

# Solid Waste Management in India : Challenges and Opportunities

Sonia Bhankhor

Assistant Professor, Department of Environment Science Indira Gandhi University, Meerpur, Haryana, India

## ABSTRACT

India faces major environmental challenges associated with waste generation and inadequate waste collection, transport, treatment and disposal. Current systems in India cannot cope with the volumes of waste generated by an increasing urban population, and this impact on the environment and public health. The challenges and barriers are significant, but so are the opportunities. A priority is to move from reliance on waste dumps that offer no environmental protection, to waste management systems that retain useful resources within the economy.

**Keywords:** Waste Management, Sustainable Development, India, Waste to Energy, Challenges, Opportunities

## I. INTRODUCTION

Solid waste management (SWM) is a major problem for many urban local bodies (ULBs) in India, where urbanization, industrialization and economic growth have resulted in increased municipal solid waste (MSW) generation per person. Effective SWM is a major challenge in cities with high population density. Achieving sustainable development within a country experiencing rapid population growth and improvements in living standards is made more difficult in India because it is a diverse country with many different religious groups, cultures and traditions.

Despite significant development in social, economic and environmental areas, SWM systems in India have remained relatively unchanged. The informal sector has a key role in extracting value from waste, with approximately 90% of residual waste currently dumped rather than properly landfilled. There is an urgent need to move to more sustainable SWM, and this requires new management systems and waste management facilities. Current SWM systems are inefficient, with waste having a negative impact on public health, the environment and the economy. The waste Management and Handling Rules in India were introduced by the Ministry of Environment and Forests (MoEF), although compliance is variable and limited.

## II. CURRENT WASTE MANAGEMENT IN INDIA

### 2.1 Key waste management legislations in India

The MoEF issued MSW (Management and Handling) Rules 2000 to ensure proper waste management in India and new updated draft rules have recently been published. Municipal authorities are responsible for implementing these rules and developing infrastructure for collection, storage, segregation, transportation, processing and disposal of MSW. Chandigarh is the first city to develop SWM in a planned way and has improved waste management compared with other Indian cities .

### 2.2 Role of the informal sector in waste materials reuse and recycling

The informal sector has a very important role in India and this must be integrated into formal SWM systems. The informal sector is characterized by small-scale, labour-intensive, largely unregulated and unregistered low-technology manufacturing or provision of materials and services. Waste pickers collect household or commercial/industrial waste and many hundreds of thousands of waste pickers in India depend on waste for an income, despite the associated health and social issues. Pickers extract potential value from waste bins, trucks, streets, waterways and dumpsites. Some work in recycling plants owned by cooperatives or waste picker associations. Waste picking is often the only source of income for families, providing a livelihood for

significant numbers of urban poor and usable materials to other enterprises. Waste pickers in Pune collect organic waste for composting and biogas generation. Waste pickers also make a significant contribution by keeping cities clean.

A recent study of six Indian cities found that waste pickers recovered approximately 20% of waste, with 80 000 people involved in recycling approximately three million tonnes. It is estimated that every tonne of recyclable material collected saved the ULB approximately INR 24 500 per annum and avoided the emission of 721 kg CO<sub>2</sub> per annum.

### **2.3 Waste collection and transport**

Waste collection, storage and transport are essential elements of any SWM system and can be major challenges in cities. Waste collection is the responsibility of the municipal corporations in India, and bins are normally provided for biodegradable and inert waste. Mixed biodegradable and inert waste is often dumped, with open burning a common practice. Improvements to waste collection and transport infrastructure in India will create jobs, improve public health and increase tourism. Local bodies spend around Rs. 500–1000 per tonne on SWM with 70% of this amount spent on collection and 20% spent on transport.

### **2.4 Waste disposal**

SWM disposal is at a critical stage of development in India. There is a need to develop facilities to treat and dispose of increasing amounts of MSW. More than 90% of waste in India is believed to be dumped in an unsatisfactory manner. It is estimated that approximately 1400 km<sup>2</sup> was occupied by waste dumps in 1997 and this is expected to increase in the future.

Properly engineered waste disposal protects public health and preserves key environmental resources such as ground water, surface water, soil fertility and air quality. Indian cities with containment landfill sites include Mumbai, Kolkata, Chennai, Nashik, Vadodara, Jamshedpur, Allahabad, Amritsar, Rajkot, Shimla, Thiruvananthapuram and Dehradun.

### **2.5 Environmental and health impacts of waste dumping**

Waste dumps have adverse impacts on the environment and public health. Open dumps release methane from decomposition of biodegradable waste under anaerobic

conditions. Methane causes fires and explosions and is a major contributor to global warming. There are also problems associated with odour and migration of leachates to receiving waters. Odour is a serious problem, particularly during the summer when average temperatures in India can exceed 45°C. Discarded tyres at dumps collect water, allowing mosquitoes to breed, increasing the risk of diseases such as malaria, dengue and West Nile fever. Uncontrolled burning of waste at dump sites releases fine particles which are a major cause of respiratory disease and cause smog. Open burning of MSW and tyres emits 22 000 tons of pollutants into the atmosphere around Mumbai every year. The impacts of poor waste management on public health are well documented, with increased incidences of nose and throat infections, breathing difficulties, inflammation, bacterial infections, anemia, reduced immunity, allergies, asthma and other infections.

## **III. BARRIERS TO IMPROVED WASTE MANAGEMENT IN INDIA**

The current status of SWM in India is poor because the best and most appropriate methods from waste collection to disposal are not being used. There is a lack of training in SWM and the availability of qualified waste management professionals is limited. There is also a lack of accountability in current SWM systems throughout India [46]. Municipal authorities are responsible for managing MSW in India but have budgets that are insufficient to cover the costs associated with developing proper waste collection, storage, treatment and disposal. The lack of strategic MSW plans, waste collection/segregation and a government finance regulatory framework are major barriers to achieving effective SWM in India.

