



FROM THE EDITOR'S DESK

India may still be lower in ranks in terms of per capita waste generation. However, the cumulative waste generation of the country and in some of its mega cities are enormous. Despite having a comprehensive MSW Rules stipulated in the year 2000, most of the cities have not moved forward in a significant way. Some of the rules related implementation issues are not so much linked with technology or understanding of rules, but intricately wired with the attitude of common man. This situation does not improve much when we combine the same with equally ignorant and direction less municipal officers and workers.

The scenario can be changed only if the attitude of the people towards solid waste management changes. The Indian constitution has many laws and regulations for management of solid waste, but people are not aware of these. Awareness needs to be created at grass root level to improve the situation. These awareness programmes should not be only linked with holding of seminars and workshops where similar people meet. Such programmes should have active components of action taken while awareness gets created. Involvement with action will provide the sustainability to the MSW good practices. Good governance concepts will emerge from there.

The present article deals with "Urban Solid Waste Management – A comparative Statement" addressing the need of using rules the right way and learning from other best practices within our country. The contents of this article have already been presented in the conference on "Urban Solid Waste and Plastic Waste Management – Issues and Solutions" at University of Mumbai held on 20th December, 2008.

URBAN SOLID WASTE MANAGEMENT

– A COMPARATIVE STATEMENT

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Municipal Solid Wastes (Management and Handling) Rules came into existence in the year 2000. It specified on all functions of SWM such as collection, segregation, storage, transportation, and disposal of Municipal Solid Wastes. These rules are applied through out the country, with some variations. Though the intent of the rule is very clear - to keep city clean. However, the interpretation varies widely in different cities of India. An attempt has been made to analyse the present practices of Municipal Solid Wastes with the parameters stated in Schedule II - Management of Municipal Solid Wastes under Municipal Solid Waste (Management & Handling) Rules, 2000. Efforts are also made to depict some best practices for each parameter adopted in various municipal corporations in India.

Municipal Solid Wastes (Management & Handling) Rules, 2000

Schedule II – Management of Municipal Solid Wastes

Parameter ~ Collection of Municipal Solid Wastes

Compliance Criteria	Present Practices	Remarks
<p>1. Littering of municipal solid waste shall be prohibited in cities, towns and in urban areas notified by the State Governments. To prohibit littering and facilitate compliance, the following steps shall be taken by the Municipal Authority, namely:-</p>		
<p>i. Organising house-to-house collection of municipal solid wastes through any of the methods, like community bin collection (central bin), house-to-house collection, collection on regular pre-informed timings and scheduling by using bell ringing or musical vehicle (without exceeding permissible noise levels);</p>	<p>It is not done in a very organized manner – the coordination time of collection and intimation to households is not satisfactory.</p>	<p>Proper awareness and education among households and coordination with the collectors should be organized. Door-to-door collection of waste should be practiced on large scale instead of community bins.</p>
<p>ii. Devising collection of waste from slums and squatter areas or localities including hotels, restaurants, office complexes and commercial areas;</p>	<p>The system is very insignificant.</p>	<p>Collection system from various sources should vary depending on the nature of waste.</p>
<p>ii. Wastes from slaughter houses, meat and fish markets, fruits and vegetable markets, which are biodegradable in nature shall be managed to make use of such wastes;</p>	<p>Biodegradable waste is not collected and managed separately.</p>	<p>Biodegradable waste should be managed separately and treated as per the norms given in the MSW rules 2000.</p>
<p>iv. Bio-medical wastes and industrial wastes shall not be mixed with municipal solid wastes and such wastes shall follow the rules separately specified for the purpose;</p>	<p>Biomedical wastes & Industrial Wastes are mixed with other wastes and are dumped in mixed form in the dumping yards.</p>	<p>This wastes should be segregated at source level and should be managed according to their rules to avoid environmental hazards.</p>
<p>v. Collected waste from residential and other areas shall be transferred to community bins by hand driven containerized carts or other small vehicles;</p>	<p>Containerized carts or the small vehicles are not designed and maintained properly to carry the waste. More often the waste is filled beyond its capacity.</p>	<p>It should be designed and maintained in good condition. Waste should be picked up directly by vehicles at the curb side and there should be no community bins.</p>
<p>vi. Horticultural and construction or demolition wastes or debris shall be separately collected and disposed off following proper norms. Similarly, wastes generated at dairies shall be regulated in accordance with the State laws;</p>	<p>This practice is yet to be adopted in urban cities.</p>	<p>Construction & Demolition waste can be recycled, sand can be recovered and reused. Horticulture & Dairy waste can be converted into green/ organic compost.</p>

