

TURNING DHAKA INTO A HEALTHY CITY: THE SOLID WASTE MANAGEMENT (SWM)

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Solid Waste Management (SWM) is a challenging problem faced by the large cities of the world. The most important factor for the emergence of solid waste as an environmental problem is the increased volume of waste due to the lifestyle of an ever-increasing urban industrial society. Increasing quantity of solid waste and its collection and disposal in Dhaka City has emerged as a serious problem. Cleanliness and safe disposal of waste are essential to public health and environment protection. In Dhaka, waste management is inadequate; a significant portion of the population does not have access to service and only a fraction of waste is actually collected. System for transfer, recycling and disposal of waste is unsatisfactory from environmental, economic and financial points of view. SWM is of course a complex task, which hinges upon cooperation between households, communities, private enterprises and Dhaka City Corporation. It also depends on the selection and application of appropriate technical solutions for waste collection, transfer, recycling and disposal. In recent years, SWM has attracted increasing attention, from all concerned due to the mounting urgency of urban environmental problems. Therefore, there is need of capacity building at the level of municipal management.

INTRODUCTION

Dhaka has emerged as the 17th mega city in the world, with a population of nearly one crore. A great deal of development work is being undertaken in the city throughout the year, and it is expanding every day. But the question is, does a resident of Dhaka feel secured in the capital when he is beset with health hazards and deprived of his basic civic rights? It is inevitable that environment will face degradation in the wake of development activities but there are methods, which can be embraced for the restoration of environmental balance. Unplanned waste disposal is one of the major causes of deterioration of environment of the city that affects the health of city dwellers. Scientific Solid Waste Management is the crying need of the hour. It involves technology and capacity building. The inhabitants can help the authority for better **Solid Waste Management (SWM)** through Community Based Organization (CBO). Solid waste can be used as raw materials for production of useful items. Many developed and developing countries are taking this advantage. Bangladesh can

learn lessons from the successful practices of these countries. Government should provide support in this area of economic exploration so that private sector finds interest to invest in SWM. In the light of the foregoing, it is time we look at SWM of Dhaka City and recommend measures for consideration.

Like some of the other predicaments, SWM of Dhaka has become a serious problem for the city administration and its inhabitants. In this paper a study will be carried out to assess the present state of SWM in Dhaka City and to identify its weaknesses. A review of scientific and modern methods for SWM shall be made to determine affordable technology. Lessons will be drawn from other countries to make a comprehensive and sustainable plan. A closer look will be taken into the composition of the waste generated in Dhaka City so as to produce compost for soil enrichment. For an efficient and cost effective waste management system the involvement of community and private organization shall also be considered. The aim of this paper is to examine SWM of Dhaka City with a view to suggesting integrated and scientific methods, exploring opportunities for turning waste into resource, and providing span for private sector participation in waste management.

