

# WASTE MANAGEMENT INITIATIVES IN INDIA FOR HUMAN WELL BEING

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## **Abstract**

The objectives of writing this paper is to study the current practices related to the various waste management initiatives taken in India for human wellbeing. The other purpose is to provide some suggestions and recommendations to improve the waste management practices in Indian towns. This paper is based on secondary research. Existing reports related to waste management and recommendations of planners/NGOs/consultants/government accountability agencies/key industry experts/ for improving the system are studied. It offers deep knowledge about the various waste management initiatives in India and find out the scope for improvement in the management of waste for the welfare of the society. The paper attempts to understand the important role played by the formal sector engaged in waste management in our country. This work is original and could be further extended.

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**Keywords:** India, Recycling, Waste Disposal, Waste Management

## **Introduction**

“There are few things certain in life – one is death, second is change and the other is waste.” No one can stop these things to take place in our lives. But with better management we can prepare ourselves. Here we will talk about waste and waste management. Each of us has a right to clean air, water and food. This right can be fulfilled by maintaining a clear and healthy environment. Now for the first question, what is waste? Any material which is not needed by the owner, producer or processor is waste. Generally, waste is defined as at the end of the product life cycle and is disposed of in

landfills. Most businesses define waste as “anything that does not create value” (BSR, 2010). In a common man’s eye anything that is unwanted or not useful is garbage or waste. However scientifically speaking there is no waste as such in the world. Almost all the components of solid waste have some potential if it is converted or treated in a scientific manner. Hence we can define solid waste as “Organic or inorganic waste materials produced out of household or commercial activities, that have lost their value in the eyes of the first owner but which may be of great value to somebody else.” (Robinson, W.D.1986). Generation of waste is inevitable in every habitation howsoever big or small. Since the dawn of civilization humanity has gradually deviated from nature & today there has been a drastic change in the lifestyle of human society. Direct reflection of this change is found in the nature & quantity of garbage that a community generates. We can dispose the waste or reuse the waste and can earn money through proper management. Indian cities which are fast competing with global economies in their drive for fast economic development have so far failed to effectively manage the huge quantity of waste generated. There are about 593 districts and approximately 5,000 towns in India. About 27.8 percent of India’s total population of more than 1 billion (as per Census 2001) lives in urban areas. The projected urban population percentage is 33.4 percent by the year 2026. The quantum of waste generated in Indian towns and cities is increasing day-by-day on account of its increasing population and increased GDP. The annual quantity of solid waste generated in Indian cities has increased from six million tons in 1947 to 48 million tons in 1997 with an annual growth rate of 4.25 percent, and it is expected to increase to 300 million tons by 2,047 (CPCB, 1998).

Population explosion, coupled with improved life style of people, results in increased generation of solid wastes in urban as well as rural areas of the country. In India like all other sectors there is a marked distinction between the solid waste from urban & rural areas. However, due to ever-increasing urbanization, fast adoption of ‘use & throw concept’ & equally fast communication between urban & rural areas the gap between the two is diminishing. The solid waste from rural areas is more of a biodegradable nature & the same from urban areas contains more non-biodegradable components like plastics & packaging. The repugnant attitude towards solid waste & its management is however, common in both the sectors. Universally ‘making garbage out of sight’ is the commonly followed practice.

In India, the urban local bodies, popularly known as the municipal corporations/councils, are responsible for management of activities related to public health. However, with increasing public and political awareness as well as new possibilities opened by economic growth, solid waste

management is starting to receive due attention. The various initiatives taken by government, NGOs, private companies, and local public drastically increased in the past few decades. Nonetheless, land filling is still the dominant solid waste management option for the United States as well as many other countries like India around the world. It is well known that waste management policies, as they exist now, are not sustainable in the long term. Thus, waste management is undergoing drastic change to offer more options that are more sustainable. We look at these options in the hope of offering the waste management industry a more economically viable and socially acceptable solution to our current waste management dilemma. This paper outlines various advances in the area of waste management. It focuses on current practices related to waste management initiatives taken by India. It also highlights some initiatives taken by the US federal government, states and industry groups. The purpose of this paper is to gain knowledge about various initiatives in both countries and locate the scope for improvement in the management of waste.

### **Classification of waste**

There may be different types of waste such as Domestic waste, Factory waste, Waste from oil factory, E-waste, Construction waste, Agricultural waste, Food processing waste, Bio-medical waste, Nuclear waste, Slaughter house waste etc. We can classify waste as follows:

- Solid waste- vegetable waste, kitchen waste, household waste etc.
- E-waste- discarded electronic devices such as computer, TV, music systems etc.
- Liquid waste- water used for different industries, tanneries, distilleries, thermal power plants
- Plastic waste- plastic bags, bottles, bucket, etc.
- Metal waste- unused metal sheet, metal scraps etc.
- Nuclear waste- unused materials from nuclear power plants

Further we can group all these types of waste into wet waste (Biodegradable) and dry waste (Non Biodegradable).

**Wet waste (Biodegradable)** includes the following:

- Kitchen waste including food waste of all kinds, cooked and uncooked, including eggshells and bones
- Flower and fruit waste including juice peels and house-plant waste
- Garden sweeping or yard waste consisting of green/dry leaves
- Sanitary wastes
- Green waste from vegetable & fruit vendors/shops
- Waste from food & tea stalls/shops etc.

