

Public Private Partnership in Solid Waste Management

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Abstract: *If the solid waste generated is not treated and disposed carefully, it is a threat to the health of people as well as the environment. As waste generation rate is expected to double over the coming years in the developing countries, the cost of managing waste is also expected to witness a steep rise. Hence there is a huge scope for the Urban Local Bodies as well as private bodies to earn revenue by management of solid waste.*

The state and central government are focusing more on solid waste management but still failing to provide sustainable and affordable waste management services. In order to eliminate the technical and financial problems that are associated with the current system, the Indian government is trying to attract the private contractors for collection, transportation and disposal and private capital to increase the rate of improvisation process. With the increase in urbanization there has been a marked shift in quantities and qualities of waste generated. This has in turn increased the gap between demand for MSW services and the current capacity to service the same. It has been observed that in India segregation and storage of MSW at source are lacking. Also the collection efficiencies are seen to be poor. Economically, the collection and transportation activities constitute around 80- 90% of the budget allocated. On the contrary, disposal and treatment of waste is an underinvested area.

Keywords: *Public private partnership, municipal solid waste, urban local body, government of India, environmental problems.*

I. INTRODUCTION

Economic development, urbanization and improving living standards in cities, have led to increase in the quantity and complexity of generated waste. Urbanization is rapidly increasing in developing countries. In India, proportion of population residing in urban areas has reached 32.8% in 2011. Due to significant growth in urban population, it is estimated that by 2020, 50% of the population will be residing in urban areas. Management of municipal solid waste (MSW) resulting out of rapid urbanization has become a serious concern for the government departments, pollution control agencies, regulatory bodies and also public in most of the developing cities.

Cities are expanding awfully and the issues of municipal solid waste (MSW), is becoming critical due to the increase in quantity and complexity of generated waste and scarcity of land for its disposal. Various studies reveal that about 90% of municipal solid waste is disposed off unscientifically in open dumps and landfills, creating problems to public health and the environment. The unmanageable MSW poses various environmental such as nuisance from odour, prevalence of unhygienic conditions and ground water pollution etc. Municipal solid waste management is an obligatory function of Municipal corporation and urban local bodies. This function is included in the 12th schedule appended to the constitution of India through 74th amendment in 1993.

Poor collection of municipal waste and inadequate transportation to transfer station or landfill are the main factor responsible for the accumulation of MSW. Its management is passing through a critical phase, due to the unavailability of suitable facilities to treat and dispose off wastes in metropolitan cities.

In India, the responsibility of waste management lies with Urban Local Bodies (ULBs) due to the public and local nature of the service. Since MSW is inextricably linked to urbanization and economic development, the nature and constitution of MSW in India differs greatly, when compared to MSW in other high-income countries. The composition of MSW at generation sources and collection points in India is observed to mainly consist of a large organic fraction (40– 60%), ash and fine earth (30–40%), paper waste (3– 6%) and plastic, glass and metals (each less than 1%).

However, with most cities/towns urbanizing rapidly there has been a marked shift in the quantities and quality of waste generated across the country, in turn contributing to a rising deficit between the demand for MSW services and the current capacities among ULBs to service the same.

In India, segregation and storage of MSW at source is lacking and the decomposable and non-decomposable wastes are often disposed off at a common communal dustbin/disposal centre.

The collection efficiencies are also seen to be poor, at around 70% in most Indian cities and continue to be predominantly manual in nature. Transfer stations are rarely used and the same vehicle that collects refuse from the individual communal bins is also responsible for taking it to the processing or the disposal site. Collection and transportation of solid waste constitute of approximately 80–95% of the total budget of MSWM; hence, it forms a key component in determining the economics of the entire MSWM system. On the contrary, disposal and treatment of waste is an underinvested area and open, uncontrolled and poorly managed landfills are a common feature across most Indian cities and town.

