favorable governance and institutional framework for private sector to feel more confident to venture into the urban sector
- JNNURM grants may be used for Tariff reforms, Escrow structures, good debt-equity structures, creations of SPVs etc
- JNNURM projects that can be taken up on PPP should be taken up on PPP
- JNNURM funding can be used to finance the viability gap of 20% to come from sponsoring Government
- Each state can leverage JNNURM funding to generate large additional investment in urban PPPs

One of the primary objectives of JNNURM is to incentivise state Governments and ULBs to pursue reforms to improve Urban Governance structure, introduce efficiency in managing municipal finances, leverage the capital market and otherwise attract Private investment.

JNNURM and UIDSSMT are providing substantial grant components for development of SWM in the country. So far, 28 Projects on SWM have been approved under PPP mode under JNNURM costing Rs.1512.53 crores.

The PPP Models in SWM under JNNURM are generally Tipping fee based Models with private Equity ranging from 15% to 30%.Infact,the ULB contribution is generally funded by the Private Operator. The remaining 70% is contributed by the Central and State Governments. The O&M contracts entered into are generally for 20-30 years.

7.3. PPPs in MUNCIPAL SOLID WASTE MGT- challenges for Urban Local Bodies:

- **Funds:** to establish and operate integrated MSW management facilities

-**Technical Expertise:** to set up and operate MSW management facilities

-**Commercial competence:** to engage the private partner transparently-e.g. Inviting ''Expression of Interest'', ''Request for Proposal' and evaluating the proposal technically and financially

-**Finding appropriate Land along with buffer zone for MSW management**

With proper monitoring, PPP ensures innovation, efficiency and improved level of services, together with compliance to environment, Health and safety.PPP allows for involvement of user and other stakeholders and inculcates the habit of user charges through service delivery.

The capital support to ULB under JNNURM is intended to reduce the capital expenditure required for creation of integrated MSW facility. The private sector with initial subsidy will charge lesser Tipping fee.

The issues, which are being highlighted by the private sector, are as under:

-Successful bidder has to sign on the dotted lines of the Concession Agreement (CA) as there is no model concession agreement

-Ownership and clarity of the CA is not there on part of authority giving Concession

-CAs needs to become 'Agreements' rather than Regulations

-Onus on getting Government Permissions typically falls on the Private sector, which causes delays. Government should ensure Permissions being a partner

-Both sides should respect Concession Agreement

-Delay in Land possession and Land Lease; jeopardize debt financing and timely project completion

-No guarantee for input waste: the private operator arrives at the Tipping fee by calculating revenue inflows from the waste generation estimates of the Government.

-Timely inflow of grant should be inbuilt into project financing

-Tipping fee /Revenues are not linked to increase in critical inputs like diesel, WPI etc

-Timely and complete payment of periodic Revenues to the Concessionaire is not there

7.4 Issues in MSW PPP Projects: The following Techno-commercial issues are important in developing PPP Projects in MSW:

1. Quantity and Quality of Waste: There is conspicuous lack of accuracy regarding estimation of Municipal Solid Waste. Further, most of the technologies require high level of segregation.Moreover, Indian solid waste has low calorific value and the developer is forced to add other material (biomass).
2. RDF/Pallets have limited no of users unless the developer uses in his own plant furnaces (e.g. Grasim project in Jaipur).Further, market has not developed for composting which has resulted in uncertainties in revenues. The burden of high operational cost falls on the developer and it becomes uncompetitive.
3. The combustion Technologies entail high cost for adequate control of emission.Moreover, high dust and ash content in wastes pose a problem in effectively using the

technology.Further,Bio-methanation Plants entail high capital cost and O&M costs and there is an additional problem of sale of power.

The following Governance Issues need attention in developing PPP projects in MSW:

1. Project Structure and Risk: Waste Quantification and characterization pose a serious problem in technology assessment and feasibility studies. Equitable risk sharing is far and few (MSW supply, payment, penalities and termination).And few developers in the sector further complicate the situation.
Land is the single most important factor in SWM sector. Availability and clearances are to be ensured for successful implementation.

Lastly, the capacity/willingness of the contracting Agency is perceived to be the biggest stumbling block. Lengthy approval period and award period and the tendency not to honour the agreement once signed creates a lot of problem. Further, the concept of Tipping fee is alien to most ULBs which is further complicated by promises of "royalty" by competing developer/agents.

8. THE WAY FORWARD

While solid waste was completely neglected in the past but it is now receiving quite a bit attention by many states and central Government. However, some states are lagging behind.

a) There is a need to create National Mission to ensure that municipal authorities perform their obligatory functions regularly in compliance with MSW Rules 2000 within a predetermined timeframe.

i) The National Mission should include a nation wide awareness campaign through media using Expert seeking community participation in SWM

ii) The national Mission and State Governments could identify empanel and circulate list of national and international experts, individuals, and organizations, to provide technical know-how as well as commercial SWM services.

These firms could construct and operationalise treatment and disposal facilities and take up O&M contracts etc.

iii) The National Mission in consultation with state Governments and with assistance provided by ADB TA and PPIAF TA could prepare Standard bidding Documents (RFQ & RFP) to facilitate SWM projects through PPP. There is a need for development of templates pertaining to various models of PPP for SWM as under:

Collection, transportation and cleaning--Mgt Contract (MC)/Service contract/BOOT
Development of Transfer Station & Transportation--BOOT/DBFOT
Waste Processing Facility--BOOT/DBFOT
Development of Sanitary Landfill & Post closure Maintenance--MC/DBFOT
Integrated MSWM system (with combination of above) --Mostly on BOOT

The Templates should deal with broader aspects with flexibility to incorporate changes at local level--

-Performance Parameters

-Technical (design and specification), Commercial and Financial Parameters

- Basic PPP structuring as per each Model

-Key Clauses for Concession Agreement defining services, service level and quality standards, performance monitoring, penalties and setting of tariff etc.

b) The ULBs should formulate waste management Strategy through independent consultants. Waste management should be solution based and not technology based. The strategy must be formulated after making a thorough introspection on the following lines:

-What are the municipality's targets on waste re-use and recycle?

-How much waste is being diverted from landfill?

-Is the municipality able to recycle majority of the waste?

