

# ISAS Special Report

No. 28 – 17 September 2015

Institute of South Asian Studies  
National University of Singapore  
29 Heng Mui Keng Terrace  
#08-06 (Block B)  
Singapore 119620  
Tel: (65) 6516 4239 Fax: (65) 6776 7505  
www.isas.nus.edu.sg  
http://southasiandiaspora.org



## India's Worlds of Waste<sup>1</sup>

*The sheer magnitude of the social, political and technological challenges in implementing India's new national priority of waste management, set by Prime Minister Narendra Modi, has attracted global attention. Some practical aspects of addressing these challenges have been discussed at a workshop organised by the Institute of South Asian Studies in Singapore.*

Robin Jeffrey<sup>2</sup>

### Preamble

A two-day workshop convened by the Institute of South Asian Studies in Singapore heard a dozen presentations on aspects of waste management in India and with comparative references to Singapore. The strengths of the workshop lay in the expertise of the presenters, the variety of perspectives they brought to the discussion and their detailed knowledge of a dozen Indian cities, including Chennai, Thiruvananthapuram, Hyderabad, Ahmedabad, New

---

<sup>1</sup> This is a Special Report on the Workshop on "India's Worlds of Waste", organised by the Institute of South Asian Studies (ISAS), an autonomous research institute at the National University of Singapore (NUS), in Singapore on 27 and 28 July 2015.

<sup>2</sup> Professor Robin Jeffrey is Visiting Research Professor at ISAS, NUS. He can be contacted at [isasrbj@nus.edu.sg](mailto:isasrbj@nus.edu.sg). The author, not ISAS, is responsible for the facts cited and opinions expressed in this paper.

Delhi and Varanasi. They also had specialised knowledge of policy initiatives and legal frameworks.

Since 2014 and the election of Narendra Modi government, India's confrontation with waste has become a national priority and gained global attention. Mr Modi chose 2 October 2014, the birthday of Mohandas Karamchand Gandhi, "the father of the nation", to announce a *Swachh Bharat Abhiyaan* or Clean India campaign. The goal is to create Clean India within five years – by Gandhi's 150<sup>th</sup> birthday on 2 October 2019. The year 2019 is also when the next national elections are due.

It is important to emphasise, however, that the participants in the "India's Worlds of Waste" workshop have been engaged with the problems of waste, recycling and public sanitation long before the recent enthusiasm of the national government. Collectively, the eight India-based participants have more than a hundred years' experience with various aspects of waste.

The urgency of India's confrontation with waste has grown over the past twenty years, along with the growth of the economy, urbanisation and a consuming middle class. A simple measure of such growth is to be found in data collected in 2011 for what was intended as a census of castes. The survey, however, also asked questions about ownership of consumer goods, including refrigerators. It found that 20 million rural households (about 11 per cent of all rural households) owned a refrigerator.<sup>3</sup> Add to that another 40 million urban refrigerators, and India had not just a significant absolute number of refrigerators but also the prospect of huge demand for more, once electricity supplies become reliable enough to make a refrigerator worth owning.

The point of such discussion is that India is acquiring and disposing of new categories of solid waste as it has never done in the past. India's confrontation with consumerist waste is more acute even than China's. China has more room – a population density of about 140 people per square kilometre against India's 400 per square kilometre.

The quantities of waste generated each day in India are not precisely known. A frequently used estimate arising from a Central Pollution Control Board report in 2012 put municipal solid waste at the surprisingly precise figure of 127,486 tonnes a day or about 46.5 million

---

<sup>3</sup> <http://secc.gov.in/staticSummary#> (accessed 6 August 2015).

tonnes a year. The problem with this, however, is that another estimate from 2011 put daily waste at 178,000 tonnes and annual waste at a more plausible 65 million tonnes a year.<sup>4</sup>

Whatever the precise numbers, volumes of waste are growing rapidly and outstripping the ability of most local governments to collect them, much less to deal with them in ways that protect the environment.