II. SOLID WASTE MANAGEMENT

Municipal Solid Waste Management (MSWM) services can be unbundled into various components, including source segregation, collection, transportation, cleaning & sweeping, secondary storage, processing and disposal. (This chain is mostly followed in cities with decentralized processing facilities. However, in case of an integrated processing and disposal system, the waste transportation component after processing would not appear as a separate activity in the value chain and tends to get handled in an integrated fashion).

Further, the chain for MSWM services comprises of the different types of waste (organic/recyclable/inert) that is present in the municipal solid waste. Subsequently, the organic waste is transported to the processing facility which can either be composting /or waste to energy facility and the by products such as compost, power as the case may be finally sold. The recyclable waste is usually sent to the material recoverable facility and then finally sold. However, the inert/rejects from the MSW are sent directly to the sanitary landfill for final disposal.

It has been observed that there is a lack of proper MSWM services in the country primarily due to reasons including; financial constraints of ULBs, institutional problems within the departments, fragile links with other concerned agencies, lack of suitable staff, and other allied problems. Mostly, expenses towards MSWM are met from the general budget and allocation from Property taxes. Very often, funding for operations and maintenance relating to provision of MSWM services is not earmarked and properly budgeted for.

A. Centralized and Decentralized Waste Management Approaches

Municipal waste can be managed through a centralized approach, and a decentralized approach or a combination of the two. Waste management services under each approach in turn can be delivered by the ULBs themselves or in association with the private sector or the local community. In India, both centralized and decentralized systems are in practice in different cities/towns.

- 1) *Centralized Approach:* The centralized approach to waste management, also termed as Integrated Solid Waste Management, is a technology-driven waste management system for handling bulk wastes at a central processing facility. With respect to the MSW chain, in a centralized waste management system, the implementing agency (either the ULB or a private entity) collects wastes from household or community bins and transports it to a processing facility. Thereafter, composting techniques and/or waste to energy technologies like incineration, pelletization, Refuse Derived Fuel (RDF), plasma gasification, bio-methanation are used to derive value from the wastes. These waste to energy technologies are more common in developed countries and have been applied in a few waste management projects in India. An Integrated Solid Waste Management System (ISWM) envisages provisioning of all aspects of waste management i.e., collection, transportation, processing and disposal of waste by one or two large entities. Moreover, coordination between the ULB and the private entity is relatively better in the ISWM framework when compared to a scenario where multiple entities are engaged in different segments of the waste management process.
- 2) *Decentralized Approach:* The decentralized method of managing a city's waste involves management of municipal waste by various small waste management centers within the locality. In technical parlance, such centers are called Integrated Resource Recovery Centers (IRRC) which can be either profit-making or not-profit organizations engaged in collecting, transporting and processing around 2 to 20 metric tons of waste from the surrounding locality. The micro-entrepreneurs owning for-profit IRRCs generally engage informal workers for collection and transportation of wastes through hand-held carts or other small vehicles. Composting is undertaken to convert organic waste into manure whereas recyclables like metal, glass, plastics etc are either sold to the recycling industry or recycled by the organization itself. The refuse is collected by the ULBs and transported to the sanitary landfill sites.



B. Need of A Proper Management System

Ministry of environment and forest in 2016 created a new framework for the management of MSW under the environment protection act 1986 under which the ULB's (urban local bodies) were given the responsibility of managing MSW.

The state governments and external funding agencies have also enhanced budget in order to support ULB's.

Proper solid waste management by *Central Pollution Control Board (CPCB)*: Scientific disposal of solid waste through segregation, collection and treatment and disposal in an environmentally sound manner minimises the adverse impact on the environment. The local authorities are responsible for the development of infrastructure for collection, storage, segregation, transportation, processing and disposal of Municipal Solid Waste.

As per information, compiled by Central Pollution Control Board (CPCB), municipal authorities have so far only set up 553 compost & vermi-compost plants, 56 bio-methanation plants, 22 RDF plants and 13 Waste to Energy plants in the country.