<p>vii. Waste (garbage, dry leaves) shall not be burnt;</p>	<p>Burning of waste is a common scenario in the cities as well as at dumping yards which is objectionable.</p>	<p>Burning of waste causes air pollution and emits obnoxious gases in the atmosphere, this practice should be banned.</p>
<p>viii. Stray animals shall not be allowed to move around waste storage facilities or at any other place in the city or town and shall be managed in accordance with the State laws.</p>	<p>Waste storage facilities are often attended by stray animals leading to scattering of waste and unhygienic condition around the storage facilities.</p>	<p>Waste storage facilities should be protected and prohibited from stray animals and unauthorized elements.</p>
<p>2. The Municipal authority shall notify waste collection schedule and the likely method to be adopted for public benefit in a city or town.</p>	<p>The responsibility of Municipal authority is not properly governed, thus city remains dirty.</p>	<p>Municipal authority should make a system by using their machinery a good governance among the city managers and public at large by arranging awareness and education program, training to their staff, adopting proper technology etc.</p>
<p>3. It shall be the responsibility of generator of waste to avoid littering and ensure delivery of wastes in accordance with the collection and segregation system to be notified by the municipal authority.</p>	<p>The attitude of public is the real menace. Proper awareness and education among citizens is needed.</p>	<p>Municipal authorities should arrange periodical awareness programs among the city fathers, city managers, employees and public at large.</p>

Best Practice:

~ Municipal Corporation of Jalandhar:

In the areas under Municipal Corporation of Jalandhar, collection from residential areas is carried out daily as the organic matter decomposes rapidly due to a hot climate.

Hand driven cart pullers collect the solid waste from door to door. These cart pullers segregate the plastic bags, polythene and metal, which is then sold to the kabariwalas. By this, nonbiodegradable solids are separated from organic substances. This collection system is also economically feasible.

Parameter ~ Segregation of Municipal Solid Wastes

Compliance Criteria	Present Practices	Remarks
<p>In order to encourage the citizens, municipal authority shall organise awareness programmes for segregation of wastes and shall promote recycling or reuse of segregated materials. The municipal authority shall undertake phased programme to ensure community participation in waste segregation. For this purpose, regular meetings at quarterly intervals shall be arranged by the municipal authorities with representatives of local resident welfare associations and non-governmental organisations.</p>	<p>In few cases segregation at source is being done however it is being mixed while collecting by Municipal authority/ designated authority. Hence there is no proper segregation from source to disposal.</p>	<p>Proper education and training should be provided to waste collectors along with proper waste collection system.</p>
	<p>Neither the Municipal authority nor the representative of the public is interested to organize such meetings to enhance segregation of waste.</p>	<p>Municipal authority in association with Professional NGOs should organize regular meetings along with Corporators/ Mayor on awareness and education program.</p>
	<p>Advanced locality Management (ALM) are gradually disappearing.</p>	<p>ALMs should be encouraged by Municipal authority.</p>

Best Practice:

~Municipal Corporation of Greater Mumbai:

In Mumbai, constant effort is being made to separate the Dry and Wet waste at the source itself, so that the dry wastes could be further segregated into different types of wastes such as plastic, paper, metal etc. and could be sent for recycling, resulting in lesser load going to the landfill, sites. Indian Centre for Plastics In Environment ICPE along with some NGO's have joined hands with Municipal Corporation of Greater Mumbai (MCGM) in some wards of Mumbai to propagate the Proper Solid Waste Management culture among the citizens. There is an increasing activity among various Local Self Government Councils to treat the wet waste also through vermiculture or similar process, to generate compost which can be used as fertilizers.

~Udagamandalam Municipality:

Udagamandalam Municipality has planned to segregate the solid waste at the source. In this connection it has been decided to collect the solid waste from the house holds by engaging sanitary workers. The places, where it is not possible to collect the waste from the source, it has been decided to keep two dust bins, one in red and the other in green, at a place easily accessible for the people living in that area.