Solid waste – everything from discarded refrigerators to food scraps – is only half of the waste problem targeted by the Government of India. The other half is liquid waste: waste water and sewage, and this is bound up with questions of random defecation, toilet-building targets and evidence that suggests random defecation is closely linked to the stunting of children’s growth. As part of the Clean India campaign, the Government of India aims to provide effective toilets for all by 2019.

Participants in the workshop had much to say in discussions aiming to highlight the nuances involved in waste management and identify effective practices.

## **First Session**

The first session brought together two different perspectives. **Bharati Chaturvedi** is founder and Director of the Chintan Environmental Research and Action Group, based in New Delhi (<http://www.chintan-india.org/>). “An important part” of the group’s work lies in “ensuring green jobs, security and dignity for the urban poor, many of whom earn a living as waste recyclers”. **M S Goutham Reddy** is Chief Executive Officer of Ramky Enviro Engineers Ltd of Hyderabad, India’s largest private company engaged in waste management (<http://ramkyenviroengineers.com/>). **Goutham Reddy** has had his education in environmental science in the United States and India.

**Chaturvedi** focused on the importance of policy making and institutional structures in working towards goals of zero-waste. She pointed out that though local governments were

---

<sup>4</sup> *Times of India*, 25 September 2013, quoting A. R. Rajeev, Principal Secretary (Environment), Maharashtra at a Confederation of Indian Industry seminar on waste management.

under supervision both of state governments and the Ministry of Urban Development of the Government of India, it was the Ministry of Environment, Forest and Climate Change at the national level that laid down many of the rules intended to govern waste management. This was because waste was considered an environmental problem rather than a resource that could be shifted towards the circular economy.

She suggested that decentralised systems that aimed to include the people who eke out a living from handling waste offered the most effective and broad-based ways to address problems of waste. She argued that, for many municipalities, the debate over *Swachh Bharat Abhiyaan* has revolved more around technology than around people. But people – both people who make waste and those who handle it – are the crucial ingredient. Their attitudes and incentives have to change to bring about sustainable ways of living.

Arguing for principles of decentralisation, she contended that Delhi's proposed Waste to Energy (WTE) plants would destroy livelihoods, as was seen in the case of the WTE plant at Okhla in the south of Delhi. Decentralisation requires appropriate technology like composting and recycling. She pointed out the need to aid officials and municipalities in finding and implementing best practices and suggested that the effective sharing of information about successful initiatives was an important contribution that the *Swachh Bharat* campaign can make. Overall, she was optimistic about the potential of the *Swachh Bharat* campaign, which, she said, was “as if Narendra Modi has pressed a button that has unleashed a huge latent energy”.

**Goutham Reddy** stressed the immense challenges and opportunities arising from growing quantities of waste of all kinds in India. He advocated Public Private Partnerships as a key institutional device for tackling waste management, and emphasised the financial and institutional weaknesses of local governments which limited their capacity to tackle waste problems on their own. Necessary capital expenditures were beyond most municipalities, whose average population was only about 100,000 people. **Goutham Reddy** advocated the need for financial support from state governments and the Government of India to assist local governments with the construction of infrastructure for waste management, including waste water and sewage.

He estimated the current waste generated in India at 200,000 tonnes a day or 73 million tonnes a year, and suggested that this figure will quadruple in the next fifteen years. Most waste in India is not being dealt with in accordance with the Solid Waste Management Rules of 2000, an excellent set of standards but impossible to abide by.

His company, Ramky Enviro Engineers Ltd, though the largest waste management firm in India, operated in fewer than 20 cities and had been in the waste-management business for less than 20 years. Ramky estimated that only 10,000 tonnes of the 200,000 tonnes of waste generated each day was scientifically managed, that just over half of medical waste was properly processed and that one-seventh of hazardous waste was dealt with in suitable treatment plants.

## **Second Session**

The second panel explored human dimensions of waste and recycling. **Shibu K Nair** is Director of Sustainable Resource Use and Management at Thanal, an NGO based in Thiruvananthapuram (<http://thanal.co.in/>). He also coordinates Zero Waste Himalaya Network, which extends across the Himalayan region and works to eliminate waste. His theme for the workshop was “Caste and Gender; the Social Barriers to Solid Waste Management in India”. He pointed out that “caste and gender form huge walls in the mind-set of people” and “become barriers to public participation” in programmes to limit and control waste.