The strategy so formulated must demonstrate how it is intended to achieve the threshold objectives as defined by the ULB.

c) The basic Project Risks under PPP in SWM i.e. waste supply risk, waste quality risk, Technology risk and marketing of process outputs to improve commercial viability need to be mitigated for success of PPP in SWM.The developer must have long term rights to waste and guaranteed MSW volumes and characteristics. Robust off-take agreements must be concluded and there should be provision of tariff increase of 2 to 3% in case of waste to energy projects. Only proven technology should be used.Further, the social return must be factored in by the Government and other providers of grants and lower cost funds as part of overall financing fix.

d) Very few municipal corporations have successfully tapped the capital markets through infrastructure bonds. Urban local bodies are not perceived to be healthy and attractive candidates for borrowing from capital markets. To reach out to the capital markets successfully, municipal corporations need to undertake reforms and carry out business and financial plans to enhance their creditworthiness. Gaining access to capital markets means leveraging projected revenue streams to raise capital today. Cities need commercial discipline to repay debt. Capital markets are becoming a viable financing option today. However, cities lack the capacity and the experience to tap into capital markets, while the latter are looking for well-developed projects and investment opportunities.

Leveraging the capital market which is considered globally to be one of the most effective methods of augmenting municipal resources has found little favour with Indian ULBs.As per a study conducted by WSP, World Bank, even in ULBs with investment grade ratings, the approach towards market borrowing has been indifferent. Only 9 of the 79 sanctioned DPRs under the JNNURM indicate a plan or probability of borrowing from the Market. Of the 855.78 billion capital expenditure proposed by 24 Mission cities under JNNURM, just Rs.63.65 billion is expected to come from Market borrowing.

To encourage greater PSP in urban sector, every Project must be passed through a PPP test, particularly in better managed states and ULBs.

Emphasis also has to be placed on not using JNNURM as a conduit for the transfer of funds. Instead, the Mission has to be utilized for promoting market borrowing, particularly among investment grade ULBs.

e) Sub-sovereign lending straight to urban local bodies needs to be facilitated: Cities are driving economic growth in the country today. And banks, financial institutions, and even multilateral agencies are willing to consider lending directly to urban local bodies. Sub-sovereign lending

requires legally and financially empowered urban local bodies. The urban local bodies need to have the legally delegated authority to borrow and repay in order to gain access to capital markets. The delegation of responsibilities, under the 74th Constitutional Amendment, has not matched the corresponding transfer of authority to the desired extent, holding back the urban local bodies from gaining direct access to capital markets. Sub-sovereign lending needs reforms. Lenders need information on the financial health of the borrowing entity. No lender will lend to urban local bodies without an audited balance sheet for the last 7 years. Therefore, ULBs must make earnest efforts to bring about financial sector reforms.

f) Further, Central Government, State Government and ULBs can take up the role as facilitators:

Role of Central Government

- Facilitating enhanced external aid
- Providing further fiscal concessions. For example scope of definition of urban infrastructure under Income Tax Act has been expanded, tax free Municipal Bonds introduced. Further concession could be provided by way of tax holiday for investment in urban infrastructure.
- Capacity building at all levels
- Encouraging Foreign Direct Investment (FDI) and further simplification of procedures
- Creation of State level institutions for urban infrastructure.
- Setting up of urban infrastructure development fund at national level to provide for interest subsidy

Role of State Governments

- Changes in the Municipal Act in line with the provisions envisaged in the Model Municipal Law in order to allow entry of private sector, introduce accounting reforms, penalize defaulters, etc.
- Tariff rationalization and pricing to make the new projects commercially viable and for setting up of regulatory authority.
- ULBs have to be empowered to improve service delivery, levy reasonable user charges in line with the spirit of the Constitution (74th Amendment) Act
- Devolution of funds, functions and functionaries to ULBs as enshrined in the Constitution (74th Amendment) Act
- State Governments should implement the recommendations of the State Finance Commission to make the ULBs vibrant units of urban governance.
- State Governments should create the required municipal cadres, such as health officers, public health engineers, etc. There should be no ad-hocism for bringing in municipal functionaries.

Role of Urban Local Bodies

- A good amount of capacity building works need to be done at the ULB level. Since ULB finances are in disarray, a great amount of hand holding is required by both the States and the Centre, which can be further strengthened by external aid in the area of capacity building.

- Political leadership should be willing to embark on urban reforms for every conceivable municipal service. At the same time, elected representatives and municipal functionaries have to be sensitized on urban reforms. They should own the reforms and implement them.

g) There is a need for formulation of **State Policy for SWM** by each state:

(i) For implementation of Integrated SWM based on MSW RULES 2000:

The concept of ISWM plan derives from the necessity to look at alternative sources of collection, transportation and most importantly, disposal to ensure a healthy living environment in urban centres. The goal of any ISWM plan is the recovery of more valuable products from the waste with the use of less energy and more positive environmental impact

(ii)The Policy must lay emphasis on measures pertaining to allotment of land at nominal lease rent. All states should appoint an empowered committee for allotment of Government land for treatment and disposal of waste free of cost or on nominal lease rental basis. Local bodies as well as regional planning authorities like the District Planning Committee, Improvements Trusts, and urban development authorities should make adequate provisions of appropriate land for setting up temporary waste storage depots in each city and for setting up treatment plants and sanitary landfill sites in land-use plans keeping in mind requirements for the next 25 years.

Further, ULBs should enter into concession agreement only when land has been identified. Signing of land lease should not be delayed as it delays debt financing and timely project completion.

(iii) The Policy may ensure that Government and semi Government parks, gardens and farmlands give preference to the use of compost produced by ULBs within the state.Further, while the private operator shall have the freedom to sell the compost/RDF and energy generated,ULBs shall have exclusive rights over carbon credits earned.

