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Waste generation in India

India is growing and so are the mountains of waste its cities and villages are producing. The composition of waste is also witnessing a major shift as the use of plastics and paper grow with the rise of the middle class and a consumerist culture

TARIQUE AZIZ LASKARI / CSE







HOW MUCH WASTE DOES INDIA GENERATE?

The 2009 Comptroller and Auditor General's (CAG) report on waste management estimated that urban India produced some 48 million tonnes of municipal solid waste (MSW) annually, calculated at 0.4 kg per capita per day.¹ In the same year, the Department of Economic Affairs (DEA) estimated that about 58 million tonnes of waste was generated per year.² The 2012 Central Pollution Control Board (CPCB) status report on MSW put this number at 47 million tonnes for 2011–12. The 2014 report of the Planning Commission Committee chaired by K Kasturirangan found that 62 million tonnes of MSW was produced per year, which is based on an average of 0.45 kg per capita per day for India's urban population. According to a latest CPCB report, in 2016, India produced some 52 million tonnes of waste each year, or roughly 0.144 million tonnes per day, of which roughly 23 per cent is processed—taken to landfills or disposed off using other technologies.³

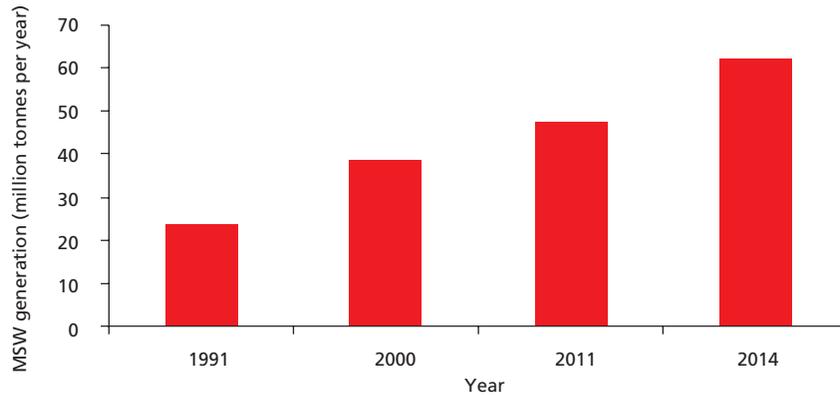
The issue with the data on waste generation in India is that all the figures are extrapolated values taken from the report produced by CPCB with the assistance of Nagpur-based National Environmental Engineering Research Institute (NEERI) in 2004–05 in 59 cities (35 metro cities and 24 state capitals). This was the last report having real time data and estimates on waste generation in the country.

Since then, data on generation of solid waste is calculated by multiplying the urban population by the amount of waste generated per capita per day. This makes estimates of solid waste generated in the country pretty much a guesstimate which, in turn, confounds management. However, what the estimates do demonstrate is the fact that bigger and richer cities produce more waste than poorer cities. This is not only due to their larger population, but also because their residents are more affluent and bigger generators of waste. *Graph 1* clearly shows an exponential increase in the production of solid waste in the past three decades.

In 2008, India produced 48 million tonnes of solid waste as per one estimate. By 2016, this had risen to 52 million tonnes

GRAPH 1: SOLID WASTE GENERATION IN INDIA (1991-2014)

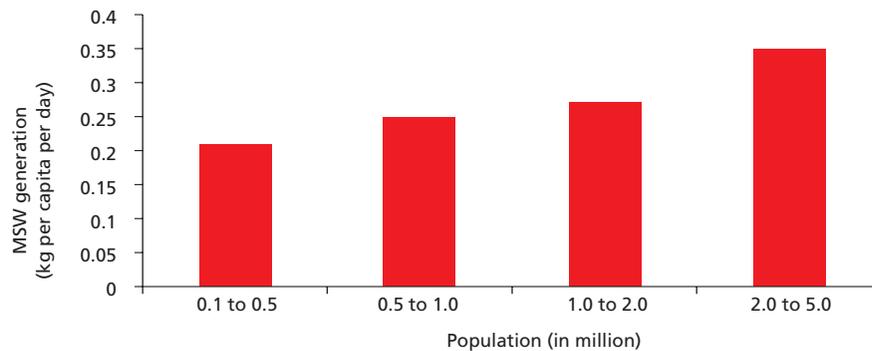
The amount of solid waste produced in India has witnessed a steady growth which is expected to accelerate, not slow down



Source: Compiled from research papers and available documents (DEA and CPCB)

GRAPH 2: PER CAPITA WASTE GENERATION—NEERI (1995)