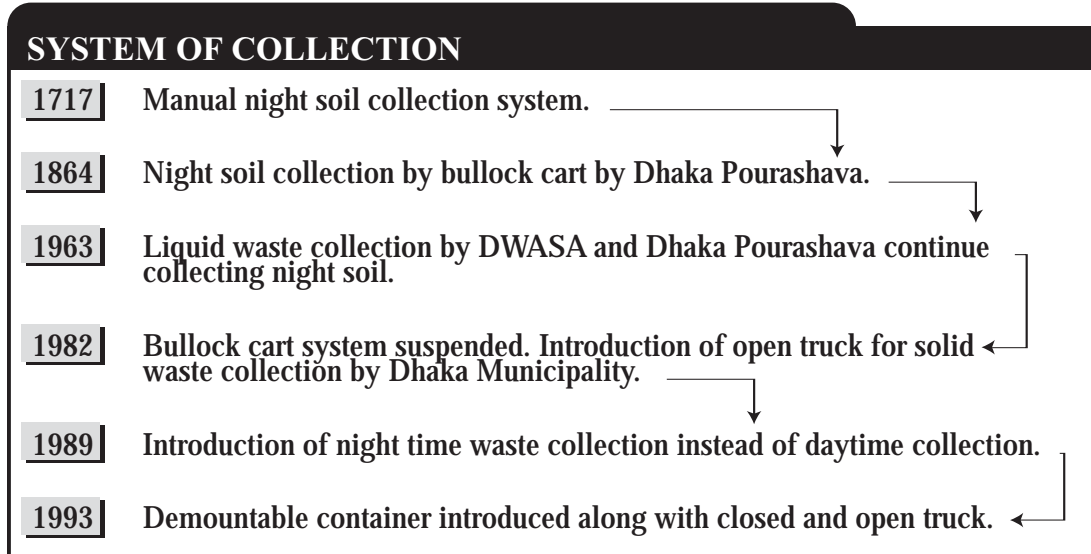
SWM IN DHAKA

Solid Waste of Dhaka City

There are broadly two types of wastes such as solid and liquid wastes. In Dhaka City, the Dhaka City Corporation (DCC) and Dhaka Water and Sewerage Authority (DWASA) manage solid and liquid wastes respectively. The conservancy department of DCC sweeps and accumulates garbage. The transport department carries the garbage by its vehicles to the final dumping depot. Mechanical Division-II has the responsibility of dressing and compaction of garbage at the disposal depot. The solid wastes of Dhaka City are composed of food waste, paper, polythene, cloth, garden trimmings, brick, wood, metal, glass, leaves/branches, shredded skin/leather, hospital, industrial and other wastes. These wastes can be broadly classified as:

- a. Domestic Waste.
- b. Commercial Waste.
- b. Industrial Waste.
- d. Hospital Waste.

The evolution of SWM in Dhaka is shown in the following table:



Cattle Van

Cattle Carrier

Shutter Truck

Open Truck &
Container-Carrier

EVOLUTION OF SOLID WASTE COLLECTION SYSTEM

Survey indicates that approximately 0.50 kg of solid wastes per person are generated everyday in Dhaka City. The result is similar to that of SAARC countries.¹ However, socio-economic and industrial developments and seasonal changes affect the waste generation rate. Growth of population and rapid urbanization of Dhaka accounts for increasing trend in waste generation.² At present approximately 5000 tons of solid wastes are generated everyday in Dhaka City.³ The solid waste collection system of DCC has limitations associated with planning, operation and management in addition to resource constraints. Thus a considerable amount of solid wastes remain uncollected leading to public health hazards and environmental nuisance. The negative impacts of inadequate waste collection in Dhaka City have three major aspects – aesthetic, public health and traffic obstruction.

1. JICA, Expert, SWM Project of DCC, Final Report, Dhaka, August 2000. p.14

2. *ibid.*

3. Anwar Hossain Patwary, A Proposal For Integrated SWM, Dhaka, February 2003, p. vi

The analysis of financial information and data indicates that DCC's revenue income for SWM is on the average TK 14 crore per year, whereas expenditure incurred for SWM is about TK 60 crore. Out of these, the revenue expenditure is on an average TK 42 crore and average development expenditure TK 18 crore. Therefore, the average revenue expenditure is 300% more than the average revenue income.

Present solid waste stream is shown in the following diagram:

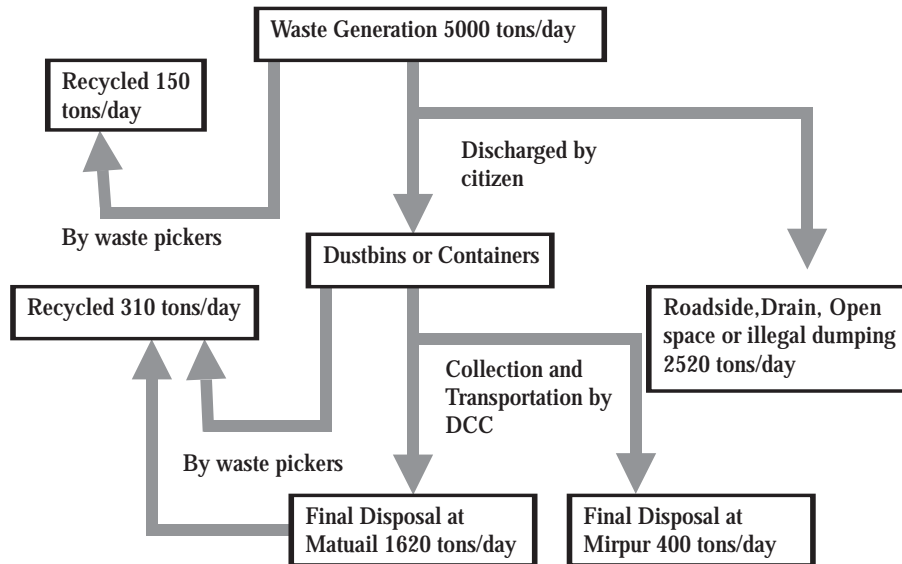


Figure Source: DCC.