(iv) Specific urban Funds at State level need to be set up for project Development, long tenor loan at concessional rates and capacity building for PPP in urban sector.

h) With a view to promote PPP; there should be a provision of free supply of Garbage to the WTE plant or compost plant if no Tipping fee is demanded by the Private operator for waste processing.

i) States and ULBs must encourage the concept of Tipping fee for Private Sector Participation in SWM.Tipping fee must be linked to critical inputs like Diesel, WPI etc.This should be entered in the concession agreement. Further, there should be periodic payment of Tipping fee to the operator. Any delay beyond 20 days should invite the liability of interest payment. This should be mentioned in the concession agreement.

j) The State Government should take responsibility for all Permissions/ clearances being a partner. The onus of getting clearances should not fall on Private sector. This should be mentioned in concession agreement.

k) Capacity building Programmes should be organized to ensure that ownership and clarity of concession Agreements is there on the part of the authority.

e) The private operator arrives at the Tipping fee by calculating revenue inflows from the waste generation estimates of the Government.Therfore there should be a provision for reset/renegotiation, may be through independent arbitrator, in the event of Government estimates going wrong.Or, alternatively, it should be mentioned in the concession agreement that the operator should himself confirm the composition, quantity and quality of waste of the city to get first hand correct picture.

m) There is a need to Develop Contract Management capacity in the Public Sector.

n) The State Government Policy should encourage cluster approach for a group of municipalities to select a common operator-economies of scale and makes business sense for private operator. The project should be of 300 TPD of MSW or more.

o) Public awareness: all good practices show that success of SWM has been possible in only those areas where the community was mobilised and willing to contribute to the cause of waste reduction. Creating public awareness thus, becomes an important, if not the most important, criteria for successful SWM.

p) Need for source segregation: segregation of waste is a catalyst to success of alternative means of waste disposal. The quality of the end product (manure in case of compost, pellets in case of WTE) and the cost involved has a direct dependence on the quality of segregation. Many cities in India having compost and WTE facilities are facing problems simply because of poor quality of segregation, and therefore, poor quality of end product which has no market demand. This is supported by the directive of Hon'ble Supreme Court to residents of all metro cities to undertake segregation of waste at source.

q) ULBs can also make use of Carbon Financing Options (Carbon credits) under CDM to improve the viability of the Projects.

r) ULBs should avail IIPDF assistance for projects related to SWM as sofar assistance sought under IIPDF has been negligible.

ANNEXURE I

PPPs in cities: The solid waste sector has witnessed max private sector participation compared to other urban infrastructure sector projects.

Bangalore: Bangalore has entered into two kinds of service contracts. One for primary waste collection from the door steps and transportation to disposal sites through small contractors and another for integrated treatment and disposal of waste through payment of tipping fees to expert agencies. In the first kind of arrangement,66% of the city has been divided into 61 groups and contracts are given for primary waste collection in waste tricycles/handcarts and direct transfer to a vehicle(owned by the contractor)and transportation to disposal sites. With this arrangement, the ULB is spending 50% of what it would cost to undertake the task departmentally.

In another contract for the treatment and disposal of 1000 MT of waste per day, land and solid waste has been provided by MCB to the private operator who has made an investment of 30 crores to set up the facility. The corporation is not expected to pay for waste treatment but a tipping fee of Rs.195 per MT of rejects is agreed upon. A max limit of 30% of waste delivered for treatment has been set to ensure that min waste comes to engineered landfill.

Chennai: is the pioneer in PPPs in solid waste on a large scale. The municipal corporation has withdrawn its staff from three out of the ten zones of the city. A seven year contract has been awarded to the private operator Onyx through a transparent bidding process for primary collection, street sweeping, secondary storage at transfer station and transportation of waste to disposal site. Onyx has engaged its own manpower, tools and equipment and fleet of vehicles. The cost per tone of waste in this arrangement is 50% of the departmental cost for the same service provided by the city administration in other zones. (P.U.Asnani)

Chennai Municipal Corporation is implementing another project of Rs.245.77 crore for primary collection, storage, and transportation to compost plant and landfill site. It is involving private operator for setting up of compost plants and for further operation and maintenance of these plants by marketing the compost. It is expected to be completed by March 2010.

Hyderabad: has privatized nearly 75% of its street sweeping operations applying a unique unit area method to eliminate the bidding process. The unit cost has been worked out on the basis of need of manpower, the min wage payable, the tools and equipment required.

Selco International is running a WTE facility using RDF technology in Hyderabad in consultation with TIFAC to produce 200 tonnes RDF per day from 700 tonnes of municipal solid waste provided by the municipality free of cost. The municipal corporation has provided 10 acres of municipal land on 30 years lease to Selco with an annual lease rent of 5% of the registered value of land.[8]

The Greater Hyderabad Municipal Corporation is implementing an integrated Municipal solid waste mgt project to handle MSW of the twin cities of Hyderabad and Seconderabad.The Rs. 897 crores project is being implemented under the JNNURM on PPP basis under BOOT for 25 years. It involves collection, transportation and processing of waste of 3800 TDP of MSW.The agreement has been signed in March 2009 with M/s Ramky.

Ahmedabad: PPPs in SWM in Ahmedabad started with the setting up 500MT Capacity compost plant. This was followed by private contracting of secondary storage and transportation. Door-to door collection is now entirely conducted through RWAs, associations of sanitation workers, and women's organizations. The municipal corporation gives grant for door-to door collection and its supervision. It has met with reasonable success in all its SWM ventures through PPPs.

[8] P.U.Asnani

In the area of waste treatment, Exel Industries LTD has set up a mechanized plant on 25 acres of municipal land allotted at a nominal lease rent of Rs.1per square metre per year for a period of 15 years. In return for 500 MT of waste provided free of cost at the plant site, the corporation expects to receive Rs. 35 per MT of compost produced as a royalty. The plant is operational since 2001.The responsibility for O&M of the facility as well as marketing of the product rests with the Excel Industries. The plant is functioning at 50-60% of installed capacity due to problem in marketing the compost.

Surat: The city introduced several measures of privatization in SWM after the plague in 1994, which transformed it to one amongst the cleanest cities in the country.

Transportation of waste from primary collection points to transfer stations has been contracted to two agencies who deploy 22 vehicles to make a total 221 trips per day.Rs.12 per trip is paid to the contractor resulting in a net saving of 17.4 % in transportation cost.

Contracts for secondary transportation of waste for removing MSW from transfer station to final disposal site have been awarded to four private agencies. Five transfer stations have been set up and the entire quantity of solid waste of 1000MT is transported by the private operator. The contractor deploys 42 close body vehicles which make 150 trips daily.

For Final waste disposal, Surat has constructed the first large sized engineered landfill in the country through private agency.

