Sustainable Solid Waste Management for the Indian Cities

National Seminar on Developing Harmonious and Sustainable Cities in India for a better Urban Future (AMDA – UN-HABITAT)

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Gravity of the situation with respect to Solid Waste Management

- India has a population of 1027 million (2001 census), out of which 285 million live in urban areas.
- Estimated 42 million tons of municipal solid waste (MSW) is generated annually, i.e., 1.15 lakh tons daily.
- Average per capita generation is 0.2-0.6 kg per day but the total generation in larger cities is huge.
- For example, Delhi and Mumbai, generate more than 6000 and 7000 tons per day respectively.
- The urban local bodies have the mandate to provide the services for proper management of MSW.
Problems faced by the urban local bodies

- With rapid increase in population and population density in the urban areas, the municipalities are in a very difficult position.
- Land available for disposal of waste is shrinking fast leading to a very challenging situation.
- Due to changing lifestyle, the waste material is becoming more complex (for example, thin plastic film, tetra-packs, different types of batteries, chemicals etc.).
- Lack of public cooperation – lack of proper mindset and attitude towards health and hygiene.
Growth of squatter settlements and slums

- Most of our cities are unplanned, especially the old city areas
- Rural urban migration as well migration from small towns to larger cities in search of livelihood and employment leads to unplanned habitation and growth of squatter settlements and slums
- Such unplanned growth puts a huge demand on the infrastructure and interferes with planned growth of a city
- Provision of basic services like water supply, sanitation including solid waste management becomes extremely difficult
Effective tools for meeting these challenges are:

- High level of institutional, managerial and planning capability
- Financial strength and financial management capability
- Qualified, trained and skilled manpower in the relevant disciplines
- Mutual understanding, confidence and support of the community
Key Challenges

1. Land
2. Centralized vs. decentralized facilities
3. Use of land unsuitable for other uses
4. Concept of regional facilities
5. The issue of compost quality
6. The standard for sanitary landfill
7. Old dump-sites – remediation and rehabilitation
8. Social issues – the plight of waste workers, rag pickers etc.
Key Challenges

Some waste materials pose typical problems:

- Construction and demolition waste
- Bio-medical waste
- Industrial / hazardous / toxic waste generated within municipal area
- E-waste (electrical and electronic waste) – an emerging issue
Key Challenges ….. contd.

- Guidelines and standards for recycling and use of recycled products are lacking
- Conflict about recycling – informal sector, occupational hazards and environmental issues
Land for processing and disposal
- the most important issue

- Difficult to get land for setting up waste processing and disposal facilities
- Even operational sites often attract objection from settlers who have come more recently
- What could be the solution?
- Strategy:
  (a) Land use plan with projection for waste management on a long term basis
  (b) No development zone of 500 meters
  (c) Confidence building with the public
  (d) Save land through resource recovery
Centralized vs. decentralized facilities

The following issues need to be deliberated upon while making a choice between centralized and decentralized facilities:

- Planning issues (ULB, communities, activists, NGOs etc.)
- Location of facilities vs. distance from the points of generation of waste
- Ownership of land
- Environment and proximity of habitation
Concept of Regional Facilities

This would open up enormous possibilities:

- Scale of economy would be favorable in establishing appropriate facilities
- Identification and acquiring of environmentally suitable land would be easier due to more number of choices
- However, these benefits are annulled by increased distance and transportation cost
- This concept is diametrically opposite to the decentralized planning options and this issue needs to be deliberated upon carefully before making regional plans
Resource recovery, recycling

- Apart from saving land, valuable products like compost, biogas, heat, electrical power, recycled paper, plastics, glass, metal etc. are obtained.
- For processing bio-degradable matter, composting is one of the most popular systems.
- Composting can be done in different ways:
  - Aerobic windrow composting
  - Anaerobic trench composting
  - Vermi-composting
  - In-vessel aerobic composting
- Quality of compost is emerging as one of the most important issue.
Composting: Quality is a formidable issue

- In spite of its simplicity and relative cost advantage, composting has remained a challenge during the long history of its application in this country.
- Commercial viability has so far been elusive except occasional reports.
- The MSW rule of 2000 stipulates stringent quality requirement, especially in terms of minimum concentration of eight metals – As, Cd, Cr, Cu, Pb, Hg, Ni and Zn.
- The FCO of 2006 has put in additional stringency, particularly, organic carbon in compost.
Composting: Quality is a formidable issue

Source segregation, separate collection and transportation and avoidance of subsequent contamination are important issues which are very difficult to achieve in practice (contamination from electro-plating industry, health care facilities within the municipality, e-waste etc.)