C. Problems Of Unscientific Municipal Solid Waste Disposal

Only about 75- 80% of the municipal waste gets collected and out of this only 22-28 % is processed and treated and remaining is disposed of indiscriminately at dump yards. It is projected that by the year 2031 the MSW generation shall increase to 165 million tonnes and to 436 million tons by 2050. If cities continue to dump the waste at present rate without treatment, it will need 1240 hectares of land per year and with projected generation of 165 million tons of waste by 2031, the requirement of setting up of land fill for 20 years of 10 meters height will require 66,000 hectares of land.

As per the Report of the Task Force of erstwhile Planning Commission, the untapped waste has a potential of generating 439 MW of power from 32,890 TPD of combustible wastes including Refused Derived Fuel (RDF), 1.3 million cubic metre of biogas per day, or 72 MW of electricity from biogas and 5.4 million metric tonnes of compost annually to support agriculture.

III. FACTORS CONTRIBUTING TO POOR SERVICE DELIVERY

ULBs' lack of commitment, poor financial health, untrained or inadequately trained work force and lack of equipment are the main reasons for the incomplete coverage and unscientific processing & disposal of waste in Indian cities and towns. However, with an increasing urban population, and a changing socio-economic demographic profile, there is growing pressure on the ULBs to deliver quality services to its citizens. This requires increasing the capacity of the ULBs for better management of MSW in their localities. Different segments of the MSW value chain are beset by different set of problems that render management of MSW ineffective, inadequate and inefficient.

A. Factors Contributing to Poor Waste Segregation System

Lack of public awareness about the need for waste segregation Creating awareness about the importance of proper waste management is an area that has not received adequate attention from policy makers. The principle of 3R's – Reduce, Reuse and Recycle is rarely practiced at the individual household or commercial establishment level. Citizens are not aware of the merits of waste segregation and scientific disposal of wastes. Even when citizens know that waste should be segregated into bio-degradable and non-biodegradable components, they do not practice it as they are not informed of the social and economic repercussions associated with the mixing of organic and in-organic waste with hazardous biomedical and electronic waste. Information, Education and Communication (IEC) campaigns highlighting the criticality of MSW management have not been undertaken at the required scale by ULBs.

B. Factors Contributing to Poor Collection & Transportation (C&T) System

1) *Unplanned and Variable City Features*: A large number of cities and towns in India have developed in an unplanned way. The width of roads and lanes vary significantly within and among cities. Therefore, C&T systems require meticulous planning to ensure successful execution. The different urban profiles of cities and towns call for different systems for C&T. However, most of the ULBs practice a uniform C&T system for an entire city/town, as a result of which inaccessible and marginal areas are not covered.

2) *Inadequate Equipment And Inappropriate Technology*: Faulty designs for waste C&T system such as inappropriate size and placement of garbage bins, transfer stations, etc. has aggravated the problem of overflowing waste and insufficient removal of waste from sites. The waste characteristic in India is different from that of industrial countries as it contains a high proportion of biodegradable wastes that increase waste density. Hence, vehicles that operate with low-density waste in industrial countries are

not suitable or reliable for Indian conditions. The vehicles for transportation of waste should be adapted to suit Indian conditions pertaining to waste density, lane width, etc.

- 3) *Inefficient And Untrained Staff*: Inefficiency, rather than inadequacy, of the existing staff results in poor coverage of MSW management services. For instance, Delhi has five health workers per 1,000 persons, more than double the prescribed CPHEEO norm of 2 health workers per 1,000 persons, but its household collection efficiency is only 4.2%. There is a need to increase the efficiency of the health workers in order to improve the collection system of the ULBs.
- 4) *Non-Integration Of Informal Workers*: Informal workers e.g., rag-pickers, waste collecting communities, etc. play a vital role in the C&T and disposal of waste and compensate, to some extent, the inadequacy of the services provided by ULBs. Failure to integrate these workers in the MSW management mainstream contributes to poor service delivery. The waste pickers often rummage waste bins and cause waste to scatter around the bins. Items like plastic, metals and glass collected by waste pickers reduces the potential value of waste and also makes production of energy from waste unfeasible as plastic is an important ingredient of refuse-derived fuel used for generating electricity. These factors play a decisive role if a ULB decides to set up an integrated waste management plant for extracting value from waste as key waste elements like plastic and metals are siphoned by the informal waste workers.