**Dry waste (Non-biodegradable)** includes the following:

- Paper and plastic, all kinds
- Cardboard and cartons
- Containers of all kinds excluding those containing hazardous material
- Packaging of all kinds
- Glass of all kinds
- Metals of all kinds
- Rags, rubber
- House sweeping (dust etc.)
- Ashes
- Foils, wrappings, pouches, sachets and tetra packs (rinsed)
- Discarded electronic items from offices, colonies viz. cassettes, computer diskettes, printer cartridges and electronic parts.
- Discarded clothing, furniture and equipment

In addition to the above wastes, another type of waste called **“Domestic Hazardous Waste”** may also be generated at the household level. These include used aerosol cans, batteries, and household kitchen and drain cleaning agents, car batteries and car care products, cosmetic items, chemical-based insecticides/pesticides, light bulbs, tube-lights and compact fluorescent lamps (CFL), paint, oil, lubricant and their empty containers. Waste that is considered hazardous is first required by the EPA to meet the legal definition of solid waste. The EPA incorporates hazardous waste into three categories. The first category are source-specific wastes, the second category is nonspecific wastes, and third, commercial chemical products. Generally, hazardous waste “is waste that is dangerous or potentially harmful to our health or the environment. Hazardous wastes can be liquids, solids, gases, or sludge. They can be discarded commercial products, like cleaning fluids or pesticides, or the by-products of manufacturing processes (EPA Wastes Website, 2010).

Similarly there is **“Non Hazardous waste”**. There are many definitions of hazardous and non-hazardous waste within the US federal government, states and industry groups. The Department of Defense (DOD) and The Environmental Protection Agency (EPA) define waste as “the extravagant, careless, or needless expenditure of DOD funds or the consumption of DOD property that results from deficient practices, systems, controls, or decisions. In addition, “abuse is the manner in which resources or programs are managed that creates or perpetuates waste and it includes improper practices not involving prosecutable fraud” (EPA Wastes Website, 2010). The Environmental Protection Agency (EPA) defines solid non-hazardous waste as “any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility

and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities” (EPA Wastes Website, 2010). The definition of non-hazardous waste can also include financial waste. In 2009 the US Presidential Executive Order, Reducing Improper Payments and Eliminating Waste in Federal Programs was initiated to eliminate payment error, waste, fraud and abuse in major Federal government programs due to public zero tolerance of fraud, waste and abuse. This Executive Order is based upon a transparent, participatory and collaborative comprehensive framework between the government and public.

### **Disposal vs. Management**

There are common practices to dispose waste from ordinary people. But disposal of waste is becoming a serious and vexing problem for any human habitation all over the world. Disposing solid waste out of sight does not solve the problem but indirectly increases the same manifold and at a certain point it goes beyond the control of everybody. The consequences of this practice such as health hazards, pollution of soil, water, air & food, unpleasant surroundings, loss of precious resources that could be obtained from the solid waste, etc. are well known. That’s why it is essential to focus on proper management of waste all over the world. Waste management has become a subject of concern globally and nationally. The More advanced the human settlements, the more complex the waste management. There is a continuous search for sound solutions for this problem but it is increasingly realized that solutions based on technological advances without human intervention cannot sustain for long and it in turn results in complicating the matters further. Management of solid waste which generally involves proper segregation and scientific recycling of all the components is in fact the ideal way of dealing with solid waste. Solid waste management (SWM) is a commonly used name and defined as the application of techniques to ensure an orderly execution of the various functions of collection, transport, processing, treatment and disposal of solid waste (Robinson, 1986). It has developed from its early beginnings of mere dumping to a sophisticated range of options including re-use, recycling, incineration with energy recovery, advanced landfill design and engineering and a range of alternative technologies. It aims at an overall waste management system which is the best environmentally, economically sustainable for a particular region and socially acceptable (World Resource Foundation, 1996; McDougall et al., 2001). This not only avoids the above referred consequences but it gives economic or monetary returns in some or the other forms.

## Basic principles of Solid Waste Management

### 1) 4Rs: Refuse, Reduce, Reuse & Recycle

- Refuse: Do not buy anything which we do not really need.
- Reduce - Reduce the amount of garbage generated. Alter our lifestyle so that minimum garbage is generated.
- Reuse - Reuse everything to its maximum after properly cleaning it. Make secondary use of different articles.
- Recycle – Keep things which can be recycled to be given to rag pickers or waste pickers (Kabadiwallahs). Convert the recyclable garbage into manures or other useful products.

2) Segregation at source: Store organic or biodegradable and inorganic or non biodegradable solid waste in different bins. Recycle of all the components with minimum labor and cost.

3) Different treatments for different types of solid wastes: One must apply the techniques which are suitable to the given type of garbage. For example the technique suitable for general market waste may not be suitable for slaughter house waste.

4) Treatment at nearest possible point: The solid waste should be treated in as decentralized manner as possible. The garbage generated should be treated preferably at the site of generation i.e. every house.

Based on the above principles, an ideal Solid Waste Management for a village could be as under.