SOLID WASTE STREAM IN DHAKA CITY

Problems Related to SWM of DCC

The following problems are confronted by DCC in respect of waste management:

- There is no master plan for SWM causing inadequacy and inefficiency.
- 60% uncollected refuse are scattered around collection areas discharging offensive odours, causing aesthetic and health problems.
- Insufficient number of conservancy vehicles for 100% collection, transportation and dumping.
- Low efficiency stemming from lack of inter-departmental coordination.
- Employees are not well trained, lack of motivation and commitment.

- f. The manual sweeping is slow and inefficient.
- g. Hospital/clinical wastes are dumped in the same bins and transported by same trucks. These hazardous wastes are required to be collected and transported separately by specially designed conservancy vehicles.
- h. Crude dumping is made at the final disposal site. The leachate contaminates water and organic/inorganic gases pollute air. Gases produced in the final dumping depot may cause explosion. Sanitary landfill arrangement can minimize these problems.
- i. There is no penalty for improper disposal of wastes.
- j. Existing laws/ordinances do not describe citizen's responsibilities towards waste management.

The solid waste generation in Dhaka City is enormous. DCC has not been able to perform SWM functions properly. Inadequate collection, imperfect disposal and absence of sanitary landfill have compounded the problem. The revenue expenditure is very high compared to income, which greatly strains DCC's budget. The requirement for large number of additional vehicles/equipment, shortage of fund and disappointing performance of DCC suggest privatization. Public awareness, recycling and composting shall reduce generation and disposal of waste. The absence of an integrated plan and scientific approach impedes SWM functions rendering the operations piece meal and unsatisfactory.

Towards a Scientific SWM

Scientific SWM is defined as integrating various approaches of SWM for an effective solution considering the economic and social conditions. Scientific SWM is a multi-disciplinary and dynamic field which includes:⁴

- a. Setting of policies.
- b. Planning and evaluating SWM activities by system designers, users and other stakeholders.
- c. Using waste characterization studies to adjust system to the types of waste generation.
- d. Physically handling waste and recoverable materials, including separation, collection, composting, incineration and land filling.
- e. Marketing recovered materials to brokers or end-users for industrial, commercial or small scale manufacturing purposes.

4. DCC, Scientific SWM, Dhaka, 1999, p.19

- f. Establishing training program for SWM works.
- g. Carrying out public information and education program.
- h. Identifying financial mechanisms and cost recovery systems.
- j. Establishing prices for services and creating incentives.
- k. Managing public sector administrative and operation units.
- l. Incorporating private sector businesses including informal sector collectors, processors and entrepreneurs.

Integrated Waste Management

Integrated waste management is a frame of reference for designing and implementing new waste management systems and for analyzing and optimizing existing systems. Integrated waste management is based on the idea that all aspects of the waste management system should be analyzed together, since they are in fact inter-related and developments in one area frequently affects practices or activities in another area.

Jurisdiction, Responsibility and Stakeholders

Sound practice in waste management systems necessitates clear delineation of jurisdiction and responsibility. All stakeholders participating in system design, and with those affected, at every level are aware of the lines of accountability. Apart from DCC, the following actors have close relation with waste management and, in some cases, significant levels of responsibility for policies or operations:

- a. Department of Environment(DOE).
- b. NGO and Community Participation.
- c. Dhaka Water Supply Authority(DWASA).
- d. Rajdhani Unnayan Kartipakkha(RAJUK).
- e. Community Based Organisation (CBO).
- f. Beneficiary Participation.
- g. NGO and Community Participation.

