Solid waste management - Indian scenario

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Additional Information:

- This is a conference paper.

Metadata Record: [https://dspace.lboro.ac.uk/2134/29976](https://dspace.lboro.ac.uk/2134/29976)

Version: Published

Publisher: © WEDC, Loughborough University

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INTRODUCTION

Public Health and Sanitation are State subjects. The responsibility of environmental improvement including collection and disposal of Solid Waste in urban areas is entrusted to the Urban Local Bodies (ULBs). In most of the cities and towns, at present public-cleansing services are inadequate and unsatisfactory. Rapid growth of industries, services and associated urbanisation being the key features of this urban scenario. Lack of financial resources, inadequate trained manpower, fragmentation of administrative responsibility, non-involvement and lack of awareness of the community are the major constraints of Solid Waste Management (SWM) activity.

Poverty and low standards of living in slum areas have an adverse effect on the sanitary conditions that prevail in cities and towns. Investment on SWM at present in Indian cities varies from US$ 2.5 to 4.5 per head per annum.

URBAN GROWTH

The urban share of population of India is expected to grow from 23% to 32% over the period 1991-2001. Half of the population growth will be urban over this period and the urban population will be more than double with an increase of 177 million. The urban population at the end of the century is estimated around 300 million. These demographic and industrial trends are now leading to environmental problems of major dimensions in cities and towns.

In the country, Class-I (Population above 1,00,000) and Class-II (Population 50,000 - 99,999) urban units together totalling 645 out of 3,768 contribute about 88% of the total urban population during 1981-91, the remaining 3,123 urban settlements sharing 12% population only. The country points to a travel towards excessive dominance of Class-I and Class-II cities in urban system of the country which obviously will have an adverse impact on environment of these cities.

SECTOR ADMINISTRATION

Role of Government of India
The role of the Ministry of Urban Development, Government of India is largely limited to advising the Urban Local Bodies (ULBs), supporting Research and Development and providing technical assistance to the State and Urban Local Bodies. The Working Group on Urban Development for the Eighth Five Year Plan (1992-97) has recommended inclusion of centrally sponsored Sanitation Programme, which includes Solid Waste Management as well. The Eighth Five Year Plan proposals are yet to be finalised.

Role of the State Government
The role of the State Government is very limited as the funds for Urban Services are also to be raised by the local body. However, due to weak financial health of the local bodies, the State Government has been extending grant assistance both for capital assets and maintenance. Such grant assistance vary from 10% to 30%.

City Administration
The Management of wastes generated within the city is the responsibility of the local authority. For the purpose of the administration of urban areas the State Governments set up such authority under the law promulgated by the State Legislature. The urban local authorities are classified into two major categories, the Municipal Corporation headed by Mayor; and Municipal Committee/Council/Board headed by President/Chairman. The Municipal Corporations are set up under specific State enactment for major and specific cities and is bestowed with a certain degree of independence and autonomy in mobilising resources and providing civic services. Notified Area Committees/Authorities look after the civic function in respect of other smaller urban areas.

WASTE MANAGEMENT

Source of Wastes
The generation of wastes differ in quality and quantity from city to city and locality to locality in a city. More quantities of domestic wastes, trade wastes, yard wastes,
construction wastes, etc. are generated from the areas which are affluent whereas less quantities of such wastes are generated from the areas inhabited by the poor people. However, human excreta, animal wastes, dust, etc. are found more in slum areas. Hazardous solid waste from industries and hospitals are frequently mixed with municipal garbage which in-turn is poorly collected and disposed, creating severe localised health-hazards. Delhi epidemic in 1988 could be attributed to improper management of wastes. So was the case in Ahmedabad in 1988.

Quantity and Types of Wastes
Reliable estimates of the quantity of solid wastes generated in various towns are not easily available. A study on Delivery and Financing of Urban Services (1989) by Operations Research Group indicates average per-capita solid waste generated is about 350-400 gms. However, based on the trade and commercial activities in the town the per-capita waste quantity may be more as in the case of Bombay, where it is between 400-425 gms. Per-capita waste generated within the New Delhi Municipal Committee area is between 800-1000 gms/day whereas in the Municipal Corporation of Delhi area is about 300 gms only. Data on quantity of Solid waste treated in the country is not available.