Arguing that waste “is not just technological issue [but] ... a behavioural issue,” **Nair** contended that “social engineering with political understanding” were as necessary as technology for dealing with the mounting challenges of waste. **Nair** pointed out that successful programmes in Kerala had emphasised decentralisation. Localities handled most of their waste close to home, and householders and businesses became partners with the people who looked after collection, composting and recycling facilities. “Waste managers” became “local environmental managers”, and “confidence and trust” became essential aspects of programmes that worked.

**Assa Doron** of the Australian National University took a specific and little-understood aspect of waste, recycling and the creation of value by examining the huge industry using discarded hair. He dramatised the story by reference to the crisis for Indian wig-makers that arose in 2004 when some rabbis banned the use of Indian hair in the wigs used by orthodox Jewish women who shave their heads. The ban stemmed from the idea that Indian hair may have been shaved off in a Hindu temple, and therefore was impure for a wig that a Jewish woman could wear. The price of Indian hair and Indian-made wigs fell, though it has since recovered and found other markets.

**Doron** used this incident to discuss the hair trade as one of the less-known elements in recycling and the extraction of value from “waste”. He pointed out that India’s great temples, especially Tirumala in Andhra Pradesh, receive tonnes of hair from head-shaving devotees every year. This is auctioned, and the proceeds go to the temple. At the other end of the hair-recycling chain, in towns and cities in north India, hair from women’s combs is collected door-to-door and salvaged from barber shops and rubbish heaps. Such discarded hair carries a stigma of pollution, but it also has value, as do most of the commodities that societies throw away. **Doron’s** presentation underlined the complex links in the value-chain and the need to understand such links to develop appropriate incentives for reuse and recycling.

### **Third Session**

**Ravi Agarwal** is founder director of Toxics Link, a Delhi-based NGO specialising in mitigation of the ill-effects of toxic substances in the environment (<http://toxicslink.org/>). His topic was “Waste to Energy Projects in India – an Overview of Key Influencers of Viability.” **Agarwal** argued strongly against the suitability of large-scale waste-to-energy plants in India. Only one currently exists at Okhla in New Delhi, and it works at less than full capacity and provokes complaints from people living in its environs. The main arguments against such big plants are their immense start-up costs, which **Agarwal** estimated at Rs 300 crores (about USD 60 million), their need for constant skilled maintenance, the dangers of possible toxic emissions and the way in which they burn recyclable materials previously collected by waste-pickers and recyclers. **Agarwal’s** position was that decentralised biomethanation plants, using biodegradable waste, coupled with recycling programmes

improving the benefits derived by traditional waste-pickers, offer more promising solutions to urban waste problems.

**Praveen Ravi** is an economist and policy analyst with Athena Infonomics, a Chennai consultancy company specialising in environmental issues (<http://www.athenainfonomics.in/>). **Ravi** carried forward the discussion of waste-to-energy methods for dealing with urban waste. He pointed to the fact that India's hundreds of local governments are charged with the responsibility for dealing with waste, but lack the expertise to assess their needs and options and often, as well, they lack the financial resources to introduce necessary infrastructure. He reported on a survey and report by his organisation which attempted to identify the efficacy of Public Private Partnerships (PPP) in helping local governments to set up workable waste-management systems. Their inquiries found that, if a local government was able to fulfil its contractual commitments, such PPP schemes had a fair chance of achieving their goals. These commitments involved ensuring the quantity and quality of waste delivered each day and the regularity of agreed payments to the private partners.

Given the ambitious targets of the Government of India for operationalising hundreds of Solid Waste Management projects in the PPP mode over the next decade, the assessment, supported by a simulation model, emphasised that cooperation between various agencies within the public sector (central, state and city governments, electricity utilities and other regulatory bodies) would be essential to ensure that the PPP process moves towards a favourable equilibrium. The current structure of fragmented incentives across agencies could derail PPP plans unless addressed through policy and capacity-building interventions.