Present solid waste stream is shown in the following diagram:

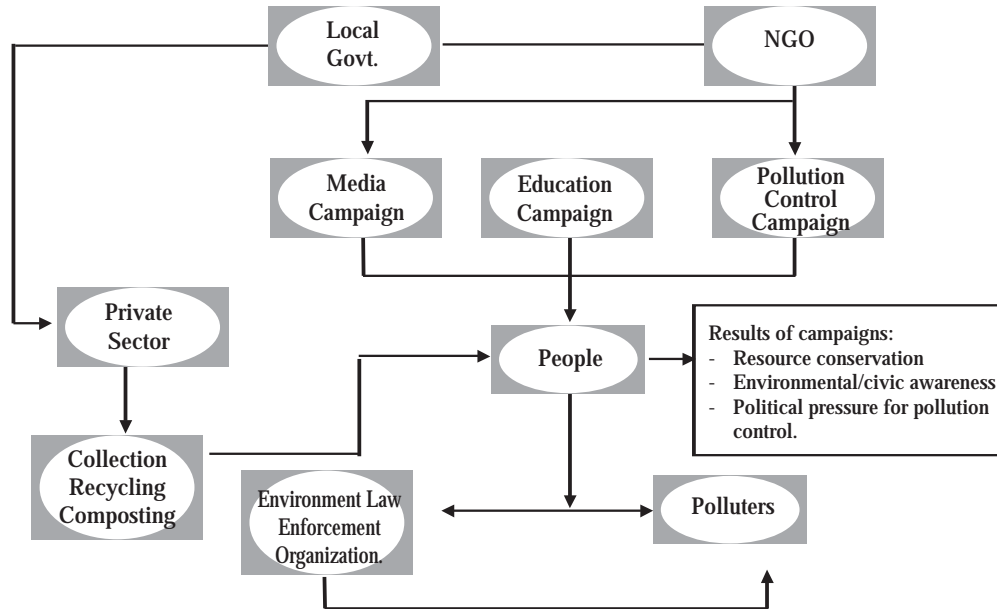


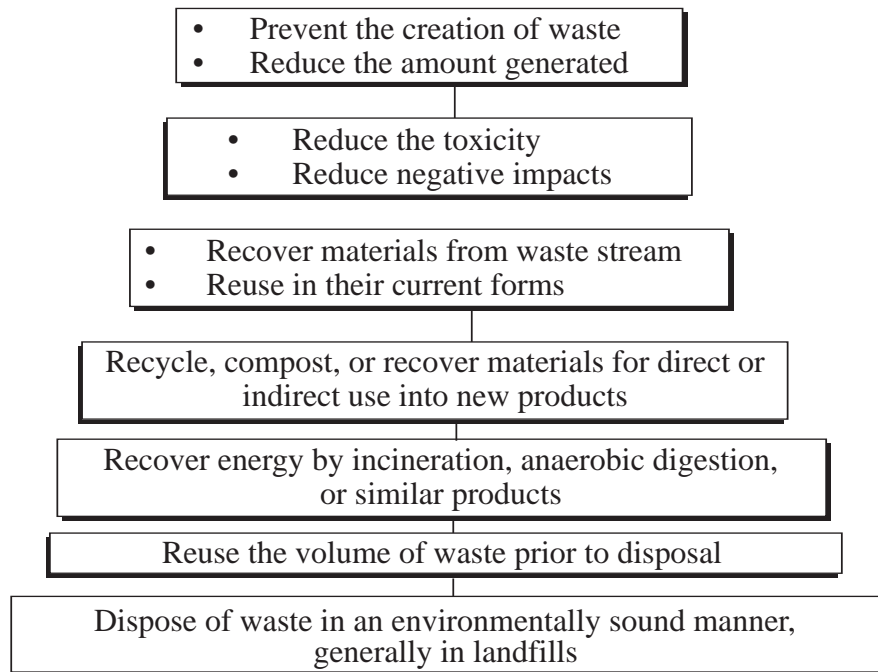
FIGURE-2: Citywide People's Participation Model

Tools For Scientific Waste Management

The scientific waste management is a widespread element of national and regional policy and is often considered a fundamental basis of sound practice. Virtually in all countries, the priority is defined as shown in the flow chart given below with the first entries having higher priority than those at the bottom.