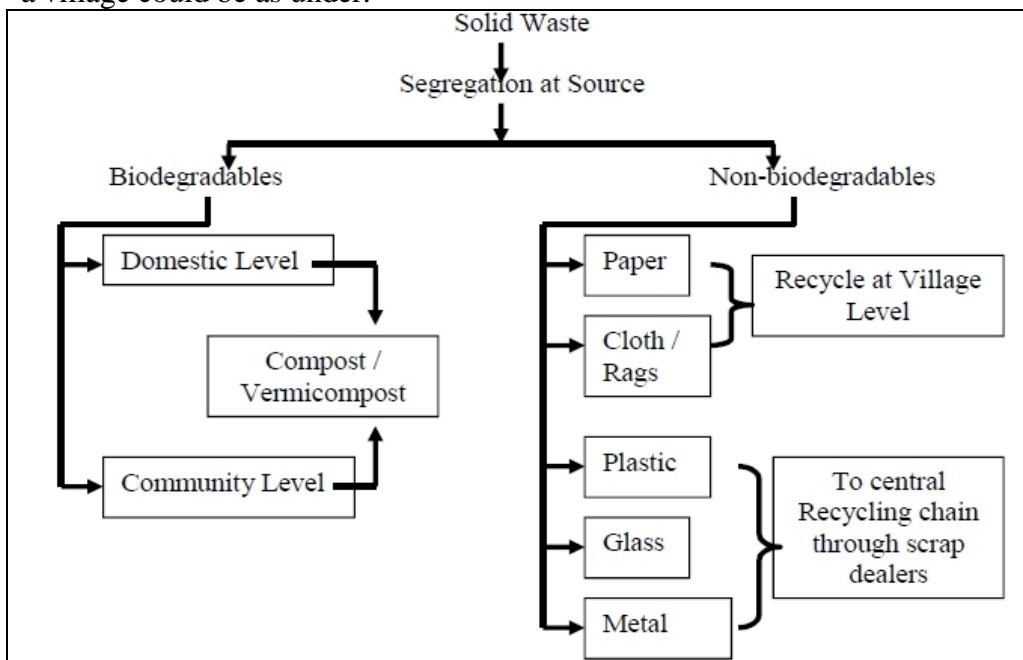


Figure 1- An ideal Solid Waste Management at a glance

Source- Shrikant M.Navrekar, "Sustainable Solid waste Management: Need of the hour"

## **Waste Management System in India**

Waste management market comprises of four segments - Municipal Waste, Industrial Waste, Bio- Medical Waste and Electronic Waste Market. All these four types of waste are governed by different laws and policies as is the nature of the waste. In India waste management practice depend upon actual waste generation, primary storage, primary collection, secondary collection and transportation, recycling activity, Treatment and disposal. In India, municipality corporations play very important role in waste management in each city along with public health department. Municipal Corporation is responsible for the management of the MSW generated in the city, among its other duties. The public health department is responsible for sanitation, street cleansing, epidemic control and food adulteration. There is a clear and strong hierarchy of posts in the Municipal Corporation. The highest authority of Municipal Corporation rests with the Mayor, who is elected to the post for tenure of five years. Under the Mayor, there is a City Commissioner. Under the city commissioner, there is Executive Officer who supervises various departments such as public health, water works, public works, house tax, lights, projection tax, demand and a workshop, which, in turn, all are headed by their own department heads. The staffs in the Public health department are as follows: Health officer, Chief sanitary and food inspector, Sanitary and food inspectors, Sanitary supervisor, Sweepers, etc. The entire operation of solid waste management (SWM) system is performed under four headings, namely, street cleansing, collection, transportation and disposal. The cleansing and collection operations are conducted by the public health department of city Municipality Corporation, while transportation and disposal of waste are carried out by the transportation department of city Municipality Corporation. The entire city can be divided in to different zones. These zones are further divided into different sanitary wards for the purpose of solid waste collection and transport operations. Currently waste management in India mostly means a picking up waste from residential and industrial areas and dumping it at landfill sites. The authorities, usually municipal, are obligated to handle solid waste generated within their respective boundaries; the usual practice followed is of lifting solid waste from the point of generation and hauling to distant places known as dumping grounds and/or landfill sites for discarding. The treatment given to waste once thus emptied is restricted to spreading the heap over larger space so as to take away the waste from the public gaze. Waste collection is usually done on a contract basis. In most cities it is done by rag pickers, small- time contractors and municipalities.

## Waste Collection in India:

Primarily by the city municipality

- No gradation of waste product eg bio-degradable, glasses, poly bags, paper shreds etc.
- Dumps these wastes to the city outskirts

Local raddiwala / kabadiwala (Rag pickers)

- Collecting small iron pieces by magnets
- Collecting glass bottles
- Collecting paper for recycling

In Delhi - MCD- Sophisticated DWM (Delhi Waste Management) vehicle

There are different sweepers employed in street sweeping and primary waste collection in each city. Each sweeper is responsible for the daily cleansing of a fixed area, usually a street including all side lanes. Domestic solid waste is usually thrown on the streets directly or in plastic bags from where road sweepers collect it into heaps. These waste are then transported by hand-cart trolley to the nearby open dumps or to bins, or directly by tractor trolley to the out-skirt of the cities. The road sweepers are equipped with a broom, pan, favda (spade/showel), hand-carts, panji (small pointed hand-rake), gayti (pointed small spade to clean road-side open drains) and buckets. The waste from street cleansing is collected in wheelbarrows and thereafter; it is dumped into roadside bins or at open dumping space along with household waste. Municipal workers collect waste from collection points (open dumping spaces or bins) into various vehicles including tractors and bull carts and haul it to disposal sites. In some cases, the workers collect the MSW from the collection points using chabra (wooden baskets) and transfer it into the vehicles manually. Normally, bull carts make only one or two trips a day to the final disposal site; a tractor makes two or three trips per day whereas refuse collectors/dumper placers make four trips. Finally recycling and reuse takes place by recycling units in different cities. Recycling is related to processing of a waste item into usable forms. The concept of recycling and reuse is well embedded in India largely due to prevailing socio-economic conditions and partly due to traditional practices. In India some cities have become a hub for recycling activities as considerable amounts of recyclable materials also come from adjoining towns and villages. Recycling industry mainly process paper, plastic, glass and metals. But recycling is not a solution to all problems. It is not a solution to managing every kind of waste material. For many items recycling technologies are unavailable or unsafe. In some cases, cost of recycling is too high. Recycling forms a big part of informal sector engaged in solid waste management. Waste recycling has, in fact, both organized and unorganized sections. The lower segments working as waste and dump-pickers, itinerant waste buyers, and small traders come under the unorganized segment, while



the big traders, wholesalers and manufacturers come under the organized segment of the waste-recycling sector.

### **Waste Management Initiatives in India**

During the recent past, the management of solid waste has received considerable attention from the Central and State Governments and local (municipal) authorities in India. A number of partnerships/alliances are found to exist in the field of solid waste management in Indian cities. These alliances are public-private, community-public and private-private arrangements. To identify the status of existing alliances in the study area, it is first necessary to identify the various actors working in the field of waste management. These actors can be grouped as under:

- Public sector: this comprises of local authority and local public departments at city level;
- Private-formal sector: this constitutes large and small registered enterprises doing collection, transport, treatment, and disposal and recycling;
- Private-informal sector: this constitutes the small-scale, non-recognized private sector and comprises of waste-pickers, dump-pickers, itinerant-waste buyers, traders and non-registered small-scale enterprises; and
- Community representatives in the form of NGOs, etc.