The market has high expectations regarding nutrient content too

Lately, the demand for organically grown food is increasing across the globe and consequently, the stringency of quality requirements
Revival of inoperative compost plants

- City garbage based compost plants are limited in number but majority of these are not operating as per designed capacity due to issues of appropriate design, quality and pricing of compost.
- The Government of India had constituted an Inter-Ministerial Task Force on ‘Integrated Plant Nutrient Management Using City Compost’ under Supreme Court directive.
- This report (2005) had also laid emphasis on revival of inoperative and under capacity plants.
- An actual case is presented here in which the closed MCD compost plant at Okhla has been re-engineered and is operated full capacity (sometimes over capacity) by IWMUSL (IL&FS Waste Management and Urban Services Ltd.).
Revival of MCD compost plant at Okhla, New Delhi by IL&FS Waste Management and Urban Services Ltd.
Revival of MCD compost plant at Okhla, New Delhi by IL&FS Waste Management and Urban Services Ltd.
Weighbridge
Composted garbage in Monsoon Shed
35 mm and 16 mm screening of compost
Compost curing for two weeks
Final disposal: the new rules

- Traditionally, solid waste has been dumped here in the open in an unscientific manner.
- The ‘Municipal solid waste (Management and Handling) Rules, 2000’ mandates final disposal in a properly engineered and constructed sanitary landfill (SLF), which is a contained system from which pollutants can not escape.
- It has an impervious bottom layer with arrangement for leachate collection (which is subsequently treated).
- The work face is covered everyday with inert material followed by capping when the SLF is full. Methane generated is collected and used but our MSW 2000 rule stipulates avoidance of biodegradable material in landfill so that methane generation is not expected.
In the last 8 years during implementation of these rules, there have been observations by practitioners as well as experts regarding stringency of the specifications, with respect to the current situation in the country.

- This increases the cost and skill-set requirement as well as management capability.
- There is vagueness about provisions for the containment norms in case there is source segregation and only inert waste goes to the sanitary landfill.
Old dumpsites : remediation and rehabilitation

- We have these dump-sites everywhere, whether old or in use
- These are not only eye-sore but environmental time bombs, which may unleash a host of diseases and suffering
- These need to be studied in depth to find out lasting and affordable solutions for different ground situations through remediation and rehabilitation
- Huge chunk of usable land could be released for use as landfill and also for other uses after complete stabilization over a period of time
Construction and demolition debris

- Inert material in the municipal solid waste has been steadily increasing (30-50%), a majority of this is generated from the demolition and renovation activities.
- Separate storage, collection and transportation of such waste needs to be enforced, which can be facilitated by appropriate use of these materials, driven by commercial considerations.
- This would reduce transportation cost and have a positive impact on compost quality as well other biological processing such as bio-methanation.
Bio-medical Waste

- Bio-medical waste is generated in relatively smaller quantity in comparison to municipal solid waste but due to its infectious and toxic nature, it is hazardous for health.
- Since it is regulated by a separate rule – ‘Bio-medical Waste (Management and Handling) Rules, 1998’, it is perceived to be outside the domain of municipal jurisdiction leading to confusion and lapses.
Special Wastes

- Different types of waste is generated within the municipal area but not covered by the two rules mentioned above, e.g., health care waste generated in homes, battery cells, electro-plating industries operating within the town, automobile garages without dedicated waste processing and disposal system etc.
- e-waste is a fast emerging issue which remains to be addressed properly
- It is high time, buy back and similar systems are deliberated upon and put in place
The eternal conflict about resources

- From whatever channel the resources come, it is ultimately the Tax Payer’s money including property tax, service charge etc.
- The important point is how best the resources are utilized and a framework of long-term sustainability is worked out.
- One perception tends to believe that PPP is the panacea but actually, it is extremely difficult to make waste management into a profitable venture on a stand-alone basis based on revenue accrual from sale of goods and services.
Resources for solid waste management