C. *Factors contributing to Poor Processing & Disposal (P&D) System*

- 1) *Insufficient Fund Allocation To Processing And Disposal*: Open dumping of waste is the easiest way to dispose waste. Before the MSW (Management & Handling) Rules, 2000 were in force, ULBs were under no pressure to adopt scientific disposal practices. However, despite the introduction of the MSW rules, the practice of 'open dumping' is still rampant in the country, with only a handful of ULBs having sanitary landfill facilities in place. The problems encountered in the C&T segment of MSW management are reflected in the P&D segment as well. Collection of un-segregated waste from source makes extraction of value costly or economically unfeasible in most cases. The Supreme Court Committee on Municipal solid waste in 1999 noted that around 70-75% of the total expenditure on waste is spent on street sweeping; 2025% on collection and only 0-5% on disposal of wastes by the ULBs.
- 2) *Unproven Technologies*: Controversies in the scientific and environmental arena for some waste management technologies e.g., incineration, plasma gasification, have made ULBs apprehensive about going ahead with such technologies. Some of the ULBs, for instance, the Municipal Corporation of Delhi experimented with scientific methods to process and dispose waste but encountered problems due to various reasons. Further, wastes to energy/compost plants require the availability of a minimum waste quantity of specified composition and nature for the smooth operation of the plants, which is usually not available.

IV. PUBLIC PRIVATE PARTNERSHIP

Public private partnership is a long or medium term arrangement between the public and private sectors whereby public sector transfers part of its responsibilities to the private sector (World Bank 2011). These arrangements are typically formed with clear goals and agreements for delivery of public services or delivery of public infrastructure.

Due to increasing problem of municipal solid waste management in most cities in the developing countries, private sector participation in providing solid waste services started as a response to major failures of service delivery by the public sector (UNESCAP, 2011). It is often believed and proposed that private sector participation in providing municipal services could be the best possible way to solve the current waste problems in developing countries and in particular public private partnership is seen as a potential alternative to the traditional service delivery system fully controlled by the public sector, more importantly public private partnership is believed to provide the services that the public sector neither have the resources nor the expertise to supply alone (Forsyth 2005). According to UNESCAP public private partnership itself is not a solution option for the service delivery problems but rather a viable project implementation mechanism for a desired solution option (UNESCAP, 2011).

Despite the increasing focus on MSW management by state and central governments, providing affordable and sustainable waste management services is among the largest municipal challenges in India. The presence of a large informal sector that remains un-integrated into the formal waste management system coupled by inadequate mechanization owing to the poor financial health of the ULBs has made the management and delivery of a well structured MSW system a difficult task.

In order to overcome the technical and financial deficiencies associated with the current system, state and local governments in India are increasingly resorting to the use of private contractors for collection, transportation and disposal and private capital to supplement the mechanization/improvisation process.



In fact, private participation in the provision of MSW services is not new to India and several corporation/municipalities have employed private contractors for secondary transportation from the communal bins or collection points to the disposal sites since 1985. However, the services provided for by the private sector then were contractual in nature and were confined to one or two segments of the MSW value chain. In recent times, the engagement of private sector participation has increased from short term contracts to long-term partnerships. Close to 31 long-term Build-Operate-Transfer concessions have been awarded to the private sector till March, 2011 to manage solid waste in the country. However, despite the rising popularity of Public Private Partnerships in the management and delivery of MSW services, the institutional setting, governance and regulatory structures and market linkages (for recyclables/compost) are at a nascent stage, making the successful implementation of PPPs a challenging task. This is further complicated by the presence of a large informal sector (mainly consisting of rag pickers) that pre-dominantly remains outside the PPP framework. Thus the evolution of the MSW sector in India and the potential role that PPPs could play, given the local institutional and market dynamics, demands closer attention.