Limited environmental awareness combined with low motivation has inhibited innovation and the adoption of new technologies that could transform waste management in India. Public attitudes to waste are also a major barrier to improving SWM in India.

## **IV. CHALLENGES TO IMPROVING WASTE MANAGEMENT IN INDIA**

Core to the vision for waste management in India is the use of wastes as resources with increased value extraction, recycling, recovery and reuse. ULBs need to be responsible for waste management, with the ULB Commissioner and Chairman directly responsible for

performance of waste management systems. Waste management needs to be regarded throughout Indian society as an essential service requiring sustainable financing. The case presented to a ULB for a properly funded system must demonstrate the advantages of sound investment in waste management.

A strong and independent authority is needed to regulate waste management if SWM is to improve in India. Without clear regulation and enforcement, improvements will not happen. Strong waste regulations can drive innovation. The waste management sector needs to include attractive and profitable businesses with clear performance requirements imposed by the ULB, with financial penalties applied when waste management services are not working effectively. Finance for waste management companies and funding for infrastructure must be raised from waste producers through a waste tax. An average charge of 1 rupee per person per day would generate close to 50 000 crores annually, and this level of funding would probably be sufficient to provide effective waste management throughout India.

Information on future quantities and characterization of wastes is essential as this determines the appropriateness of different waste management and treatment options. State-level procurement of equipment and vehicles is necessary for primary and secondary collection with effective systems for monitoring collection, transport and disposal.

Littering and waste in streets is a major problem in India that has serious impacts on public health. Nagpur has introduced a system for sweeping roads in which every employee sweeps a fixed road length. The Swatchata Doot Aplya Dari (sanitary worker at your doorstep) scheme of the Centre for Development Communication was selected as an example of good practice by UN HABITAT in 2007.

Waste management must involve waste segregation at source to allow much more efficient value extraction and recycling. Separating dry (inorganic) and wet (biodegradable) waste would have significant benefits and should be the responsibility of the waste producer.

Long-term waste management planning requires visionary project development by ULBs, the private sector and NGOs. The roles and responsibilities to

deliver sustainable systems need to be defined, with monitoring and evaluation to monitor progress. Experiences should be shared between different regions of India and different social groups. There are a number of research institutes, organizations, NGOs and private sector companies working on a holistic approach to SWM, and future waste management in India must involve extensive involvement of the informal sector throughout the system.

There is a need to develop training and capacity building at every level. All Indian school children should understand the importance of waste management, the effects of poor waste management on the environment and public health, and the role and responsibilities of each individual in the waste management system. This will develop responsible citizens who regard waste as a resource opportunity.

## V. CONCLUSION

Waste segregation at source and use of specialized waste processing facilities to separate recyclable materials has a key role. Disposal of residual waste after extraction of material resources needs engineered landfill sites and/or investment in waste-to-energy facilities. The potential for energy generation from landfill via methane extraction or thermal treatment is a major opportunity, but a key barrier is the shortage of qualified engineers and environmental professionals with the experience to deliver improved waste management systems in India.

## VI. REFERENCES

- [1]. PPCB (Punjab Pollution Control Board). 2010. Status report on municipal solid waste in Punjab, Punjab Pollution Control Board, Patiala. See <http://www.ppcb.gov.in/Attachments/Annual%20Reports/AR201011.pdf> (accessed 1 July 2015).
- [2]. Narayan T. 2008. Municipal solid waste management in India: from waste disposal to recovery of resources? *Waste Manage.* 29, 1163-1166. (doi:10.1016/j.wasman.2008.06.038) [PubMed]
- [3]. Biswas AK, Kumar S, Babu SS, Bhattacharyya JK, Chakrabarti T. 2010. Studies on environmental quality in and around municipal solid waste dumpsite. *Resour. Conserv. Recycling*

- 55, 129-134. (doi:10.1016/j.resconrec.2010.08.003)
- [4]. Ministry of Environment and Forests (MoEF). 2015. The Gazette of India. Municipal solid waste (Management and Handling) rules, New Delhi, India.
- [5]. Bhalla B, Saini MS, Jha MK. 2013. Effect of age and seasonal variations on leachate characteristics of municipal solid waste. *Int. J. Res. Eng. Technol.* 2, 223-232. (doi:10.15623/ijret.2013.0208037)
- [6]. Census of India. 2011. Ministry of Home Affairs, Government of India, New Delhi, India. See <http://censusindia.gov.in/> (accessed 27 June 2015).
- [7]. ISWA (International Solid Waste Association). 2012. Globalization and waste management final report from the ISWA task force. See <http://www.iswa.org/knowledgebase/tfgfinal> (accessed 27 June 2015).
- [8]. World Economic Forum. 2010. Committed to improving the state of the World. See [http://www.idfc.com/pdf/publications/wef\\_positive\\_infrastructure\\_report.pdf](http://www.idfc.com/pdf/publications/wef_positive_infrastructure_report.pdf) (accessed 1 July 2015).
- [9]. Sridevi P, Modi M, Lakshmi MVVC, Kesavarao L. 2012. A review on integrated solid waste management. *Int. J. Eng. Sci. Adv. Technol.* 2, 1491-1499.
- [10]. Rana PR, Yadav D, Ayub S, Siddiqui AA. 2014. Status and challenges in solid waste management: a case study of Aligarh city. *J. Civil Eng. Environ. Technol.* 1, 19-24.