These actors enter into partnerships for providing various activities related to solid waste management. These partnerships can be as follows:

- public-private (Local Authority and private enterprises);
- public-community (Local Authority and NGOs); etc
- private-private (waste-pickers, itinerant-waste buyers, waste traders and dealers, wholesalers, small scale and large scale recycling enterprises); and
- Public-private-community (Local Authority, private enterprises and NGOs).

National Solid Waste Association of India (NSWAI) is the only leading professional non-profit organization in the field of Solid Waste Management including Toxic and Hazardous Waste and also Biomedical Waste in India. It was formed on January 25, 1996. NSWAI helps the Ministry of Environment and Forest (MoEF), New Delhi in various fields of solid waste management makes policies and action plans and is entrusted the responsibility of collecting information and various data related to solid waste management from the municipalities of Urban Class-I cities (population more than 1Lakh) and Urban Class-II cities (population above 50,000), collate and disseminate the information to website which is

linked to national and international organizations. The association is a member of the International Solid Waste Association (ISWA), Copenhagen, Denmark and provides forum for exchange of information and expertise in the field of Solid Waste Management at the national and international level.

The other regulatory framework for waste management is related to Indian government Initiatives for waste management under Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT), “Recycled Plastics Manufacture and Usage Rules (1999) amended and now known as The Plastics Manufacture and Usage (Amendment) Rules (2003), “Draft Guidelines for Sanitation in Slaughter Houses (1998)” by Central Pollution Control Board (CPCB), Non-biodegradable Garbage (Control) Ordinance, 2006, Municipal Solid Wastes (Management and Handling) Rules, 2000, etc. At the national policy level, the ministry of environment and forests has legislated the Municipal Waste Management and Handling Rules 2000. This law details the practices to be followed by the various municipalities for managing urban waste. Other recent policy documents include the Ministry of Urban Affairs’ Shukla Committee’s Report (January 2000) the Supreme Court appointed Burman Committee’s Report (March 1999), and the Report of the National Plastic Waste Management Task Force (August 1997). In order to get a sense of the current status of sanitation in India's cities, a survey was initiated by the Ministry of Urban Development as a part of the National Rating and Award Scheme for Sanitation in Indian Cities. The methods used for the survey can be found on the Ministry of Urban Development website. The Government of India announced the National Urban Sanitation Policy (NUSP) in 2008. As a part of this, the government proposes to encourage states to develop their own sanitation strategies to tackle their own sanitation problems and meet the goals of the NUSP. The rating and award scheme has been taken up under this policy initiative.

The first major initiative was taken by the Honorable Supreme Court of India in 1998, which resulted in formation of an expert committee to study the status of SWM in Indian cities. This Committee identified the deficiencies/gaps in the existing SWM system in the country and prepared the Interim Report in 1999 on SWM Practices for few cities. As a second major initiative, in conformance with Sections 3, 6 and 25 of the Environment Protection Act of 1986, and on the basis on the recommendations by the Committee, the Ministry of Environment and Forests (MoEF) of the Government of India, developed and issued Municipal Solid Waste (Management and Handling) Rules (MoUD, 2000). These rules aim at standardization and enforcement of SWM practices in urban areas. These rules dictate that “Every municipal authority shall, within the territorial area of the municipality, be responsible for the implementation of

the provisions of these rules and infrastructure development for collection, storage segregation, transportation, processing and disposal of municipal solid wastes”. The municipal authorities are further required to submit a detailed annual report on waste management to the Secretary-in charge of the Department of Urban Development of the concerned State in case of a metropolitan city; or to the District Magistrate or the Deputy Commissioner concerned in case of all other towns and cities every year. As per NSWAI, there are 303 projects till September 2009 running in the country related to waste management, environment and others. The CPCB in collaboration with National Environmental Engineering Research Institute (NEERI), Nagpur has undertaken a detailed survey of 59 cities in the country to assess the existing status of solid waste management in these cities (MoEF –India). The objective of the survey was to assess the compliance status of 59 cities with Municipal Solid Wastes (Management and Handling) Rules, 2000 and initiatives taken for improving solid waste management practices. The 59 cities selected for study cover 35 metro cities. It has been observed that initiatives for collection of waste from house-to-house and waste segregation has been undertaken in only seven cities, privatization of transportation of waste has been done in 11 cities and waste processing facilities have been set up in 15 cities. Ten waste processing facilities are based on composting; one of these composting facilities has provision for energy recovery also, four are based on vermin-compositing, and one facility employs pelletisation and energy recovery technology. In relation to hospital waste the Government of India (Notification, 1998) specifies that Hospital Waste Management is part of hospital hygiene and maintenance activities. This involves management of a range of activities, which are mainly engineering functions, such as collection, transportation, operation/treatment of processing systems, and disposal of waste. If the infectious component gets mixed with the general non-infectious waste, the entire mass becomes potentially infectious. Before the notification of Bio-Medical Solid Waste (Management and Handling) Rules 1998, now amended, waste from houses, streets, shops, offices, industries and hospitals was the responsibility of municipal or governmental authorities, but now it has become mandatory for hospitals, clinics, other medical institutions and veterinary institutions to dispose of bio-medical solid waste as per the Law. Besides all these initiatives Delhi Waste Management (DWM) was formed in 2004 as a Special Purpose Vehicle (SPV) in the Public Private Partnership (PPP) format for collection, segregation and transportation to landfill sites of municipal waste. Over 1000 employees are employed as a part of this initiative. The overall initiatives related to waste management in India can be summed up as follows in the table 1.