For biomedical waste, seven year contract has been awarded to a private operator on BOOT basis. A plant with capacity to dispose 200 kg of waste per day has been constructed. It is equipped with an incinerator, autoclave, and shredder. Rs. 10 per kg is charged for collection,

transportation and disposal of biomedical waste. 356 hospitals with 5087 beds, 1154 dispensaries and 157 pathological laboratories are served through 27 collection centres.[9]

Bio-Methanation Plant: Lucknow

Background

The Lucknow Nagar Nigam (LNN) faced major threat from disposed wastes as its two landfills were overflowing. Lucknow produces around 1800 MT of MSW daily. Inability to identify a suitable area in proximity forced LNN policy managers to look for other alternatives. The city also faces a huge crisis in terms of energy requirements, especially for its industries, and an option of generating environment-friendly power from MSW was determined to be the most optimum solution to the problem. Studies estimate that MSW in Lucknow has the potential of generating 1000 MW of power while industrial waste has the potential of generating 700 MW of power. The LNN, therefore, invited firms for development and execution of a WTE power generation and bio-fertiliser producing plant. The facility is designed to handle a minimum of 300 TPD of municipal waste and uses the bio-methanation process for conversion of waste to energy with help of a BIMA digester, a technology that is being used in over 50 WTE plants worldwide. The estimated project cost is Rs. 76 crore (LNN, 2002).

Stakeholders/Partnerships and Financial Outlay

The LNN invited Chennai-based Enkem Engineers to be the project promoters. Enkem India Ltd. floated a Special Purpose Vehicle (SPV) called Bio Energy for the project. ENTEC, an Austria-based firm, provided the project technology and digester for production of methane. m/s C.G.E.A. Asia Holdings, Singapore, is responsible for O&M. The proposed financing plan and the source of funding is as follows:

	Funding Type	**Source**	**Amount (Crore**

[9] P.U.Asnani

			Rupees)
1.	Promoter Equity	SPV – Asia Bio Energy	20
2.	Government Subsidy	MNES (@30 million per MW)	15
3.	Equipment Supplier	Supplied on Operating Lease basis	11
4.	Debt	Contract-based lending from IDFC	20
5.	Credit	Deferred credit being provided by equipment supplier	10
	Total		76

The following have taken an equity stake in the project

(i). Enkem Engineers Pvt. Ltd., Chennai

(ii). Entec Environment Technology, UgmBH, Austria

(iii). Innovative Umwelltechnik Ges.mbH, Austria

(iv). Jurong Engineering Ltd., Singapore

(v). CGEA Asia Holdings (P) Ltd., France

(vi). Larsen and Toubro, India

(vii). IDFC

Other stakeholders include LNN, NEDA, LDA, UPPCL, UPPCB and GoUP. The GoUP has given a guarantee against any default in payment of electricity charges. The solid waste is provided by LNN while the electricity is purchased by UPPCL.

Description of the Project

This project was designed as the first solid waste power project in Indian which the MNES identified as a full-scale national demonstration plant. Although the project was initiated in 1998, the project got delayed because of finalisation of land transfers, government guarantee, identification of financiers and other related formalities, which could be completed only by August 2001. The plant construction was completed in August 2003 (see picture).

The project is being executed on a Build Operate and Transfer **(BOO)** basis. The land for the project was provided by the LNN on a lease for a period of 30 years. LNN was given a subsidy to the tune of Rs. 75 lakhs from MNES for providing this land. While the technical inputs are being provided by firms from Austria and Singapore, human resource for execution was provided by Indian firms. As part of the original contract, LNN agreed to assure provision of 113 to 120 MT of MSW daily to the operator although the Plant has been designed to take a maximum of 300 MT daily. Depending on success of the initial phase, LNN was to increase supply to the Plant over a period of time.

Broad features of the project as envisaged include:

- 300 MT of solid waste to be treated daily to provide biogas.
- 5 MW power will be generated by using biogas as fuel for five gas generators.
- 70 tonnes of organic fertiliser will be produced daily as bye product.
- There will be no toxic liquid or gas effluents from the Plant.

Cost Recovery

As per the original framework, LNN was to get 1% of the cost of power sold to UPPCL and 5% of the organic fertiliser produced, an amount estimated around Rs.35 to 40 lakhs annually.

Electricity is being sold to UPPCL at rate of Rs. 2.48/- per unit. As per estimates, the Plant was to produce around 5000 units/hour by beginning of 2004. Power generation over 1 MW was started by Dec 2003 and is now expected to reach 5 MW soon.

Bio-Methanation Facility – Nagpur

Background

Nagpur's population of about 2.12 million (Census 2001) and generates almost 600MT of MSW per day. The waste is collected by the Nagpur Municipal Corporation (NMC) and dumped at the Bhandewadi dump yard. The content is mostly organic because the non-organic materials are taken by rag pickers for informal recycling. The NMC decided to set up a bio-methanation facility, a pioneering effort designated as a demonstration project by the MNES.

Stakeholders/Partnerships

The primary stakeholder for this initiative was NMC. The MNES, as a part of its initiative to promote WTE projects in India, provided subsidies to NMC as well as the contractor.

The CICON Environment Technologies Limited, a group company of ENBEE based industries, was designated as the project promoter.

The project promoters entered into separate Power Purchase Agreements with Madhya Pradesh Papers Ltd., and Nav Bharat Papers Ltd.

Financing Agreement

The total cost of the plant was estimated to be Rs. 47.2 crore (at 1999 prices). The debt equity ratio for the project was proposed to be 2:1. In early 2001, the proposed financing plan consisted of Rs. 12 crore of equity participation from promoters, Rs. 12 crore of grant from the MNES, Government of India, Rs. 11.7 crore of debt from Housing and Urban Development

Corporation (HUDCO) and another Rs. 11.7 crore from the Indian Renewable Energy Development Agency (IREDA).

Components

The project proposed to use a technology called 'dry anaerobic composting' or 'anaerobic digestion in a closed chamber' to produce biogas. The gas could be utilized in biogas engines to generate electricity. The semi-solids left in the closed reactor can be used as compost. This bio-methanation plant was proposed to be constructed at Bhandewadi, in Nagpur, on 10 acres of land and was to process 520 TPD of MSW. This was to produce 5.4 MW power and around 150 TPD of organic compost for sale.