Scientific SWM calls for an integrated approach allowing participation of public and private stakeholders to result in a range of SWM practices that complement each other. Integration allows for capacity or resources to be fully utilized. DCC and NGOs may assist in organizing the informal recycling sector. Indirect fees may raise necessary money required for waste management and to eliminate DCC's budget deficit. Successful applications of scientific and integrated design for SWM have solved waste management problems of developed countries in Europe, America and Asia.

WASTE MANAGEMENT PRIORITY FLOW CHART



SWM IN ASIAN CITIES AND LESSONS FOR DHAKA

Asia is a diverse continent characterized by varying SWM practices. Solid waste generation in the cities of this continent has been increasing at the rate of 3% to 7% per year. SWM consumes about 40% to 60% of the total municipal budget.⁵ In this section the different stages of SWM as practiced in different Asian countries will be discussed and will see whether lessons from other countries can be applied in the case of Dhaka.

The Different Stages of SWM Practice in Asia

a. Waste Reduction

Throughout the continent, cities have been practicing source separation formally and informally. The most common recyclables are ferrous metals, construction debris, scraps, rejected tyre, paper cardboards, plastics, glass, wood/timber, animal bones, feathers, waste oils, grease etc. In economically and technologically advanced Asian countries like, Japan, Korea, Hong Kong, China and Singapore a high degree of waste reduction, separation at source and recycling are being brought about through public education and new practices e.g., curbside collection and volume based collection fees.⁶

5. Scientific op.cit. p.29

6. ibid

b. Collection and Transfer

Collection and transfer dominate SWM cost in Asian cities. It is about 60% of the total cost of SWM.⁷ In most cities it is still the public sector's responsibility. Currently there is a trend towards contracting out some services. Collection through containers, collection bins, communal bins etc. functions side by side with door-to-door collection system. In the urban centers of Hong Kong, Japan and Singapore, collection and transfer systems are capital intensive and mechanized. Increasingly, collection services are being privatized. In the region as a whole roughly 20% of collection service is now contracted out to private waste collection companies.⁸

c. Training

In industrialized countries of the region, operators of SWM facilities are required to attend courses and pass certification examinations for promotion or to hold jobs. In addition to hands-on training on technology used in SWM, health and safety courses are conducted for both sanitation workers and management staff. SWM facilities are opened to the public for educational purposes. All Japanese school children visit the local incinerator and learn about recycling in their area.

d. Public Education

Subjects like ecology and environmental management are becoming part of the school curricula in countries like Japan, Korea, Singapore and Hong Kong. Despite lack of resources, campaigns are organized regularly to promote environmental awareness and resource conservation through recycling/reuse of waste materials.

e. Financing

Financial options and mechanisms vary from city to city and from country to country even within Asia. In general, there are three sources of funds, namely, municipal taxes, fees charged for services, and subsidies from municipal revenues received from government sources. Although privatization is a significant trend in the region, many believe that the most effective, efficient, and accountable system of SWM will evolve through a combination of government-run and privatized services.

7. *ibid.* p.30

8. *ibid.* p.31

Lessons Learnt for Dhaka

Experience from developed Asian countries and our neighbours are important inputs in formulating a master plan for Dhaka's SWM. Necessity for sanitary landfill to prevent soil, ground and surface water contamination and to stop methane emission should be emphasized. While for disposal of hazardous/hospital wastes incineration is identified as an affordable means for Bangladesh, privatization has also been successful in improving SWM and reducing expenditure. Cost recovery is suggested through recycling and composting. People involved in collection, separation and recycling within the informal sector should be recognized and supported by DCC. However, recovery of landfill gas for commercial purpose will not be viable in Dhaka because of the availability of cheap natural gas. Appropriate laws/regulations, promotion of public awareness, training of officials/staff/workers, involving NGOs and community are the essence of a comprehensive SWM system. Top down approach with no input from community does not and will not work well.

Reducing Waste into Resources

About 70 percent solid waste generated in Dhaka City is early degradable organic waste.⁹ Proper policy and adequate planning might bring a treasure of low cost organic fertilizer from solid waste composting and that could contribute to the agriculture sector for better crop production. Besides, semi-mechanical and/or manually operated composting could generate significant room for employment. Compost is the stable end product derived from the biological degradation of organic material, which can vary from ¹⁰ dead leaves and roots to kitchen waste and vegetable remains.