There is also seasonal variation. Fermentable organic matters ranges from 50% to 75%. Paper textile, metals, glass and plastics form a negligible percentage. Inert material like sand, earth, stones, bricks, etc. vary from 15% to 30%. The calorific value of waste is very low, much below 2000 B.T.U.

Level of Service
In larger centres like Bombay, Delhi, Madras, Ahmedabad, etc. the waste is collected from collection points and sent to a transfer station from this point it is then transferred for disposal. In most towns the cleaning of streets and waste is categories in 3 classes. Streets are cleaned every day, once in two days, and once in three days. In terms of vehicle fleet most small and medium towns used tractors whereas it is highly mechanised in larger towns. On an average 83% of wastes generated in metropolitan towns are collected whereas only about 59% are collected in other Class-I and Class-II towns.

EXISTING PRACTICE OF SOLID WASTE MANAGEMENT

Collection and Transportation
Normal practice is that house owner collects the refuse at his place and dumps the same in a bin located nearby on the street side, while in some specific areas house to house collection of garbage is made by civic employees. Mostly the garbage is collected by municipalities from these bins and carried away to the place of disposal by means of mechanised transport. In certain cases there are arrangements for collection of garbage from the bins located in narrower streets by the employees in wheel barrows which are then placed in a larger bin on the main road from where the trucks collect the same. At most of the places the waste is thrown around the bin inspite of providing concrete enclosure. In market areas and public places sweepers on the payroll of municipalities collect the garbage from the place of origin and take it to a central bin, from where it is transported to the disposal sites in open trucks. In a smaller municipal areas bullock carts etc. are also used. Special types of trucks like tippers and compactors are rarely used for garbage collection in India.

Disposal Methods
Recycling
Constituents of the domestic wastes which are commonly extracted for recycling are paper, rags/textiles, metals, glass, rubber and plastics. In India, some kinds of waste are also extracted from domestic wastes for personal use in the low income areas. These are (i) cinders, fragments of coal, coconut shells, etc. for use as fuel; (ii) metal cans for use as domestic vessels; and (iii) vegetable wastes for animal feed. In the country, recycling of saleable material is one of the methods of earning livelihood for the low income group of people.

Disposal on Land
The waste is often observed to be disposed off on land in an uncontrolled manner. These sites are not properly selected and often cause environmental pollution. There is no mechanical equipment at such sites except in a few metropolitan cities. In some sites in metropolitan cities, bulldozers are provided to compact the waste and to give soil cover at the top. However, no proper site selection is carried out in most of the cases. In some of the towns, night soil is collected in tankers and disposed of in shallow pits excavated at such sites which are covered with soil when full.

Composting
Resource recovery by composting of waste is commonly carried out in India and in most of the urban centres are known to carry-out manual composting of wastes. Semi-mechanised pilot composting plants were set up in
10 cities in India and evaluation of 7 pilot compost plants built at Delhi, Bombay, Calcutta, Bangalore, Baroda, Jaipur and Kanpur with a Government of India assistance has indicated that these plants are not working properly mainly due to high degree of mechanisation, use of redundant mechanical equipment, inadequate marketing facilities, high transportation cost and presence of glass which cause problems to the farmers.

**Incineration**

Due to low calorific value and high moisture content of refuse, the disposal of waste through incineration has been proved to be cost prohibitive. A 300 Tonnes per day capacity incinerator has been installed at Delhi. Technical snags crippled the plant and the incinerator could not put to use.

**Refuse Derived Fuel Production**

It is a fuel produced from domestic, commercial and industrial wastes through various processes such as fuel pellets, methane gas, etc. Generation of methane gas from the landfill site has been demonstrated successfully at Delhi and Nagpur in India and it is felt that commercially it may be viable to extract gas from the landfill site after some more experimentation. In so far as the production of fuel pellets is concerned, it is still under experimental stage in the country.

**Organisation and Management**

SWM in Municipal Corporations is normally under the control of a Public Health Engineer. The conservancy staff in some of these centres are under the Health Officer. In these centres the vehicles and staff are placed under the City Engineer who maintains and allocates duties. In major cities like Delhi and Bombay, the SWM is looked after by Chief Engineers. In small and medium towns wastes management is under the Health Officer of the municipality/local body. The department as such is headed by the Sanitary Inspector. The department as a whole is over burdened. The vehicles are few in number and financial constraints inhibit maintenance of fleet.