Procurement Process

After discussions with four interested parties, NMC with the help of MNES selected the CICON group for further project development. After deliberations in 1997, NMC issued a letter of intent to CICON Environment Technologies Limited, a group company of ENBEE based industries, to undertake the project. ENBEE is a Bhopal based company, a special purpose vehicle created especially to execute projects for infrastructure development in India. In April 1998, the Nagpur Municipal Corporation entered into a concession agreement with CICON and ENBEE Infrastructure Ltd. to set up the WTE facility on a **BOO basis**.

Implementation Arrangements

NMC leased 10 acres of land to the project company for 30 years and guaranteed a supply of 520 tpd of raw material to the plant. The lease deed is renewable for another 30 years. In case of a shortfall of organic content (including paper) below 60 percent, the NMC was to provide an additional amount of waste up to 100 TPD. The project promoters entered into separate Power

Purchase Agreements with two companies. They also executed a manure purchase agreement with ENBEE fertilizers.[10]

Integrated SWM Project, Guwahati: Hyderabad based Ramky Enviro Engineers Ltd has secured an integrated SWM project. The project to be developed on 60 acres of land on BOOT basis. The company signed a 20 year concession agreement with Guwahati Municipal Corporation on Oct 29, 2008.

The project being implemented under JNNURM.A grant of Rs.350 million for the Rs.1.02 billion project has been approved. The municipal corporation has set up a SPV,the Guwahati Waste Management company Ltd, to implement the project. The project involves two segments-under the first segment, primary (door-to-door) collection of MSW, transportation to the processing site and disposal of MSW is being undertaken. The second segment involves setting up a plant with a capacity to convert 650 tpd of MSW into refuge derived fuel (RDF), a 50 tpd compost plant to produce manure as well as a 6 mega watt power plant to run on the RDF produced.

Integrated SWM, Project, Coimbatore: The Coimbatore City Municipal Corporation in Tamil Nadu is implementing an integrated SWM project under JNNURM.The project awarded to JV of UPL Environmental Engineers Ltd and Bharuch Enviro Infrastructure Ltd, is being implemented on BOOT basis and has a concession period of 20 years. The 965.1Million project is being implemented under two compoments.The first component, requiring an investment of Rs.269.1 million, involves distribution of bins, primary segregation of garbage, secondary storage in bins and transportation of waste to transfer stations.

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[10] Source:Nagpur and Lucknow:Solid Waste Mgt Part-II,Background Paper,12th Finance Commission by IPE(P) LTD

The 696 million second component involves development, design, engineering, finance, construction implementation and O&M of transfer stations, transportation of MSW from transfer stations to waste processing and disposal sites, processing and disposal facility for treating 400 tonnes of waste generated from Coimbatore. The JV has formed an SPV, Coimbatore Integrated Company Ltd, to implement the second component of the project. The project is expected to be completed by Sept 2009.The capital grant of 70% is being funded under JNNURM and the private operator UPL will contribute the remaining 30% in the form of Equity and Debt. The CMC will pay to UPL total NPV for 20 years Rs.264.85 crores (Tipping fee)

MSW Management Project: Navi Mumbai

The NMMC is planning to set up an MSW processing unit with a capacity of 500 tpd under the JNNURM on PPP basis. The project aims at the bioremediation of old accumulated waste, acceleration in aerobic composting of waste using windrows under controlled conditions for converting these to organic compost, converting combustible waste to RDF and recovering dry recyclables like glass, metals and plastics.

The operational methodology under the project is divided into six steps. Beginning at waste segregation, the project will move on to composting, RDF manufacturing, plastic recycling, inert processing to civil bricks and sanitary landfills.

Two main products are expected to be generated from the MSW. These are compost/ organic fertilizer and fuel pellets/ RDF. Segregated waste like plastic will be sent to recycling units.

Of the total 500 tpd of waste received, about 125 tpd of RDF and 100 tpd of compost will be recovered. The remaining components will comprise about 25 tpd of recyclables, 125 tpd of rejects that will be sent to sanitary landfills and 25 tpd of inert processing paver blocks. The balance 100 tpd will comprise moisture.

The project will be implemented on PPP basis. In April 2008, the corporation entered into an agreement with the UK based firm Ecomethane for tapping landfill gas (LFG) and availing carbon credit under the clean development mechanism (CDM) technology.

The firm will be responsible for arranging all financial, legal and technical aspects of investment in the LFG project, design and contract effective LFG tapping, develop all CDM-related documentation, undertake baseline study, monitor plans, register the project with the CDM executive board, and monitor emission reduction of the project in accordance with the United Nations Framework Convention on Climate Change procedures during the project's lifetime. The Corporation on its part will be responsible for providing electricity to the site.

The corporation is expected to receive an upfront amount of Rs 6.38 million for the project, and generate revenue of about Rs 80 million in the 10 years.

MSW Management Project: Kollam

Preliminary work on construction of a comprehensive MSW management project has started in Kollam district of Kerala. The project was secured by Jamshedpur Utility and Services Company Limited (JUSCO). An agreement for constructing the project was signed between JUSCO and the Kerala Sustainable Urban Development Project on July 29, 2008.

The Rs 650 million project is being funded by the Asian Development Bank. The project scope involves establishing an integrated solid waste processing and disposal facility, a new sanitary landfill capacity, closure of the existing waste dump site, erection of an electromechanical compost plant and establishment of a leachate treatment plant.

The plant will have a capacity to process and dispose of 100 tpd of waste. Currently, seepage of leachate into nearby drinking water wells and the Ashtamudi Lake, especially during the rainy

season, is a major problem. The establishment of the landfill site is expected to obstruct the seepage. The project is expected to be made operational by February 2010. [11]

MSW projects in Jaipur: Rs.20 crores plant has been set up on PPP basis by M/s Grasim at Langaria Was in Jaipur for conversion of MSW into RDF.The plant accepts about 300-400 MT unsegregated SW per day at plant site from Jaipur Municipal Corporation (JMC).

The rejects/inert material will be dumped at the adjoining sanitary landfill site which is being constructed by JMC.