Segregation of waste: Udagamandalam

Parameter ~Storage of Municipal Solid Wastes

Compliance Criteria	Present Practices	Remarks
<p>Municipal authorities shall establish and maintain storage facilities in such a manner as they do not create unhygienic and unsanitary conditions around it. Following criteria shall be taken into account while establishing and maintaining storage facilities, namely:-</p> <p>i. Storage facilities shall be created and established by taking into account quantities of waste generation in a given area and the population densities. A storage facility shall be so placed that it is accessible to users.</p> <p>ii. Storage facilities to be set up by municipal authorities or any other agency shall be so designated that wastes stored are not exposed to open atmosphere and shall be aesthetically acceptable and user-friendly;</p>	<p>Bins overflow due to excess of garbage not being collected on time ultimately rots, emits foul smell, attract animals, pests and creates unhygienic and unsanitary conditions around it.</p> <p>The storage facilities are not covered; the waste is exposed to atmosphere and is mostly attended by stray animals and rag pickers. Where the covering is provided they are not maintained in good condition, the bins are left open.</p>	<p>Design of bins should be modified and should be emptied on a minimum period/daily. Eco design of bins is highly recommended.</p> <p>Proper bin should be provided with cover to avoid nuisance and should be maintained properly. Alternatively a closed mechanical system with in built shredder should be introduced.</p>

<p>iii. Storage facilities or 'bins' shall have 'easy to operate' design for handling, transfer and transportation of waste. Bins for storage of bio-degradable wastes shall be painted green, those for storage of recyclable wastes shall be painted white and those for storage of other wastes shall be painted black;</p>	<p>No easy handling is observed neither the waste is stored in a segregated nor provided separate bins.</p>	<p>Eco design bins should be introduced.</p>
<p>iv. Manual handling of waste shall be prohibited. If unavoidable due to constraints, manual handling shall be carried out under proper precaution with due care for safety of workers.</p>	<p>None of the waste handlers are provided with safety gears which leads to health impact on the waste handlers.</p>	<p>Safety to the waste handlers in regard to their health during operation should be taken care. Metals, glass pieces etc in the waste should be segregated at source to avoid any accident.</p>

Best Practice:

~Allahabad Municipal Corporation:

Allahabad Municipal Corporation (AMC) has provided 49 depots for storage of MSW, which are scattered throughout the city. The depots are enclosed system with capacities ranging from 15 to 40 m³.

AMC has also provided two types of community bin containers with covered system for MSW storage. The first one has wheels and a capacity of 1 m³. The bin is placed along the roadside in areas where the system has been adopted. 19 wards are covered by this system (597 bins) and distance between the containers ranges from 100 to 150 m. The second type of bin is without wheels and has a capacity of 4.4 m³. 6 such bins are provided in big markets and road crossings where collection of MSW seems to be heavy.

Parameter ~Transportation of Municipal Solid Wastes

Compliance Criteria	Present Practices	Remarks
<p>Vehicles used for transportation of wastes shall be covered. Waste should not be visible to public, nor exposed to open environment to prevent their scattering. The following criteria shall be met, namely:-</p>	<p>Transport system is not properly designed as a result waste overflows, moisture gets dripped along the roadways and emit foul smell.</p>	<p>Environmentally sound design transport system should be adopted. The waste should not be exposed to the atmosphere. Mechanized closed system of trucks should be used. In built shredder system is recommended.</p>
<p>i. The storage facilities set up by municipal authorities shall be daily attended for clearing of wastes. The bins or containers wherever placed shall be cleaned before they start overflowing;</p>	<p>The storage facilities are not attended on time and as a result the bins overflow. The scenario is worst in monsoon season.</p>	<p>The waste should be collected on regular basis depending on the frequency of waste generation.</p>
<p>ii. Transportation vehicles shall be so designed that multiple handling of wastes, prior to final disposal, is avoided.</p>	<p>Multiple handling of wastes by workers and public is usually observed during transportation of wastes.</p>	<p>The transport vehicle design should be modified for safe & easy handling and transportation of wastes.</p>

Best Practice:

~Municipal Corporation of Greater Mumbai:

In A ward of Municipal Corporation of Greater Mumbai, Electric tow tractors with closed trolleys have been used through busy roads to collect waste from markets, and defense establishments, employing marginalized persons from slums near the area and teaching them the necessary skills. The savings achieved have been 59% of the present costs of the Municipal Corporation of Greater Mumbai for transporting waste to fast depleting dumping grounds outside the city. Other transport vehicles like waste compactor trucks and stationary compactors have been deployed for safe and easy handling and transportation of waste in the city.