**Table -1  
India’s Waste Management Initiatives**

<b>Policy and Regulation</b>	
Institutional Framework	<ul style="list-style-type: none"> <li>• Central Level</li> <li>• State Level</li> <li>• Other Organizations/Associations</li> </ul>
Legal Framework	<ul style="list-style-type: none"> <li>• 74th Constitutional Amendment Act, 1992</li> <li>• Management and Handling Rules</li> <li>• Environment (Protection) Act, 1986</li> <li>• National Environment Tribunal Act, 1995</li> <li>• National Environment Appellate Authority Act, 1997</li> <li>• Water (Prevention &amp; Control of Pollution) Act, 1974</li> <li>• Water (Prevention &amp; Control of Pollution) Cess Act, 1977</li> </ul>
Environmental Norms	<ul style="list-style-type: none"> <li>• Existing Environmental Standards</li> <li>• Recently Notified Environmental Standards</li> </ul>
Policy Initiatives	<ul style="list-style-type: none"> <li>• National Urban Sanitation Policy, 2008</li> <li>• National Environment Policy, 2006</li> <li>• Policy Statement for Abatement of Pollution, 1992</li> <li>• National Conservation Strategy and Policy Statement on Environment and Development, 1992</li> <li>• Law Commission Recommendation</li> <li>• Ecomark Scheme, 1991</li> </ul>
<b>Key Government Programmes</b>	
JNNURM	<ul style="list-style-type: none"> <li>• Programme Scope and Structure                             <ul style="list-style-type: none"> <li>• Funding</li> </ul> </li> <li>• Experience So Far</li> <li>• Experience on Reforms</li> <li>• Issues and Challenges</li> </ul>
Total Sanitation Campaign	<ul style="list-style-type: none"> <li>• Programme Scope and Structure                             <ul style="list-style-type: none"> <li>• Funding</li> </ul> </li> <li>• Experience So Far</li> <li>• Issues and Challenges</li> </ul>
MNRE's Waste-to-Energy Programmes	<ul style="list-style-type: none"> <li>• Programme Scope and Structure                             <ul style="list-style-type: none"> <li>• Experience So Far</li> </ul> </li> <li>• Issues and Challenges</li> </ul>
Other Programmes	<ul style="list-style-type: none"> <li>• Integrated Low Cost Sanitation Scheme</li> <li>• National Biogas and Manure Management Programme</li> </ul>
<b>Technology and Practices</b>	
Traditional Technologies	<ul style="list-style-type: none"> <li>• Landfills</li> <li>• Waste Incineration</li> <li>• Sanitation</li> </ul>

Key Projects	<ul style="list-style-type: none"> <li>• Kolkata: SWM Improvement Project</li> <li>• Kanchrapara: SWM through Citizens' Participation             <ul style="list-style-type: none"> <li>• Kollam: MSW Management Project                 <ul style="list-style-type: none"> <li>• Chennai: MSW Project</li> </ul> </li> <li>• Navi Mumbai: MSW Management Project</li> </ul> </li> <li>• Gurgaon: Ultra Modern Waste Management Plant             <ul style="list-style-type: none"> <li>• Namakkal: Zero Garbage Status</li> </ul> </li> <li>• Suryapet: Dustbin Free and Zero Garbage Town</li> <li>• Visakhapatnam: SWM Through Citizens Participation             <ul style="list-style-type: none"> <li>• Thiruvananthapuram: Decentralised SWM</li> </ul> </li> <li>• CIDCO: SWM System at Areas Adjoining Navi Mumbai</li> </ul>
Key Initiatives	<ul style="list-style-type: none"> <li>• Chennai: GPRS Equipped Waste Bin</li> <li>• Ahmedabad: Tapping Methane Gas</li> <li>• Goa: Solid Waste Management Corporation</li> <li>• Nagpur: Bye-Laws to Collect Waste Generated in Hotels             <ul style="list-style-type: none"> <li>• Nagpur: Management of Construction Debris                 <ul style="list-style-type: none"> <li>• Akola: CBO for Waste Management</li> </ul> </li> </ul> </li> <li>• Yavatmal: Door-to-Door Collection of Solid Waste</li> </ul>
<b>Rural Waste Management</b>	
Key Projects	<ul style="list-style-type: none"> <li>• Tamil Nadu: Zero Waste Mgt. at Vellore District</li> <li>• Maharashtra: Slwm at Dhamner Village</li> <li>• Gujarat: Greywater Mgt. at Fathepura Village</li> <li>• Maharashtra: Greywater Mgt. at Wadgaon Village             <ul style="list-style-type: none"> <li>• Nashik: Wastepaper to Pepwood</li> </ul> </li> <li>• Kerala: Post-NGP Initiatives at Kattapana Village</li> </ul>
<b>Industrial Solid Waste Mgt.</b>	
Key Projects	<ul style="list-style-type: none"> <li>• Andhra Pradesh: 3.66-MW Power Generation Project</li> <li>• Uttar Pradesh: 6-MW Biomass Cogeneration Power Plant             <ul style="list-style-type: none"> <li>• Other WTE Projects</li> </ul> </li> <li>• Kolkata: Waste Minimisation of Small-Scale Industrial Units</li> <li>• Himachal Pradesh: Waste Treatment Plant</li> </ul>
<b>Liquid Waste Management</b>	
Key projects	<ul style="list-style-type: none"> <li>• Municipal Liquid Waste</li> <li>• Other Noteworthy Water Reuse and Recycling Projects             <ul style="list-style-type: none"> <li>• Industrial Liquid Waste</li> </ul> </li> </ul>

Source- India Infrastructure report (2009)