A good market for compost exists in Bangladesh. NGOs such as Waste Concern may assist the communities to sell their compost to a number of outlets like fertilizer marketing companies and nurseries. Waste Concern is at present selling its compost at a price ranging from TK. 2.5 to TK. 5.0 per kg.¹¹ The quality of compost is monitored in the laboratory of Soil Resources Development Institute.

Community based decentralized composting program integrated with door-to-door collection of solid waste can yield substantial savings for municipal authorities. The experience of Waste Concern's model in Dhaka shows that if composting is undertaken in a decentralized manner, from one ton

9. Md. Zulhash Uddin and Nakajo Keigo, "Technology Selection For Sustainable SWM, Bangladesh Aspects", Bangladesh Environment 2002, vol 2, BAPA, p. 838

10. *ibid.* p. 29

11. Iftekhar Enayetullah and Md. AH Maqsood Sinha, "Decentralized Composting", Dhaka, Waste Concern, February 2003, p.26

of waste, only 15 percent of the reject has to be transported to the landfill site. This will decrease the quantum of land required for disposal of solid waste and also reduce the amount of leachate as well as methane emission.

But there are some practical problems regarding these projects. For example:

- a. Land is the biggest constraint for replication of the project. If land is not provided by the public agency to the private sector or community groups interested to run the project, the model is difficult to replicate. This highlights the necessity of partnership.
- b. Community may not agree to install community based composting units in the neighbourhood due to NIMBY (Not in My Back Yard) syndrome. If waste is not handled properly and aerobic condition is not maintained throughout the composting process, it may create problem of bad smell.
- c. Quality of compost has to be ensured for marketing purpose.

Future Prospects

Waste Concern had an agreement with Map Agro to market 500 tons of compost per year. Recently, due to heavy demand generated for enriched compost, Map Agro has requested Waste Concern to supply them with 15,000 tons per year.¹² Recently, the Ministry of Local Government, Rural Development and Cooperatives of GOB with support from UNICEF, has started replication of the decentralized composting project integrated with door-to-door solid waste collection program in 14 cities and towns of Bangladesh. Moreover, DOE is planning to replicate the project in 20 towns of Bangladesh.¹³

Composting can become a useful tool in reducing waste collection, transportation and disposal load to a great extent. Barrel type composting will contribute to SWM in slum areas. Over and above the economic potentials of compost can minimize SWM costs. Community based composting is economically viable which will also generate employment opportunities.

STRENGTHENING DHAKA'S SWM THROUGH PRIVATIZATION

Dhaka's SWM can be improved and strengthened with the right combination of privatization, strict and effective monitoring, and regular capacity building programs.

12. *ibid.* p.29

13. *ibid.* p.29

Scopes of Privatized Sectors

The principal reasons for privatization are to improve operational efficiency and to bring in private sector investment. By involving the private sector, Georgetown (Guyana) was able to increase the number of vehicles engaged in daily collection from 4 to 18, more than double the frequency of service, and increase city wide coverage from 50% to 85%.¹⁴

Most activities undertaken by DCC can be performed with participation of private sector at some level. DCC should focus on privatizing those activities that are most inefficiently done and consume a significant portion of budgets. For example, solid waste collection should be a privatization priority, as it is inaptly handled in the absence of competition. Furthermore, solid waste services are considered relatively easier for the private sector to undertake, considering the level of skills required, as well as the magnitude of the needed investment and investment risk. Maintenance of vehicles should also be considered for privatization in view of the delays typical of DCC workshop often caused by slow procurement procedures and cash flow problems in purchasing spare parts. Sweeping is another area for potential private sector participation because public sector is often subject to restrictions on working hours.

Monitoring of Performance

Performance monitoring establishes a basis for evaluating the efficiency, effectiveness and cost of service delivery. It defines the "rules of the game" and measures how well the "game" is being "played"! Comparative performance monitoring of all private sector and government players increases competition among service providers, leading to increased efficiency and improved service quality. By quantifying the performance measures to the maximum extent possible, accountability among service providers is increased. In addition, service delivery is linked with consumer satisfaction, and so actions are linked with their consequences. There is effective feedback. The aspects of performance that are monitored include:

- a. Service frequency and quantity.
- b. Service efficiency and productivity.
- c. Service reliability.