Parameter ~Processing of Municipal Solid Wastes

Compliance Criteria	Present Practices	Remarks
Municipal authorities shall adopt suitable technology or combination of such technologies to make use of wastes so as to minimize burden on land fill. Following criteria shall be adopted, namely:-	The technologies adopted from developed countries are not suitable for the Indian waste. A confused stage has arise among city managers in this regards.	Encourage research in technological development in India prior to adopting any technology from developed countries.
i. The biodegradable wastes shall be processed by composting, vermicomposting, anaerobic digestion or any other appropriate biological processing for stabilization of wastes. It shall be ensured that compost or any other end product shall comply with standards as specified in the rules.	Both Composting and anaerobic digestion are practiced in India. However it is accomplished in an unorganized manner.	A professional and organized process of technology is required.
ii. Mixed waste containing recoverable resources shall follow the route of recycling. Incineration with or without energy recovery including pelletisation can also be used for processing wastes in specific cases. Municipal authority or the operator of a facility wishing to use other state-of-the-art technologies shall approach the Central Pollution Control Board to get the standards laid down before applying for grant of authorization.	No formal recycling is carried out. Waste is dumped in mixed form.	Formal recycling plants should be established and encouraged by the government. Certified agencies should only be encouraged.

Best Practice:

~Pune Municipal Corporation:

Pune city has 37 bio-methanisation plants owned mainly by hotels, where 20-25 metric tonne garbage is taken care of. Moreover, 20 units of modernized composting plants process about 12 metric tonnes biodegradable waste to produce manure. Pune has 1,500 vermi-composting units, of which 300 units are run through voluntary participation.

~Tamil Nadu Municipal Corporation:

A Biomethanation plant for vegetable market waste has been set up in Chennai at Koyambedu wholesale vegetable marketing. The market generates about 80 tonnes of waste per day, and at present its waste is collected by the private agency and transferred to transfer station within the market complex. A project based on high rate biomethanation technology has been installed for generation of electricity and treatment of waste.

~Municipal Corporation of Cochin:

Under the Solid Waste Management Project under Jawaharlal Nehru National Urban Renewal Mission (JNNURM)for Municipal Solid Waste Disposal Facility (MSWDF) at Brahmapuram. The Municipal Corporation of Cochin have developed Municipal Solid Waste Disposal Facility (MSWDF) at Brahmapuram. This plant is designed for a capacity of total 250 tonnes per day including 200t by mechanical composting and 50t by vermi composting.



Waste Processing plant at Brahmapuram

~Mira Bhayander Municipal Corporation:

An innovative technology for treatment and processing of raw/mixed MSW to obtain the finished products such as compost, RDF and sand is being practiced in Mira Bhayander Municipal Corporation. Almost 85% of the material is recovered in the form of compost, Refuse Derived Fuel (RDF) and sand at the plant with a potential of revenue generation.

Parameter ~Disposal of Municipal Solid Wastes

Compliance Criteria	Present Practices	Remarks
Land filling shall be restricted to non-biodegradable, inert waste and other waste that are not suitable either for recycling or for biological processing. Land filling shall also be carried out for residues of waste processing facilities as well as pre-processing rejects from waste processing facilities. Land filling of mixed waste shall be avoided unless the same is found unsuitable for waste processing. Under unavoidable circumstances or till installation or alternate facilities, land filling shall be done following proper norms. Landfill shall meet the specification given in the rules.	No landfill, only open dumps. Waste is dumped in mixed form in an unscientific manner on outskirts of city in low lying areas near the creek with no compliance of regulations/rules. Besides this the old dumping grounds are used for developing commercial and residential hubs.	Biodegradable wastes and recyclable wastes should be segregated at source. Sanitary landfill should be constructed for new waste disposal sites. Only inert should be sent to sanitary landfill. Construction on or near the old dump sites should not be allowed. Old dumping site should be remediate by a suitable technology.