The Project is on BOOT basis -built, own, operate and transfer of land only for 30 years. The corporation has allotted underdeveloped land equivalent to 25 acres to the private operator @ Rs.1 per sq metre on lease for 30 years. The operator M/s Grasim is supposed to pay revenue share of Rs.1,20,190 per annum to JMC.The RDF produced is being used in the cement plant of M/s Grasim so there is no problem of marketing.

JMC has a bio-medical waste treatment plant established on BOOT basis at village Rupari on the 4 acres land provided by JMC on lease basis.

JMC has worked as a facilitator to arrive at a negotiated rate of Rs.3.10 per day per bed to be paid by the hospitals/clinics to the service provider.

482 hospitals (Government/private), 8000 beds are being provided facility.

The common bio-medical waste treatment facility is treating about 4 tonnes of bio-medical waste daily generated from hospitals/clinics.

Work on an additional plant at Agra road is in progress.

[11] Source: Guwahat,Coimbatore,Navi Mumbai & Kollam Projects-Indian Infrastructure Vol II,Issue 7, Feb 2009

Compost plant for waste treatment: Another project on PPP basis for production of compost from MSW is coming up in Jaipur on DBOOT basis at Sewapura at a cost of 8 crores.

JMC will supply min waste of 250 MT per day at the plant site. Land has been provided to the private operator for a lease period of 30 years.

100 MT of compost is likely to be generated per day.LOA has been issued to the private operator

Municipal Solid Waste Management Project in Asansol Urban Areas: Durgapura and Asansol MC generate about 700 tonnes of solid waste every day. A project of Rs.44 crores has been prepared and proposed under JNNURM.The five ULBs have to shell out 30% of the project cost.ADDA(Asansol Durgapura Municipal Corporation) have decided to enlist PSP in implementation. The private partner will set up and run processing plants at three sites and manage the landfill site.ADDA invited bids for selection of private operator on BOOT basis.5 ULBs have to ensure 350 tonnes of Garage at the processing site every day. The consortium of Gujarat Enviro Protection Infrastructure Ltd and Hanjer Bio-tech Ltd has been selected. Tipping fee has been agreed as Rs. 85/tonne of MSW.The project is to be completed in 24 months. Door to door collection of waste at such a large scale has been conceived of for the first time. For sustainability of the project, ULB will collect:

RS.5 to 25 per month per household

Rs.25 to 50 per month in commercial areas

Up to Rs.4000 per month for larger units like hotels, shopping complex etc.

Box 1

Integrated Reforms at the Municipal Corporation of Delhi

The Municipal Corporation of Delhi is among the largest municipal bodies in the world providing civic services to more than 13.78 million citizens (2001) in the capital city. It is next only to Tokyo in terms of area under its jurisdiction. Also within its jurisdiction are some of the most densely populated areas in the world. The Conservancy and sanitary engineering department (CSE) of MCD caters to 94 per cent of the area of Delhi state, serving a population of more than 13 million. The per capita garbage generation is estimated to be 0.45 Kg per amounting to 6500 MT per day for the city. Currently, the actual garbage lifting per day is 6000 MT. The projected garbage generation by 2021is 18,000 MT per day. CSE department has staff strength of between 60,000-70,000 persons consisting mainly of sweepers.

Undoubtedly the task of MSWM in Delhi is a daunting one and in spite of massive daily expenditure on service provision, there remains a significant need for upgradation. The failure of the MCD to provide quality services complying with MoEF Rules in a timely, aesthetic, and hygienic fashion to the citizens satisfaction within the city's budget constraints raises serious issues that demand attention. While health concerns of the sanitation workers led to the mechanization and modernization of collection and transportation operations, the city faces a limitation of disposal sites.

To tackle these key concerns a comprehensive strategy, strongly driven by the Commissioner, was developed after detailed discussions with the CSE personnel. The overall upgradation strategy to create an integrated efficient and effective garbage collection, transfer and disposal system in Delhi was designed in three phases: (a) collection, segregation, and transportation through PPP, (b) a technical master plan for disposal and (c) private sector based treatment and disposal projects on recommendations of the Master plan. The MCD with other agencies developed the parameters for project development including technical and financial viability studies. The first two phases were started simultaneously while the final phase is

expected to commence towards the end of phase II. United Nations Office for Project Service (UNOPS) funds were raised for the waste treatment and disposal master plan for the state of Delhi for the next 25 years.

In the first phase a '**Public Private Partnership** in Collection and Transportation of Municipal Solid Waste in 6 MCD Zones' was initiated with the following key features

1. Six of the 12 zones selected for the projects were – City Zone, S. P. Zone, K. B. Zone, South Zone West Zone and Central Zone.
2. An open competitive bidding process was used to select the private operator. The six zones were organized into two zones sets and bidders qualified for one zone set were barred from applying for another zone set. Final proposals were received from three bidders each in the two zone sets.
3. The contractual framework on a Design, Procure, Renovate, Operate, Maintain, and Transfer (DPROMT) basis was set in place through a Concession Agreement.

Some important development have resulted:

1. *New standards of service:* The new contracts were designed to provide higher levels of service than currently available. This included daily clearance of biodegradable waste; containerization from community bins onwards through the transport chain and mechanized lifting of waste.
2. *Segregation and segregated transportation of waste*: The contract also specifies a segregation benchmark, which the transporter has to achieve year on year. The segregation benchmark, which allows for a low level in the first year of operations steadily, builds up over a five year period. Elaborate arrangements have been conceived of to test the segregation levels achieved at the disposal site. Strong incentives and penalties have been built in to ensure that the transporter achieve the segregation benchmark.
3. *Tipping and long term contract:* The contract envisages a 9 years exclusive concession, which is based on a tipping fee payable by MCD on a per tones basis. This was developed out of the typical depreciation period for vehicles as well as on a risk mitigation strategy based on

which the private sector is expected to take all design and financing risks associated to the project.

4. *Independent performance monitoring* has been built into the contract with detailed schedules for performance measurement linked to a strong set of incentives for improving levels of service and penalties and cancellation of the contract for non- performance.

5. *Independent regulation*: a specific mandate to an independent consultant to review environmental compliance is directly related to performance evaluation of the private operator.

6. *Dispute resolution:* a committee of private operators is envisaged which will be responsible to benchmark the performance in each zone and will be the first stop to work out disputes with the MCD.