A. PPP Policy Framework

Major growth in the amount of PPPs in the last 15 years has made our country one of the principal PPP marketplaces in the world which has resulted in a proper PPP eco-system covering institutions, financiers, developers, equity providers, policies and procedures have emerged. Major policy and institutional initiatives taken

- 1) Formation of PPP appraisal committee to streamline appraisal and approval of projects
- 2) Preparation of PPP toolkit to improve PPP decision making process
- 3) Establishment of transparent and competitive bidding processes through model bidding documents.
- 4) Extending financial support through development funds, VGF, user charge reforms, etc.

Considering the growing PPP tendencies and policy/ institutional intervention, the Indian Government thinks it is crucial having an extensive policy agenda. Following the finance ministers' budget 2011-12 speech suggesting an all-inclusive policy, the ministry of finance drafted a national PPP policy for importuning propositions.

The draft National PPP policy offers spotlight on supplementary Central and state government agencies and private investors by:

- a) Enterprising PPP projects through rationalized methods and standards.
- b) Guaranteeing implementation of worth for money methods through optimization of risk-return distribution in project organization.
- c) Achieving suitable public oversight and supervision of PPP projects.
- d) Introducing the governance organization to smoothen the progress of competition, even handedness and simplicity.

B. Types Of Public Private Partnerships

- 1) *Contracting*: Contract with Private party to design & build public facility is financed & owned by public sector Key driver is the transfer of design and construction risk.
- 2) *Build-own-operate (BOT)*: Contract with a private sector contractor to design, build and operate a public facility for a defined period, after which the facility is handed back to the public sector. The facility is financed by the public sector and remains in public ownership throughout the contract. Key driver is the transfer of operating risk in addition to design and construction risk.
- 3) *Design-build-finance-operate (DBFO) Concession*: Contract with a private party to design, build, operate and finance a facility for defined period, after which the facility reverts to the public sector. The facility is owned by the private sector for the contract period and it recovers costs through public subvention. Key driver is the utilization of finance and transfer of Design, construction & operating risk. Variant forms involve different combinations of the principle responsibilities.
- 4) *Concession*: As for DBFO except private party recovers costs from user charges. Key driver is the Polluter Pays Principle and utilizing private finance and transferring design, construction and operating risk.

V. CASE STUDY

A. Tirupur Case Study

During the 1990s, Tirupur Municipal Corporation started facing problem of managing the waste generated because of the over generation of waste. The waste produced was of all the three types: Biodegradable, Non-Biodegradable & Recyclable. Hence, then the Tamil Nadu Urban Development Fund (TNUDF), asked TMC to build a plant for the treatment of biodegradable waste. Hence a PPP deal was established with IVR Infrastructures and Projects Ltd on BOOT basis for a period of 20 years.

Hence, a window compost yard was made on 7 acres of land, which was provided to the private concessionaire party at Rs. 1.75lakh/annum. The concessionaire imported a plant worth Rs. 55 crore.

According to the deal, TMC was supposed to supply 100 MT of mixed waste, out of which at least 40 MTD would be biodegradable. The concessionaire would pay 3.5 per ton of waste sold to it. If the municipality defaults in providing the concessionaire the waste, it would compensate the concessionaire by paying it 5.20 per ton of waste not supplied. Hence, the entire demand risk will be with the municipal corporation. On the other hand, the concessionaire would earn by converting the waste into fertilizer and then selling it.

1) *Issues Faced*

- a) Villagers didn't allow the operation by threatening the labour.
- b) A peace committee was formed to see to it that foul odour is not present near villagers.
- c) Implementation of MSW Rules, 2000 made it mandatory to segregate the waste at source that was not included in the agreement, hence many changes were laid down at a later stage.

B. *The Greater Hyderabad Municipal Corporation*

The Greater Hyderabad Municipal Corporation (GHMC) in 2007 estimated that the city would generate nearly 3,800 tons of waste per day.

Only about 10-15% of the households disposed it in the nearby community points. There were no means of quantifying the efficiency and monitoring of the garbage clearance mechanism.