14. Sandra Cointreau Levine, "Private Sector Participation in Municipal Solid Waste Management, " Swiss Centre for Development Corporation in Technology and Management, 2000, p.9

- d. Service quality.
- e. Service cost.

Cost Recovery

Apart from having the means to finance capital works, the private sector wants assurances that DCC will be able to meet its regular payment obligations to cover recurrent costs. Taxes are one means by which DCC can raise money to pay for service. The private sector usually prefers a direct cost recovery system based on user charges. Finance to cover recurrent costs for SWM may be obtained from the following sources:

- a. DCC revenues through tax or indirect charges.
- b. Penalties for littering, clandestine dumping and other solid wastes infractions.
- c. License fees from private haulers of solid waste.
- d. Revenues from the sale of recyclables and recovered resources such as compost.
- e. Direct user charges for collection services.
- f. Direct user charges for use of transfer or disposal facilities.

Capacity Building

It might appear that private sector participation would reduce the need for capacity building of DCC since work that is done by the City Corporation would be done by the private sector. In fact, the introduction of private sector participation usually requires municipal strengthening because of the new tasks which City Corporation officials are required to perform. DCC often need technical assistance and training so that it can:

- a. Write competent tender documents for privatization of solid waste service.
- b. Prepare estimates of waste quantities and service cost.
- c. Handle complaints.
- d. Monitor the performance of the private sector operations.

Present Situation of Dhaka: Introduction of Privatization by DCC

While this study is in progress, DCC has initiated partial privatization program on experimental basis. Ward Numbers 17, 18, 19, 20, 21, 37 and 38 of Zone 9 (Gulshan) and Ward Number 1 of Zone 10 (Uttara) have been included in this test project. The private companies have been performing their works for last few months. The tasks given to these private organizations are sweeping, cleaning, collection and transportation of wastes to Matuail. These companies do not have experience, adequate equipment/vehicle and enough funds for investment in SWM project. Therefore, survey of these wards reveals that the services are not very satisfactory. However, it is the beginning of a process, which has much to unfold towards effective SWM. The expenses have reduced, and the full benefits from privatization shall accrue if mechanisms and modalities as described are rigidly adhered.

A properly monitored and supervised private sector engagement in SWM may be a suitable response. The private companies are required to acquire technologies, expertise and funds for investment to be effective.

CONCLUSION

Dhaka is the capital of one of most densely populated countries of this world, and as a mega-city it faces an enormous challenge of solid waste management to keep the city running. Waste management of over a crore people is a challenge in itself and when it is combined with resource limitations and least civil responsibilities of its citizens, the task of DCC gets more complicated. But strategies implemented by other Asian countries that had almost similar backgrounds can be good lessons for us, and therefore, a more scientific approach and a partial privatization can be an answer to our SWM problem.

Keeping the realities of budget and other resource limitations, some steps are recommended for a better and scientific SWM for Dhaka.

RECOMMENDATIONS

An Integrated Scientific Master Plan . As a basis of performance oriented management, an integrated comprehensive SWM master plan is required for DCC to eliminate existing impediments. The plan will provide guidelines regarding the degree of decentralization of specific waste

management functions and responsibilities. It will encompass laws/regulations, application of technology, awareness building, and training and cost recovery mechanisms.

Private Sector Engagement. As potential service suppliers, private enterprises might be allowed to perform SWM in Dhaka City under appropriate conditions. Private companies are required to draw expertise and technologies from successful privatization programs abroad. The introduction of privatization could be done in a pragmatic and incremental manner, beginning with pilot program to assess and encourage interest and willingness of community to participate.

Composting. The organic fraction in Dhaka City's solid waste should be converted into valuable resource i.e. compost fertilizer through community based plants. It will enhance waste collection, stabilization and volume reduction minimizing disposal cost substantially. It is, therefore, an effective and logical approach to solve major problems associated with ever increasing volume of waste in a mega city like Dhaka.

Sanitary Landfill and Incineration. Construction of sanitary landfill is essential to prevent water contamination and air pollution. Incineration of hospital/hazardous waste is to be enforced.

It can be hoped that very soon Dhaka will be able to operate a better SWM structure that would benefit its people and become an example to other countries struggling with similar problems.

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