### **Initiatives taken by Private Companies**

There are various private companies that are providing complete solutions for waste management. For example Subhash Projects and Marketing Limited (SPML) is a leading Engineering and Infrastructure development organization with 26 years in Water, Power and Infrastructure. Today SPML is surging ahead in Urban Infrastructure, Solid Waste Management, Water and Waste Water Systems, Cross Country Pipelines, Ports and SEZs, through BOOT/PPP initiatives. “SPML Enviro” is an integrated environment solution provider arm of Subhash Projects and Marketing Limited (SPML). It provides complete solution in relation to collection, transportation & disposal of municipal / hazardous waste, segregation and recycling of municipal waste, construction & management of sanitary landfill, construction & operation of compost plant and waste to energy plant at the Delhi airport and Hyderabad Airport. SPML Enviro has invested in the necessary resources and partnerships to provide solid and water treatment solutions. Its expertise includes solid waste-to-resources’ solutions – universal, industrial and medical waste. SPML Enviro has teamed up with PEAT International, North Illinois, USA, a waste-to-resources company specializing in treating and converting waste to usable resources. PEAT's proprietary Plasma Thermal Destruction Recovery (PTDR) technology is an environmentally friendly process, that converts wastes into non-toxic synthetic gas (which is a valuable source of alternative energy) and other useful end-products. The PTDR is a proven, cost-effective, environmentally clean and commercially viable solution for waste remediation. SPML Enviro together with its joint-venture partners, has proven capabilities to successfully execute projects on turn-key basis involving Okhla sewage treatment plant, Delhi Jal Board, Bewana common effluent treatment, Delhi State Industrial Development Corporation, Delhi State Industrial Development Corporation, Yelahanka primary/tertiary sewage treatment plant, Bangalore Water Supply and Sewerage Board, Okhla common effluent treatment plant, Sewage treatment plant, Mysore, Karnataka water supply and sewerage board, etc. SPML has also formed a joint venture with the US based Company INSITUFORM Technologies (INC.). INSITUFORM is a pioneer in sewer rehabilitation projects world wide. The Company brings with them a No Dig Technology, that eliminates replacement of old sewers. In this, pipe within a pipe concept - a liner is inserted into the sewer, which makes it as good as new.

### **Initiatives taken by Indian corporate**

In India, there are various initiatives taken by many corporations. For example HCL Info system believes that the producers of electronic goods are responsible for facilitating an environmental friendly disposal,

once the product has reached the end of its life. HCL Info system supports the ongoing initiative for separate e-waste legislation in India. HCL has been working on an easy, convenient and safe programme for recycling of e-waste in India. HCL has created the online process of e-waste recycling request registration, where customers (both individual and corporate) can register their requests for disposal of their e-waste. Apart from corporate customers, HCL has extended its e-waste collection program to retail customers also through its HCL Touch spread points spread across the country HCL extends the recycling facility to its users regardless of the fact, when and where they purchased the product. To promote recycling of electronic waste, Nokia India launched a 'Take Back' campaign where customers can drop their old handset in the company's stores and win gifts. The take-back campaign is aimed at educating mobile phone users on the importance of recycling e-waste. As a part of this initiative, Nokia encourage mobile phone users to dispose their used handsets and accessories such as charges and handsets, regardless of the brand, at any of the recycling bins set up across Nokia Priority Dealers and Nokia Care Centers. ITC Ltd has chosen energy management, environmental & waste management and social & farm forestry as major focus areas for CSR. Specific processes include recycling/reuse of paper mill back water for dilution of bleached pulp, recycling of paper machine primary clarifier outlet water for miscellaneous uses, etc. These are few examples to show that Indian corporate is not behind in producing initiatives related to waste management.

### **Challenges in India**

Key issues and challenges include lack of collection and segregation at source, scarcity of land, dumping of e-waste, lack of awareness, etc. Simple dumping of mixed waste is the practice followed practically everywhere and especially in the developing countries as they cannot mobilize financial resources for applying expensive technology propounded by the developed countries.

In India, “The new Municipal Solid Waste Management Rules 2000”, which came into effect from January 2004, fail, even to manage waste in a cyclic process. Waste management still is a linear system of collection and disposal, creating health and environmental hazards. Urban India is likely to face a massive waste disposal problem in the coming years. Until now, the problem of waste has been seen as one of cleaning and disposing as rubbish. But a closer look at the current and future scenario reveals that waste needs to be treated holistically, recognizing its natural resource roots as well as health impacts. Waste can be wealth, which has tremendous potential not only for generating livelihoods for the urban poor but can also enrich the earth through composting and recycling rather than spreading pollution as

has been the case. Increasing urban migration and a high density of population will make waste management a difficult issue to handle in the near future, if a new paradigm for approaching it is not created.

A strong need felt on private sector participation in waste management but we can not ignore the risk of private sector participation. Risks of private sector involvement may include a lack of transparency, a commercial failure that would then lead to disturbance of public services, or low cooperation between stakeholders. Another important questions is that how effective are the public-private partnerships? We remember that Chennai based corporation and French conglomerate Onyx partnered for garbage collection. But we really don't know how effective it was in practical sense. The Corporation paid heavy amount for garbage clearance. But there were complaints against the company. In any case the company was simply collecting garbage and dumping it on the dumpsites. There is no engineering miracle in collecting and dumping waste. The way forward is proper waste management policies which must be adopted and responsibilities of each are defined in proper manner and correctly watched, if the municipal authorities get the private companies (like onyx) to composting and recycling wastes rather than just dumping it.

There have been a variety of policy responses to the problem of urban solid waste in India, especially over the past few years, yet sustainable solutions either of organic or inorganic waste remains untapped and unattended. For developing countries, recycling of waste is the most economically viable option available both in terms of employment generation for the urban poor with no skills and investment. All policy documents as well as legislation dealing with urban solid waste mention or acknowledge recycling as one of the ways of diverting waste, but they do so in a piece-meal manner and do not address the framework needed to enable this to happen. Critical issues such as industry responsibility, a critical paradigm to enable sustainable recycling and to catalyze waste reduction through, say better packing, have not been touched upon. Recycling of only some types of materials like plastics, paper and metals is not enough. Many types of new materials mainly used for packaging are not, or indeed cannot be, recycled in the low-end technology being employed. Besides, there are serious issues of poor occupational safety provisions of the waste pickers as well as workers.