Best Practice:

~Navi Mumbai Municipal Corporation:

From Navi Mumbai Municipal Corporation area, around 489 MT of solid waste is collected per day on an average. This waste is transported to a sanitary landfill, weighed and treated with the help of a culture for bio-stabilization. Manure is separated and rejects are disposed off in a sanitary landfill developed at Turbhe. While disposing solid waste, AFM is sprayed to minimize fly and odour nuisance. The operation and management is given to a private contractor. The sanitary landfill is protected from stray dogs and unauthorized dumping.

~Mumbai Metropolitan Regional Development Authority:

Mumbai metropolitan Development Authority (MMRDA) is planning to setup regional sanitary landfill site for all local bodies in the Mumbai Metropolitan Region (MMR). The approach of setting up regional landfills is environmentally benign as small scale landfills are insufficient and typically operate with lower level of environmental protection. The Project seeks to setup highly effective regional municipal waste management, information system, and select the technologies and equipment that meet the required disposal standards or reuse, so as to improve environmental quality and to promote the sustainable development of society in MMR.

~Jalandhar Municipal Corporation:

The Municipal Corporation, Jalandhar, has signed a MoU with the Punjab Grow More Fertilizers Ltd. for converting waste into manure using the waste sanitization treatment. Waste sanitization treatment method: Solid waste is first of all treated with biological inoculum at the collection point. The celrich substrate used i.e. DF-BC-01 (manufacturer USA) is a mixture of biological enzymes and herbal extracts that is spread over the MSW. The material is nonhazardous and nontoxic. The solid waste becomes free of hazardous pathogens, which eliminates the foul smell from it. Dumping points get hygienically upgraded. The solid waste becomes free of flies, insects and other disease-carrying vectors. This provides better working conditions and reduces the chances of smoke, fire and explosion hazards at the dump yards as the production of methane is reduced by this. Advantage of the technology is that area required in this process is very less. Also, corporation gets an annual lease rent as well as royalty to meet the collection cost partially. Clean refuse is generated, which can be used for landfilling. Polythene and plastic material that is segregated can be recycled. The waste sanitization and treatment method is a 'clean' option for waste disposal.

Conclusions:

The MSW rules have been written very comprehensively. Though at some places, there are ambiguities, however, keeping the final goal for clean city could provide the right path to the destination. Rules have been stipulated for effective management of Municipal Solid Waste and as we can see above, it could also be used for exceeding the expectation of the rules. Efforts are being made in various municipal corporations to meet these standards, however these efforts need to be more widespread to see the impact. Awareness is therefore, key to get the results in cities with public co-operation and their working with the municipal authorities to make the country a cleaner and better place to live in.

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We would appreciate your feedback on this newsletter and welcome you all to contribute articles, news or in any other form pertaining to the Waste Management issues, for publishing in our subsequent newsletters.

Upcoming Events

International Exhibition EE and RES
April 6-8, 2009
Sofia Bulgaria
Web: www.viaexpo.com/congress-ee-vei/eng/congress.php

6th International Conference on Solid Waste, Sewage and Air Emissions management
April 8-9, 2009
Kharkiv, Ukraine
Web: www.waste.com.ua/cooperation

"Closing Dumpsites and opening landfills"
April 21-22, 2009
Abuja, Nigeria
Web: www.wamason.org/wastesummit09.htm

ISWA Beacon Conference on 'Waste management Towards a (re)cyclical system'
May 5-7, 2009
Sao Paulo, Brazil
Email: hb@iswa.dk

2009 Waste-to-Fuels Conference & Trade Show
May 17-19, 2009
San Diego, California United States
Website: www.waste-to-fuels.org/

WasteTech 2009
May 26-29, 2009
Moscow, Central Federal District Russia
Website: w2009.sibico.com/?content=list§ion_id=21

2009 International Symposium on Environmental Science and Technology
June 2-5, 2009
Shanghai, China
Website: www.isest.com.ch

Waste Conference and Exhibition
June 3-5, 2009
Brisbane, Queensland, Australia
Website: www.wmaa.com.au/wq2009/index.html

Ontario Green Economy Summit
June 12-13, 2009
Toronto Ontario, Canada
Website: <http://torontocotimes.ca/>

EESD 2009 - International Conference on Energy, Environment, Sustainable Development
June 24, 2009
Paris, France
Website: www.waset.org/wcset09/paris/eesd/

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