The corporation had already entered into two Memorandum of Understandings (MoU) with private concessionaires for conversion of waste to energy. Each concessionaire was provided with 700 metric tons of waste, thereby privatizing as well as treating only 37% of the total waste generated.

In order to improve the serviceability the GHMC decided to adopt an integrated solid waste management system under the PPP mode.

The Infrastructure Corporation of Andhra Pradesh (INCAP) was the consultant for project structuring, bid processing, financial analysis and selection of the concessionaire for the Hyderabad Integrated Solid Waste Management Project (ISWM).

The Greater Hyderabad Municipal Corporation (GHMC) and REEL entered into an agreement for integrated solid waste management in Hyderabad in February 2009. The scope of the project included:

- Door to door collection of waste
- Collection of waste from storage points
- Transportation of waste to a transfer station
- Construction, operations and maintenance of transfer station
- Secondary transportation of waste from the transfer station to a processing facility
- Construction, operation and maintenance of the processing facility
- Disposal of waste by means of scientific landfill
- Construction, operations and maintenance of the landfill
- Capping of existing dump sites

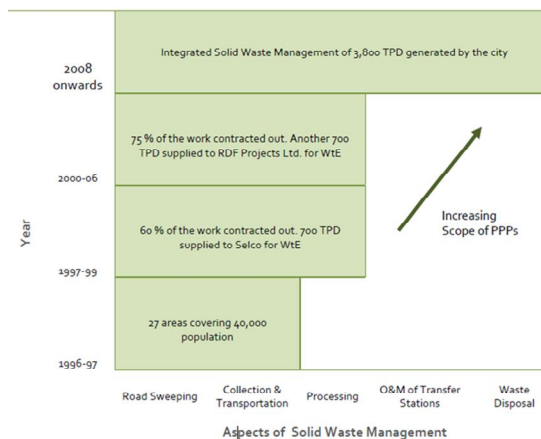


Fig.1 Increasing scope of PPP in Hyderabad

The total project cost was 434.91 Cr. The GHMC was responsible for provision of power connections to the transfer stations and treatment and disposal sites. However, the arrangements of the distribution network, usage charges, water supply and power back up facilities were to be made by the concessionaire.

According to the agreement, REEL had to commence the collection and transportation facilities within six months of being awarded the project and establish the processing facilities in two years.

The municipal workers argued that once the private developer would take the responsibility of collection and transportation of waste, their role would be restricted to sweeping of roads. However, after consultations with the labour union leaders and the municipal of administration and urban development, a memo was signed and the project was resumed.

REEL paid 3 Cr as project development fee and submitted bank guarantee of 18 Cr for the performance guarantee.



VI. CONCLUSION

Solid waste management is not only the responsibility of public sector or private sector because everybody who generates waste is a stakeholder and needs to take some responsibility. On the other side it has repeatedly been pointed out by most influential organizations such as World Bank and European Commission that there is a need for a change and different approach in order to overcome the increasing problem of solid waste management in most of developing countries. Social perspective of organizations emphasise on community and private sector participation in the form of partnerships. This partnership can be build for following situation:

Firstly, the growing deterioration in the environment due to population growth, uncontrolled rapid urbanization and economical growth has challenged the capacity of public sector to work up to the expectation of the people.

Secondly, private sector is believed to have the resources, technologies, capacities, efficiency and expertise needed for more effective management of solid waste, while public sector can play a significant role in make the regulations and retain the authority of monitoring over the private sector contractors. Such distribution of responsibilities can be arranged in the form of public private partnership.

Many reasons are there for the partnership between private and public sector in provision and developing infrastructure services. These are:

- A. Increased efficiency and flexibility in SWM service delivery.
- B. Cost efficiency in operation and management of landfills.
- C. Resources availability for growing needs of investment in the sector.
- D. Access to advanced technology.
- E. Availability of expertise.

Establishment of public-private partnerships to carry out the services that were formerly public sector responsibilities has potential benefits for both citizens and governments. Public private partnership can increase competition and efficiency in delivering of waste management services, expand coverage, and can reduce delivery costs.

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