**LEGISLATIONS AND BYLAWS**

In a majority of cases it is observed that the bylaws framed are not exhaustive and suffer from a number of short-comings. Local Civic Authorities in Indian States like Uttar Pradesh, Punjab, Bihar, Tamil Nadu, West Bengal are governed by statutes passed in 1916, 1911, 1922, 1920 and 1932 respectively which deal with collection and carting away of waste. The Calcutta Municipal Corporation Act, 1980 has defined that for the purpose of securing efficient scavenging and cleaning of all streets, public places and premises, the Corporation shall undertake the functions of collection, removal and disposal of solid wastes. Depositing or throwing any solid waste in contravention of the provisions of the Act is punishable with fine. Similarly, the Bombay Municipal Corporation Act, 1988 has also empowered the Municipal Commissioner.

**MAIN PROBLEMS AND ISSUES**

Main problems and issues of SWM services in the country are briefly described as under:-

- Lack of national policy and fragmentation of responsibilities.
- Ad-hoc decisions are taken resulting in avoidable duplication of efforts and resources. Involvement of more than one Department creates problems of inter-sectoral coordination.
- Inability of existing institutions to provide services effectively.
- Institutional arrangements for effective sustained community involvement in solid waste practices are mostly non-existent. Ill-defined policies on roles and responsibilities, ineffective legislation and inadequate finances have hampered the performance of sector agencies.
- Lack of health protection and community participation.
- The health risks to solid waste workers and waste pickers as well as the general public have largely been overlooked by the sector agencies. Consequently, with rare exceptions, health considerations are not integrated in the overall Municipal SWM. Community participation and involvement has generally been inadequate.
- Insufficient financial resources, financial planning and management.
  Although SWM activities take a large share of the municipal budget, financing is inadequate and charges, if any, do not even cover the cost of inadequate services provided. The low priority accorded to SWM is one of the main reasons for inadequate SWM services.
- Inadequate quality of human resources from planning to implementation level.
- There are inadequate training facilities in the country specially designed for developing the human resources need in this sector. This results in inefficient and unacceptable environmental sanitation practices in SWM.
- Use of inappropriate technologies for implementing sanitary cost-effective practices.
- The lack of professional expertise in sector agencies has often resulted in the selection of unsuitable equipment and the application of technologies that are not cost-effective. The poor technical approach to route selection and management has resulted in ineffective and wasteful practices.
Old and Ineffective Bye-laws governing solid waste management services.

The bye-laws governing the SWM are out-dated, ineffective and need to be revised to account for the larger amounts of industrial, hazardous and hospital wastes which now get collected and disposed off along with the municipal solid waste.

Suggested Plan of Action

Following are the priority areas of suggested plan of action:

- Sector assessment at the national level, through an interministerial/departmental task force should be undertaken under a modal Ministry responsible for formulating sector policy and comprehensive national strategy and action plan to achieve a minimum level of service within the targeted period.
- A national Master Plan is required to be prepared for highlighting important issues, identifying thrust areas and work programme along with the framework of technical and financial support needed to achieve it.
- Appropriate technical guidelines for SWM activities should be developed. These technical guidelines should include preparation of sector assessment, policies, short-term and long-term Action Plans, institutional development management of solid waste, and other related aspects.
- Training facilities at local/district, State and National level for human resources development for different categories of personnel are needed to be established.
- Proper case studies to be carried out ensuring services to the poor and involvement of formal and private sector in such areas as resources recovery, collection and disposal.
- Demonstration of pilot project at National and State levels on proper design and operation of SWM systems should be established.
- Research and Development activities to develope appropriate equipment and technology should be carried out.
- Effective sector monitoring and planning at the National level, with continuous and systematic data collection through MIS should be developed.

Conclusions and Recommendations

The absence of adequate planning and the use of inappropriate technology by ULBs have led to a serious wastage of expenditure and effort in this direction. There is, therefore, increasing demand for efficiency in the sector. And where the Ministry of Urban Development, Government of India has proposed to step in to assist the State Governments and local bodies by way of providing financial support for developing efficient solid waste management in few of the selected cities during the 8th Five Year Developmental Plan.

Under the Research and Development Programme of the Ministry, the emphasis is given to develop software, which could be utilised for optimising the collection and transportation routes of the vehicles to economise the system. Looking into the dimensions of the problem of solid waste management in the country, with the coordinated and concerted efforts by the Ministry of Urban Development, Government of India, concerned State Governments and local bodies, the objective could be achieved within a reasonable period.

References