In the discussion, **Shibu Nair** drew attention to the difficulties local governments face in assessing the viability of proposals for Public Private Partnerships. He cited the example of a local government in Kerala which was on the brink of entering a PPP for what looked like an exemplary project. At the last moment, it discovered that its international partner was a shady company with a number of unfulfilled previous agreements. Municipalities need to know where to find good advice. **Bharati Chaturvedi** agreed with the critique that local-government attempts to deal with their waste-management needs were disconnected and often ran at cross-purposes with one jurisdiction setting up systems that were at odds with those in neighbouring municipalities. **Shubhagato Dasgupta** further pointed out that the

waste-management sector had not, for example, managed to figure out its margins for breaking even on basic activities. There were no industry-wide standards.

## Fourth Session

An economist at the Centre for Policy Research in New Delhi, **Shubhagato Dasgupta** leads a project to map sanitation in a number of India's smaller cities. His presentation to the workshop was entitled "Mapping Sanitation Challenges in 'Smaller Cities' in India." He drew attention to the objectives of *Swachh Bharat Abhiyaan*:

- Eliminate *open defecation*
- Eradicate *manual scavenging*
- Ensure 100% collection, scientific processing, disposal, re-use and recycle of *municipal solid waste*
- Effect *behavioural change* for healthy sanitation practices
- Generate *awareness* about sanitation, and its link with public health
- Strengthen *Urban Local Bodies* (ULBs) to design, execute and operate systems for urban sanitation
- Create an enabling environment for Public Private Partnerships in *Capital Expenditure* and *Operational Expenditure*

He pointed out that although the *SBA* placed emphasis on urban sanitation, it was India's largest cities that looked likely to be the greatest beneficiaries. The hundreds of towns and smaller cities with populations of fewer than one million were – as others at the workshop agreed – ill-prepared to tackle the responsibilities and targets that were thrust upon them. **Dasgupta** argued that such places face "the most urgent sanitation challenges in India".

His research focuses specifically on liquid waste and sewage in smaller urban areas. The study estimates that more than 90 per cent of sewage and waste water in such jurisdictions goes untreated into ground water, ponds, lakes, rivers or the sea. Laying sewer lines in hundreds of such towns and cities appears an impossible task, and the septic tanks installed by thousands of householders are usually flushed out by tankers that merely deposit the effluent into any available water body.



**V Thiruppugazh** is a member of the Indian Administrative Service and a former commissioner for rural development for the state of Gujarat. He spoke on “Promoting Rural Sanitation: Issues and Challenges in India – A Case Study of Gujarat.” **Thiruppugazh** spelled out the task to achieve Open Defecation Free (ODF) status in rural Gujarat by 2019. As per the 2012-13 baseline survey, the state has 7 million rural households, of which an estimated 47 per cent, or 3.3 million households, do not have toilets of any kind. In the two years since 2013, 650,000 toilets have been built.

Taking up a theme that other speakers had referred to – that local authorities are often lacking in the reliable advice – he pointed out that contractors and other interested groups were quick to advocate “solutions” to the authorities. In his view, however, toilet-building had to be owner-driven, though state-assisted, if the goals of ODF were to be achieved. It was one thing to construct a building, but it was another to see it built well, used regularly and maintained properly. It was crucial to choose toilet designs suitable to the locality: coastal areas had special needs, just as did areas with rocky subsoil layers.

Underlining points made by **Shibu Nair**, **Thiruppugazh** emphasised the need for attitudinal change, promoted by school-based education and skilful information campaigns aimed at various sectors of society. He drew attention to reasons that people resisted toilet-building and use. People believed such government-driven campaigns were automatically suspect; toilets made more work for women who were expected to keep them clean; and the benefits of having a toilet were not visible. He cited the surprising statistic that in many areas, households Above the Poverty Line (APL) were less likely to have toilets than households Below the Poverty Line (BPL), largely because a toilet is not a felt need; lack of money is not the only factor for non-construction of toilets. This underlined the powerful cultural preferences that need to be confronted if Open Defecation Free targets are to be achieved.