In India, new and expensive technologies are being pushed to deal with our urban waste problem, ignoring their environmental and social implications. It is particularly true in the case of thermal treatment of waste using technologies such as gasification, incineration, pyrolysis or pelletisation. Indian waste content does not provide enough fuel value (caloric value) for profitable energy production. It needs the addition of



auxiliary fuel or energy. Such technologies put communities to risk and are opposed widely. For example, the United States has not been able to install a new incinerator for the past five years, while costs for burning garbage have escalated astronomically with rising environmental standards in other countries. While the more developed countries are doing away with incinerators because of high costs (due to higher standards of emission control), developing countries have become potential markets for dumping such technologies.

### **Suggestions for future improvement**

The political will is the first priority. Generally Government bodies and municipalities give priority to present problems which they face but do not think for future problems due to environmental decay. Their view is that, they will solve problems when they will face it but not now. Because doing something for environment does not provide political gains or assure next time seat. Now questions is that how can we change this mentality? We believe there should be a positive approach for a long time planning and implementation. Legislation and its effective enforcement is a key to sustainability for which the framework requires to be established.

Efforts to improve waste storage and collection are required. This can be done when each household and locality are provided standard bins that are placed outside for ease of collection. In areas where this is not appropriate, centrally located waste collection points should be established that are shared by a number of households. Wastes need to be increasingly sorted at the source, to separate materials that can be recycled and to reduce the amount of wastes requiring collection and disposal. Co-operation is required among communities, the informal sector, the formal waste collectors and the authorities. An effective Solid Waste Management system should aim at minimizing manual handling and 100 % collection & transportation of solid wastes should be achieved.

In solid waste management, one thing became very clear that segregation at source is to be practiced. There are lots of initiatives to manage wastes but goes in vein because of not identifying wealth in wastes. In India, we cannot afford sanitary land filling as land is precious here and there are lot of municipalities who do not have land as trenching ground. The source segregation needs lot of study on human behavior against waste littering. A continuous sensitization programme is to be planned according to the sentiments of the residents towards their city and ultimately it will work as wonders. If waste segregation is practiced, the potential threats can be minimized directly. Besides, the quality of materials retrieved will be better due to absence of mixing. The pickers can thus, fetch better money on the

materials retrieved besides having lesser threats of catching diseases, cuts and wounds encountered in the usual practice of waste picking.

The adoption and transfer of the technologies from the developed countries without adapting them to the local or regional perspective would be fallacious on the part of the developing countries. Therefore, the technical aspects for a waste management would have to take into account many points for planning and implementation of strategies according to situation of the country. It would call for the strengthening of the management sector which has to go hand in hand with technical planning.

General public can play a very important role. Public participation is necessary for a proper waste management system. Changes in the habits of segregation, littering, can change the approach towards wastes. For example in a heritage town of West Bengal, there was a movement related to waste management. Within a span of two years it successfully sensitized residents for segregation at source and not littering in open areas. Now the city is really becoming clean and other people are also participating in the movement.

In order to improve the system efficiency and increase the coverage to 100 percent in each city, it is recommended to explore alternative arrangements for collection of waste like involving private operators. A mechanism to generate revenue from the citizens should also be developed. However, the approach to public-private partnerships pursued in the developed countries cannot be replicated for Indian towns in general. This approach can only be implemented after some modifications taking into account the local conditions.

There may be separate parallel decentralized schemes by the government. Financial support by the community based on decentralized schemes will provide the right impetus for the development of waste management method. For example the municipality of Bangalore has a parallel scheme, “Swaccha Bangalore”, which levies mandatory fees for all households, businesses and educational institutions to increase its financial resources. These user fees imply that the residents will expect the municipality to provide proper waste collection services. It integrates them into the overall waste management strategy in all localities thereby helping to reduce the amount of wastes going outside the locality. The levying of waste collection and disposal fees should be based on waste generation rates and according to the economic standard of the area, whilst considering the nature of the waste wherever necessary. However, these fees should not be levied solely to meet the financial lacunae for management and the equipment demand.

In India waste management could materialize only if service delivery will be linked to private sector participation. “It is imperative that the private

sector comes forward and enables the public sector stakeholders to devise appropriate frameworks that result in a win-win for both sides.” Although there are some initiatives taken by corporate but there is strong needs that all corporate must come forward to take first step. At least they should manage their industrial waste rather littering and throwing in the rivers as we can find many examples in Indian cities like Kanpur, Varanasi, Agra, etc. The private sector could also play an important role in building the capacities of municipal bodies. Solid waste management, along with recycling, presents plenty of opportunities for partnerships. For example, EXNORA is an NGO in Chennai that focuses on the environment through their solid waste management program, which works in municipalities throughout Tamil Nadu.

In fact, despite the lack of proper legal and financial support by public agencies, the informal sector has a firm standing and gives an invaluable service to a large section of the society in relation to waste management. There is an urgent need to understand the vital role of this informal sector engaged in municipal solid waste management, study their socio-economic conditions, and to integrate them with the formal sector to achieve sustainable solid waste management on one hand and improve their living conditions on the other.

The possible future policy options available with the policy makers for management of municipal solid waste are to promote either/all of the existing alliances between private-private enterprises, private-public enterprises and private-public-community. The selected scenario should be based on socio-economic, environmental and health considerations. It should fulfill the basic goal of recycling the maximum waste generated, creating maximum employment through cleaner methods without bringing any threat/reducing the potential health hazards to the lower rung of the waste recycling sector and improving their socio-economic conditions, as well.