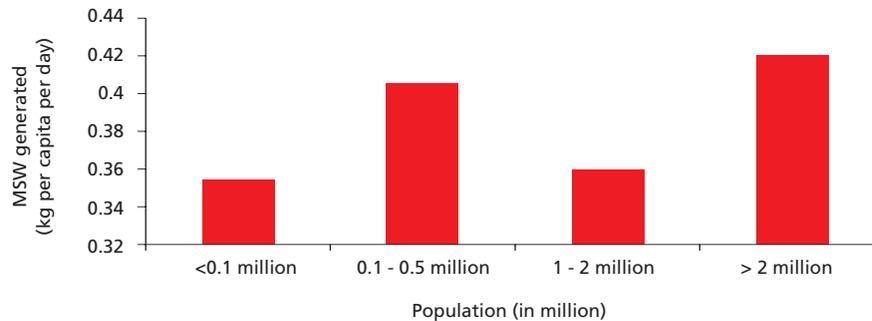
The study concluded that bigger cities produce more waste per capita



Source: Strategy paper on solid waste management, 1995, NEERI Nagpur

GRAPH 3: PER CAPITA WASTE GENERATION—NEERI-CPCB (2008)

The assessment paper presented a more staggered relationship between per capita waste generation and the population of an urban centre



Source: Sunil Kumar *et al.* 2008, 'Assessment of the status of municipal solid waste management in metro cities, state capitals, class I cities, and class II towns in India: An insight', *Elsevier, Waste Management* 29 (2009) pp 883–895

An assessment says that per capita waste generation is increasing by about 1.3 per cent annually

WHAT IS INDIA'S PER CAPITA WASTE GENERATION?

As per a study done by NEERI in 1995, per capita waste generation ranges between 0.2 kg and 0.6 kg per day in Indian cities. *Graph 2* shows the increase in per capita waste generated with an increase in population. As per the study, cities with population between 0.1–1 million produce 0.25 kg per capita per day; the corresponding numbers for cities with population between 1–5 million is 0.27–0.35 kg per capita per day and for cities with population over 5 million is 0.5 kg per capita per day.

As per a 2008 joint paper by NEERI and CPCB on the assessment of the status of MSW management in metro cities, state capitals, Class I cities, and Class II towns in India,⁴ (examining over 59 cities across India), the per capita generation in India lies between 0.2–0.6 kg per capita per day. Cities with a population of less than 0.1 million have a per capita waste generation of about 0.17–0.5 kg; however, cities with over 2 million population, mainly the metros and Class I cities such as Delhi, have a per capita waste generation in the range of 0.22–0.62 kg (see *Graph 3*). The paper offers differences in standard of living, food habits, geographical status, employment of workers per 1,000 population, road conditions, difference in implements, equipment and machinery used, and climatic conditions, which all vary from city to city, as possible reasons for the staggered data.

As per a 2009 report of the Department of Economic Affairs, per capita waste generation is increasing by about 1.3 per cent annually. Given that urban population is growing at an annual rate of 3–3.5 per cent, the yearly increase in the overall quantity of solid waste comes to about 5 per cent.

A 2012 study by Columbia University on solid waste management in India analysed the per capita waste generation in the context of the growth in the population of India. The study also did per capita MSW estimations, extrapolated till 2041 when it would be around 0.74 kg per person per day (see *Graph 4*).

As per a 2015 paper in *International Journal for Research in Applied Science and Engineering Technology* (IJRASET) on quantification of solid waste,⁵ per capita waste generation is approximately 500 g per person per day. CSE surveyed different kinds of cities in the year 2014–15 across the country to understand the status of waste generation in the country. It found that on an average, the generation of waste is 350–600 g per capita per day (see *Graph 5*).

HOW MUCH WASTE DO DIFFERENT CITIES GENERATE?

The 2004–05 CPCB–NEERI study on waste showed New Delhi, Greater Mumbai and Chennai to be the biggest waste generators in the country, producing 5,922 TPD, 5,320 TPD and 3,036 TPD respectively. In 2011, inventorisation by CPCB again revealed that metro cities, economic hubs of the country, are the biggest waste generators—Delhi: 6,800 TPD, Mumbai: 6,500 TPD, Chennai: 4,500 TPD, Hyderabad: 4,200 TPD, and Kolkata: 3,670 TPD. *Graph 6* depicts the status of MSW generation in the country from 2000–11. *Graph 7* depicts the per capita waste generation in a few Indian cities which is the highest in Hyderabad followed by Chennai and Bengaluru.

GDP AND SOLID WASTE GENERATION

Waste generation and wealth are directly correlated. According to the 2007 Intergovernmental Panel on Climate Change (IPCC) report, there is a direct

In 2011, Delhi produced 6,800 tonnes per day (TPD), Mumbai 6,500 TPD, Chennai 4,500 TPD, Hyderabad 4,200 TPD and Kolkata 3,670 TPD of waste