## **Fifth Session**

**Harsha Anantharaman** is a researcher and analyst working for the Citizen, Consumer and Civic Action Group, Chennai (<http://www.cag.org.in/>). His discussion of “Data-driven planning for Solid Waste Management in Chennai” complemented other presentations by

underlining the lack of reliable data about waste generation and the need for wider understanding in local governments about viable options for waste management.

**Anantharaman** presented findings of a detailed survey of a single Ward of the Chennai Municipal Corporation. For a start, this door-to-door survey discovered a discrepancy of more than 5,000 households. Official figures showed the ward as having 9,000 households; the door-to-door survey enumerated 14,443 households, plus commercial premises. The survey then took a random sample of 5 per cent of households and analysed their waste for nine days. The average household generated 864 grams of waste a day, which extrapolated to about 13 tonnes of waste a day from the ward as a whole. The composition of the waste was about three-quarters organic and therefore suitable for composting and biomethanation. Only 16 per cent was inorganic, a large proportion of which could be recycled. The survey attempted to calculate the value of some of the recyclables and concluded that the Ward was producing about Rs 6,800 worth of plastic waste, Rs 2,000 worth of metal, Rs 1,000 worth of glass and Rs 890 worth of paper waste a day, or a total of more than Rs 10,000 a day or Rs 300,000 (USD 6,000 a month).

One of the key results of the survey was the need for careful planning at the Ward level for all aspects and especially for the location of Resource Recovery Parks (RRPs). To manage waste, it is essential to have space to sort and consolidate recyclables; but the objections of people living close to such sites have to be overcome. The survey calculated that one tonne of dry waste needed about 1,600 square feet of floor space in which to sort it (an area about 12 metres x 12 metres).

The survey argued for the importance of protecting the livelihoods of people who live from waste-picking and to include them in planning and in future organisation.

**Robin Jeffrey** of the Institute of South Asian Studies, National University of Singapore, spoke on “Garbage and [Local] Government: Landmarks, Places, Practices and People” (<http://www.isas.nus.edu.sg/>). He argued that local governments, on which most of the responsibility for public sanitation fell, were underprepared in various ways to fulfil their tasks. He used the example of nineteenth-century Melbourne in Australia to illustrate how British ideas of local government created a multiplicity of small units, unable on their own to handle the demands of growing towns and cities. Melbourne in the 1880s had a crisis of infectious diseases, especially typhoid and cholera, and an infant mortality rate of about 130

per 1,000 live births. It also had more than 50 tiny units of local government. The colonial government created an overarching Melbourne Metropolitan Board of Works, with overriding powers and representation on a per-rate-payer basis from each local government. The MMBW had the authority to raise capital, override local objections and build metropolis-wide sewage and drainage schemes. The infant mortality rate fell to about 35 by 1910.

The scale of urban India's challenges today is far greater, but the under-powering of local governments is similar to that faced in urban areas of the British imperial world over the past 150 years. In spite of the 73<sup>rd</sup> and 74<sup>th</sup> Amendments to the Indian Constitution in 1993, which were intended to strengthen local governments, they remain dependent on state governments for much of their funding and for appointments of key officials. At the level of smaller units (municipalities and nagar panchayats) executive officers are appointed by state governments from the state services and usually owe their appointment to seniority rather than aptitude in urban government.

As other participants in the workshop pointed out, local governments were the key institutions in improving public sanitation, but optimum local-government mechanisms were still to be found. New Delhi recently created three Municipal Corporations where once there had been one. Hyderabad had done similarly. But Bengaluru, which had been created as a single large unit, the Bruhat Bengaluru Mahanagara Palike (BBMP), is about to be divided into two or three units.<sup>5</sup> **Jeffrey** argued that there seemed to be consensus that much of waste management is best carried out as close to the source of the waste as possible. If that is the case, then effective local government is essential, as is the involvement of Ward-level elected leaders and citizens.

## **Singapore Sessions**

For comparative purposes, the workshop benefited from presentations from **Amy Ho**, Director of the Office of Environmental Sustainability at the National University of Singapore (<http://www.nus.edu.sg/oes/>), and **Fadil Supaat**, Deputy Director of Waste and Resource Management Department at the National Environment Agency of Singapore

---

<sup>5</sup> *Business Standard*, 3 August 2015, <http://goo.gl/JccsnP> (accessed August 2015).