Broadly there are two requirements: capital investment and O&M

Capital Investment:
- Internal Resources (municipal taxes)
- Government grants
- Debt (loan) from FIs, bi-lateral and multilateral agencies
- BOT mode

Operation and Maintenance:
- Part of the revenue accrual from taxes
- Service charges
- Carbon credits (CER)
Mobilizing resources

Issues in mobilizing resources:

- How to mobilize resources to finance solid waste management and other urban services
- How to improve the financial management of these resources
- How to organize capacity building of the municipal institutions to promote greater efficiency and responsiveness in urban service delivery
Resource Generation Opportunities – different Options

Broadly there are three options:

1. Resource recovery based (revenue accrual)
2. Fee based
3. Carbon Credit (CER)
Resource Recovery Based (Revenue Accrual)

- Revenue generation from sale of products, e.g., compost / vermi-compost
- Revenue from sale of power generated from municipal solid waste using one of the available technologies
- Revenue from extraction and use of landfill gas (not for new SLF according to MSW 2000)
- Revenue from recycling of paper, plastics, glass, metal etc.
- Revenue from sorted and graded construction debris
- Revenue from Carbon Trading
Fee Based Business Opportunities

Tipping fee is important for certain activities:

- Collection and transportation of waste from the points of generation / intermediate points to the desired destination
- Street sweeping and cleaning
- Operation of sanitary landfills (revenue from sale of landfill gas / power is not sufficient for landfill operation)
Carbon Credit

There is possibility of getting carbon credits for projects involving solid waste management, where there is mitigation of methane emission. This is to be done through International trading of Certified Emission Reduction (CER) and there may be scope for Sanitary Landfill with harnessing and use of landfill gas containing methane (not applicable in India for SLF but applicable for remediation of old dump-sites where methane is expected), waste to energy, composting etc.
Sustainability is essential for safeguarding Investment

- The 3 sources mentioned above are not sufficient as stand alone and must be combined judiciously for sustainability
- It must be appreciated that waste management related projects and activities have tremendous environmental and social impacts but these may not appear to be lucrative when compared to many other businesses
- The Local and the State Governments must appreciate these social and environmental factors, indirect benefits such as increase in tourist and business potential, concomitant increase in property value etc.
Ways to consolidate Business Opportunities in Waste Management

- Comprehensive planning for the whole issue of municipal and bio-medical waste management, which should be appropriate for the ground situation.
- The issue of decentralization should be clearly deliberated upon so that there is no confusion while planning for the entire town or city.
- Installation of Integrated Common Facilities instead of separate facilities at different sites.
- Continuous IEC in the form of training (municipal and private sector staff) and awareness generation for the public.
Social Issues

- The plight of waste workers and rag pickers
- All efforts should be made to change the situation in which the poor are forced to work with waste under compulsion and not by choice
- Construction workers and domestic help
The plight of waste workers and rag-pickers

- Higher salary should be considered in view of the difficult and dirty situation in which they have to work
- Medical check-up at regular intervals should be provided
- Health insurance would help them considerably
- Awareness regarding health and hygiene is essential for these people
- They may be organized into SHGs to provide the same services in a more dignified and commercial manner
Construction workers and domestic workers

- The builders should provide temporary shelter and sanitation facilities to the migrant labour employed by them (and their family).
- It is a pity that people who toil hard to build our houses, have to live in inhuman conditions.
- Similarly all housing societies should endeavour to make provision for shelter and sanitation facility for domestic workers.
- These steps would help in checking the growth of squatter settlements and slums to some extent.
Conclusion: can there be a definite road map?

- Apparently there are conflicts in the whole scenario of waste management.
- It is possible, however, to deliberate upon these issues, resolve the conflicts and find viable and sustainable solutions by using the tools of meticulous planning (preferably participatory planning), appropriate technology and management.
- Sustained IEC should be applied as the fly wheel to scale any barriers or conflicts.
The eternal conflict about resources

The challenge is to combine with associated activities in innovative ways – from resource recovery to carbon credits.

Here again the tools for optimization are – meticulous and comprehensive planning, appropriate technology and management with a vision.
Thank You