Another option is to promote formation of micro-enterprises among the waste-recycling sector through various policies. It is observed from various case studies of developing countries like Latin America, Egypt, etc. that if waste pickers and recyclers get official recognition from the local authorities and they organize themselves and institutionalize their activities, there is an overall improvement in the living conditions of these people. Micro-enterprises in the field of solid waste management sector are a new process in India and only few examples are available. The Self Employed Women’s Association (SEWA), Ahmedabad, India successfully improved the living conditions of women paper pickers, by organizing them into cooperatives and by searching for easily accessible raw materials in bulk quantity.

There are several missing links and many loose ends both in terms of management, technology and professional skill. The solutions need thorough understanding, for example, deployment of competent persons qualified in solid waste management (real hard taskmasters and not people who turn up with a handkerchief to cover their nose to keep the stink away), application of efficient combination of waste handling equipments in cost effective manner and streamlining of the handling of waste at various stages throughout its journey from source of generation to ultimate safe disposal site, without intermediate dumping and accumulation of waste for days together. A flawless continuous flow sheet of waste management has to be developed. Matching financial support, discipline and attitudinal change in all concerned will obviously be the key for effective and successful waste management in India.

In India the landfill, sometimes described as 'sanitary landfill', does not go beyond filling up of low-lying areas with stinking waste conveniently bypassing the recommended requirements for 'sanitary landfill'. In the end, anything that is emptied at dumping or landfill sites continues to cause serious environmental depredation. The developed countries do boast that they handle their waste in a more scientific manner at landfill sites by laying the dumping grounds with a vulcanized plastic sheet to avoid leaching of toxic digested and undigested waste into the ground underneath. In our countries authorities practicing landfill do declare that they assiduously implement requirements for recommended landfill to assuage citizen concern.

The quantum of solid waste is ever increasing due to many reasons. Plastics waste is a significant portion of the total municipal solid waste (MSW). Recycling of plastics should be carried in such a manner to minimize the pollution level during the process and as a result to enhance the efficiency of the process and conserve the energy. Newer techniques related to recycling and reuse of plastic can be adopted.

Any new paradigm should include a cradle-to-grave approach with responsibility being shared by many stakeholders, including product manufacturers, consumers, communities, the recycling industry, trade, municipalities and the urban poor. The Ministry of Urban Development and Poverty Alleviation, as well as Agriculture, should develop the market for compost, and if required provide subsidies for compost manure – first to provide organic soil nutrients to the farmers and to solve the urban waste problem which continuously is polluting land through uncontrolled dumping.

In order to make proper waste management activity sustain in true sense, following other points need to be given attention to –

**1) Region specific planning:** Looking at the geographical, topographical and cultural diversity of the country it can be divided into five regions such as

Northern region, Eastern region, Western region, Central region and Southern region. Each of these regions has different structure. Hence all the activities should be planned & implemented on regional basis.

2) Planning from below: To make Solid Waste Management a success in true sense, the planning as well as implementation should start from general public level planning followed by block level planning, district level planning and state level planning.

3) Involvement of self help groups, youth groups and small entrepreneurs: The general public level waste management units can be run by self help groups, youth groups or small entrepreneurs. This will help in making the programme self supportive and sustainable.

4) Well planned and effective training policy: Technical training at all levels (General public to state) forms the backbone of a successful waste management programme. Adequate training must be given to all those concerned prior to actual launching of the programme in the field.

## **Conclusion**

It is suffice to say that we require a more stringent integrated and strategic waste prevention framework to effectively address wastage related issues. There is an urgent need to build upon existing systems instead of attempting to replace them blindly with models from developed countries. To prevent any epidemic and to make each city a healthy city-economically and environmentally, there is an urgent need for a well-defined strategic waste management plan and a strong implementation of the same in India. To achieve financial sustainability, socio-economic and environmental goals in the field of waste management, there is a need to systematically analyze the strengths and weaknesses of the community as well as the municipal corporation, based on which an effective waste management system can be evolved with the participation of various stakeholders in India. The public apathy can be altered by awareness building campaigns and educational measures. Sensitization of the community is also essential to achieve the above objectives and we need to act and act fast as every city in India is already a hotbed of many contagious diseases, most of which are caused by ineffective waste management.

All these above said suggestions are given in relation to India and will be effective only when we individually feel the responsibility of making environment clean. As general public, we can not do much in policy and regulations formulation, adoption of newer technologies related to recycling and other waste management options but we can play a very important role in this process if we can adopt only few tips. Here are a few tips to achieve this goal.

1. **Keep ourself informed:** It is important that we are in the know about what is happening on the environment front. Read about how untreated sewage is thrown into the rivers, attend public lectures about air pollution, & keep in touch with new policies that affect our environment. The more informed we are, the better equipped we are to fight such issues.

2. **Consume less:** Motto: Refuse.....Reduce....Reuse... Recycle .This means consuming fewer resources, reusing whatever we can and finally recycling what cannot be reused. This process greatly reduces the garbage.

3. **Say ‘No’ to plastic bags:** One of the biggest sources of pollution in Indian cities is the ubiquitous plastic bag. Refuse to accept one. Instead, carry a cloth shopping bag with us.

4. **Separate our garbage:** India has one of the world’s most efficient recycling mechanisms. Use the service of our raddiwalla. Newspapers, bottle cans and other such recyclables can fetch us money and in the process we can help to save the environment. Rag pickers, too, perform a vital function for the city. Kitchen garbage (biodegradable) should be separated from non-biodegradable waste.

5. **Compost our organic waste:** Start a vermiculture bin. We can convince our neighbors to start a vermiculture bin also to produce manure.

6. **Stop burning garbage:** Ask our neighbors to desist from burning solid wastes. It may seem harmless but smoke emitted from leaves contributes to air pollution. Also, when there are plastic in the heap, it emits dangerous toxic fumes. Leaves can be converted to fertilizer through composting & plastic can be recycled.

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