This contract was very successful in the market and 6 bidders' submitted proposals. Finally four were selected and operations have started. The bid price has provided immense savings to MCD as most of the awards have been at levels which are approximately half the expenses incurred in an MCD run system despite significantly upgraded service levels.

(P.U.Asnani)

Box 2

Waste Management in Greater Noida

The Greater Noida Industrial Development Authority (GNIDA) has established a Solid Waste Management System with the active participation of the Private sector and CBOs. While the Collection and maintenance of cleanliness of the city is the task of the Private operator, monitoring and the Neighborhood Management Committees & GNIDA officials carry out

supervision.

GNIDA has privatized Waste Collection and sweeping services through a process of competitive bidding based on the lowest quoted unit rate per tonne of Waste collected. The private operator has to adhere to the SWM rules 2000 and put in the requisite financial, technical and human resources. At the end of the Month, the operator based on the actual volume of Waste collected raises a monthly bill, which is paid within 21 days.

In a joint initiative with NOIDA, GNIDA has also invited bids from prospective developers for setting up a Waste treatment unit & sanitary landfill.

The private operator has opened a computerized customer service office for requesting written or telephonic complaints of the management council and residents, which is operational round the clock, and immediate steps are taken to rectify the complaint.

GNIDA has developed a SWM monitoring system in which daily reports on the status of sweeping of roads, cleaning of Urban centres, industrial areas and collection of Waste from households are filled up.

GNIDA is planning to collect user changes from the residents for waste management to ensure full Cost recovery from the end users. The will relieve the Authorities from financial burden as the payments to the private operator will be fully recovered from the users, thereby making the SWM system financially sustainable.

The involvement of Neighborhood Management Councils in monitoring and supervision of the work of private operator has ensured that proper feedback is available to the officials of the GNIDA regarding the quality of Performance.

Box 3

Timarpur Integrated Municipal Waste Management Processing Complex

In the late 1980s, a power plant using MSW as feed was conceptualized and implemented in Timarpur, Delhi. The plant was built and designed by a Danish operator,M/s Volund on turnkey basis. The plant was designed to incinerate 300 tpd of MSW and generate 3.75 MW of electric power. When the plant became operational, it could not meet these targets. The broad reasons for the poor performance were:

-The poor calorific value of the incoming MSW

-Unscreened Garbage affected the performance of equipment, as the plant was designed for screened Garbage.

Efforts were made to get over the design defect by installation of a screening plant. A Screening plant of 100 tpd capacity was installed in 1989 and the plant commenced its operation again. Though the plant performance did show some improvement, it was still not adequate to operate at its capacity and the plant had to be shut down in 1990.

The reasons for the initial failure of the Timarpur project were analyzed and subsequently, the Department of Science and Technology, GOI successfully developed and demonstrated the technology for MSW that was suitable for Indian conditions-the technology rights for this technology were vested in TIFAC (Technology Information, Forecasting and Assessment Council-an autonomous body under Deptt of Science and Technology).

APTDC (Andhra Pradesh Technology Development and Promotion Centre) has been given the mandate by DST to commercialize the said technology for MSW processing.

Delhi Power Company LTD has been setup to develop an integrated waste Mgt facility for MCD.The project which will produce electricity from processing of MSW will be located in Okhala, New Delhi.MCD has mandated ILFS to conceptualize develop and bid out a power project that will use MSW as a feed to generate power. For the proposed project, TIFAC would offer the upgraded technology.

Projects Installed for Energy from Urban Wastes

- 3 MW Incinerator in Delhi in mid eighties
- 6.6 MW project based on MSW at Hyderabad
- 6 MW project based on MSW at Vijayawada
- 5 MW project based on MSW at Lucknow
- 1 MW power from Cattle Dung at Ludhiana
- 150 kW plant for Veg. Market, sewage sludge and slaughterhouse waste at Vijayawada
- 250 kW power from Veg. Market wastes at Chennai
- 3.5 MW power from biogas at STPs in Surat

1.0 MW power project based on cattle dung at Haebowal Dairy Complex Ludhiana, Punjab

August 21, 2009

0.15 MW Power Project Utilizing Vegetable Market and Slaughterhouse Wastes at Vijayawada, A.P.

August 21, 2009

3000 cum biomethanation project for solid waste at Slaughterhouse in Andhra Pradesh

August 21, 2009

BOX 4 Contracts for Solid Waste Management – Municipal Corporation of Hyderabad

Measures under taken by Hyderabad Municipal Corporation have spanned private sector involvement in primary collection, street sweeping, transportation and disposal of solid waste in the city. There is a clear effort to move towards a simple system that responds to the local private sector and HMC capacity to monitor. This process suggests the need to continually review and adapt the process to local contexts.

Item	1996-97	1997-98	1998-99
Scope of Contracts	Only for sweeping, collection and transportation of garbage	Separate contracts for areas and main roads with inclusion of transportation	Contracts reforms into "Day Units" for areas and "Night Units" for main roads.
Procurement process	Procured through lowest bid for a monthly rate for given quantity of work in specified areas	Procured through lowest bids for a rate per quantity of garbage delivered	Procured through technical capacity and past experience at a fixed price for a defined unit which represents equal quantity of work.
Coverage of the Arrangement	27 areas covering about 40000 population and a distance of 27 km.	For main roads a length covering 153.5 km in 4 contracts. For other areas, 7 municipal wards with about 30 percent coverage of city	Planning for the entire city by dividing into day and night units. About 60 percent of total work is contracted out.
Provision for Penalties	Penalty linked to 'unsatisfactory' work at 2 percent of the contract amount	Penalty linked to 15 percent of the assessed value of 'unsatisfactory' work.	Penalties based on performance monitoring system using detailed input and output criteria.
Monitoring Systems	Limited role of communities, weak municipal monitoring	Enhanced role of communities and increased participation of women. Strengthened municipal systems and introduction of computerized weigh bridges.	Role of communities made more extensive with informal committees Computerized monitoring with the Daily Deduction System.

Note: The procurement process has changed to a lottery, and is no longer based on competition.
Source: Mehta Meera (1999). "A Review of Public-Private Partnerships in the Water and Environmental Sanitation in India", Water and Environmental Sanitation Group. DFID, India.