<http://www.nea.gov.sg/energy-waste/waste-management>). Participants in the workshop also visited the Tuas South Incineration Plant, one of Singapore's four large Waste-to-Energy Plants.

**Ho** spelled out the efforts of NUS and its global affiliates in the International Association of Research Universities (IARU) to reduce and recycle waste. NUS produces just over 5,000 tonnes of waste a year, of which more than 10 per cent is recyclable. In recent years, NUS has introduced a coloured bin system for segregation of plastic, glass, paper and "other". Its first e-waste week in 2014 netted 34 tonnes of electronic waste in seven days. Singapore has an industrial-scale e-waste-recycling operation with which NUS e-waste has connected (<http://www.tes-amm.com/>). The university also works to connect students in environmental science programmes with practical waste management on campus.

Prior to a visit to the Tuas South Incineration Plant, **Fadil Supaat** explained Singapore's waste-management strategy in a presentation entitled "The Waste Management System in Singapore". Singapore uses high-temperature combustion waste-to-energy incinerators to deal with all burnable waste that cannot be reused or recycled. It is working to increase recycling levels and involve the entire community in such efforts. Ash from the city's four incineration plants is transported to the island of Semakau where it is used as landfill in the creation of an expanded island (<http://www.nea.gov.sg/energy-waste/waste-management/semakau-landfill>) which will occupy 350 hectares and is expected to meet the landfill needs of Singapore beyond 2035.

The visit to the Tuas South Incineration Plant provided an opportunity to tour the facility and to hear a presentation from the plant's management. Built in 2000 at a cost of SGD 890 million, the plant is the third and largest incineration plant built in Singapore and has a capacity to burn 3,000 tonnes of waste a day. Incineration reduces the volume to about 10 per cent of its original bulk. The ash is transported by barge to the Semakau landfill. Modest amounts of electricity are generated from the incineration, 20 per cent of which is used to run the plant itself, with 80 per cent being exported into the grid. Participants were told that high incineration temperatures, filter systems to clean flue gases and good maintenance programmes ensure that emissions from the plant meet environmental standards.

## Discussion Points

The workshop concluded with a one-hour discussion of points raised during the presentations and visit. There was general admiration for the knowledge and commitment that each participant brought to the event.

Some of the propositions put forward were:

- High-combustion incineration plants on the Singapore model are unsuitable for India. The reasons lie in the huge capital costs of construction; the high proportion of wet waste in most Indian towns and cities; incineration's hunger for high-calorie-value waste which currently offers livelihoods to waste-pickers and recyclers; and the difficulty of preventing toxic emissions in situations where maintenance may sometimes fail.
- Local governments are underpowered in various ways. They depend heavily on their state governments for funds and for the legal authority to regulate their jurisdictions. They do not appoint their key executives; state governments do that for them. They lack reliable, efficient methods for discovering best-practices from around India and for evaluating proposals from organisations that aim to sell them waste-management programmes. Within most states, local-government jurisdictions are formed haphazardly and are seen by state and national legislators not as vital engines for improving urban life, but as convenient vehicles for patronage and electioneering.
- Millions of Indians earn incomes from aspects of waste and waste-processing. This is low-status, poorly rewarded and uncertain work, but it enables people to survive. The best hope for improving public sanitation and waste management lies in integrating such people into more coherent systems and improving their rewards and status in return for regular work practices.
- As a general rule, the most effective waste-management systems for India are decentralised, and minimise the transport of waste. Sorting centres for recyclables, composting areas and biomethanation plants work best when they deal with no more than 10,000 households or businesses. This reduces the need for long journeys by diesel-powered trucks to poorly-maintained dumps and has the potential to engage householders in attitudinal change.

- The problem of open defecation articulated in the *Swachh Bharat Abhiyaan* is much more complicated than merely target-setting and bricks-and-mortar construction. Attitudinal change is essential. This can be achieved through educational campaigns and demonstration of toilet constructions appropriate to local conditions and preferences. This requires effective technologies, skilled builders and motivated workers.

. . . . .