ANNEXURE II

International Best Practices

Anapolis Royale (Canada) – Zero Waste System through Decentralised System

The town of Annapolis Royal embarked on an ambitious plan in 1998 to reduce waste using locally based, low-cost and low-tech strategies to achieve Zero Waste by 2005. The goal of Zero Waste is to have waste reduction programs in place and purchasing options available that will allow residents and businesses to be waste-free with a minimum of personal effort. A central feature of Zero Waste involves the treatment of organic waste, which represents over 30% of the MSW through composting of all organic waste, both residential and commercial, within town limits. Composting was propagated at three levels:

1. Backyard residential, employing backyard composters and food waste digesters (Green Cones): designed for the homeowner, these inexpensive aerobic digesters can compost all household organics, including meats, bones, dairy products and other kitchen waste not normally backyard composted;
2. Neighbourhood composters (low-tech multi-household composting facilities located throughout town): designed for multi-family shared use, these larger low-tech composting bins have three compartments and can handle virtually the same organic waste as Green Cones; and
3. Earth Tubs serving restaurants, grocery stores and other commercial organic waste producers: can handle up to 200 pounds of organic waste per day.

This resulted in a 53% diversion of wastes from landfills to organic composting, which compounded with reduced negative environmental impact of trucking led to an improved environmental situation in the city. Very soon, most Canadian towns started adopting similar practices. This initiative ensured local sustainability with a high level of community participation; currently around 80% of town population act as volunteers in decentralised organic composting. All parts of the initiative were low-cost, low-tech and locally managed, giving it a local ownership.

As a small town with a limited tax base, Annapolis Royal faced major financial challenges in implementing SWM. Realizing that transportation and tipping costs associated with the curbside collection and central composting of organic wastes are quite high, citizens in the Annapolis County Environmental Protection Association (ACEPA) researched alternatives that could save the town considerable resources. ACEPA produced a plan to handle MSW on a local (rather than regional) scale. ACEPA invited the public to attend general information meetings. Speakers (such as environmental activists and waste management professionals) explained alternatives that would cost less, be earth-friendly, and permit a high degree of local control. The town formed an Environment Committee with community representatives, including a representative from ACEPA. This Committee handled much of the transition to a new system of local waste management, and continues to guide the programs now in place. The Environmental Committee also propagated segregation of waste at source and a four-way segregation has been adopted to collect: (i) recyclable beverage containers, (ii) clean paper waste, (iii) organic waste and (iv) residual waste.

The Zero Waste is a practical approach to a long-term sustainable initiative because all technological components (Green Cones, Neighbourhood Composters, Earth Tubs) pay for themselves in a relatively brief period of time, and the town is better able to budget for the future. The uncertainty of budgeting for increased tipping fees and rising fuel costs are avoided by keeping the initiative local, low-cost and low-tech

Hangzhou (China) – Waste-to-Energy Initiative

Hangzhou is located in the Yangtze River delta in the southeast part of China, a coastal region relatively developed for its economy. MSW in the city is taken to sanitary landfills with a daily capacity of 2300 to 5000 tons of solid waste, which comply to state environmental norms. However, it was decided to tap this waste and convert it into energy. Subsequently, a landfill-gas-to-energy power plant with an output of 1940 KW was set up. The power plant of phase 1 makes an annual profit of RMB 7.2 million (approximately Rs.37 million at 1999 rates) and reduces landfill gas pollution by about 12 million cubic meters (9 million cu.m. of CH_4, 3 million cu.m. of CO and 4000 cubic meters of H_2S). The plant has the option of expanding upto 5280 KW in Phase II.

Funds were mainly raised through levying a local tax called the urban construction and maintenance tax, which accounts for 72.3% of the total cost of the project. The remaining capital was made up by foreign investment. Experts from across the country were invited to provide necessary technical and scientific inputs. The advanced technology of gas-to-energy recovery was imported from abroad.[12]

[12] Source: Solid Waste Mgt Part I, Background Paper, 12th FC by IPE (P) Ltd

Annexure III Illustrative list of existing / awarded PPP projects in the MSWM sector in India

Sl. No	City	Project	Term of Contract	Revenue Model for private operator	Status and Remarks
1	Ulhasnagar, MH (300 TPD)	Collection & Transportation I	10 years	Management Contract	Project Value – INR 45 crore Awarded in Oct, 2007
2	Ambattur, TN (400 TPD)	Collection & Transportation	12 years	BOOT (Tipping Fee/Tonne)	ULB pays Rs. 750/- per MT to concessionaire
3	Greater Noida (50 TPD)	Collection & Transportation	3 years	Management Contract	Project Value – INR 7.2 crore Awarded in Aug, 2007
4	Coimbatore, TN (400 TPD)	Integrated MSW system; setting up of transfer station (4 nos. of 200/125 TPD), waste processing (375 TPD), and SFL in 33.80 acres	20 years	BOT (Tipping Fee/Tonne) *JNNURM funds – 70%*	Total NPV to Concessionaire – Rs. 264. 85 cr Awarded in Nov, 2007
5	Hyderabad (3800 TPD)	Integrated MSW system; collection & transportation, transfer stations (8nos.), waste processing & SFL	25 years	BOOT (Tipping Fee/ Tonne)	Awarded to private player in Feb, 2009
6	Delhi (5 zones) (1000 TPD)	Integrated MSW system, collection, transportation, processing & disposal	20 years	BOOT (Tipping Fee/Tonne)	Awarded to private player in 2008
7	Guwahati (500 TPD)	Integrated MSW system, collection, transportation, processing & SFL on 180 bighas of land	25 years	BOT (Tipping Fee/Tonne)	JNNURM grant of INR 31 crore in project cost of INR 52 cr
8	Asanol, Durgapur (693 TPD)	Integrated waste processing & Sanitary landfill on 167 acres of land	20 years	BOT (Tipping Fee/Tonne)	Awarded to private player in 2007
9	Thiruvananthapuram, Kerala	Only Sanitary Landfill at Villapilsala	20 years	BOT (Tipping Fee/Tonne)	SFL land area of 13.47 acres

10	Madurai, TN (350 TPD)	Integrated waste processing and sanitary landfill	20 years	BOT (Tipping Fee/Tonne)	Awarded to private player in 2007

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