

THE FATE OF PLASTICS IN OUR CITIES

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On a hot September day, 50-year-old Sadashiviah looks over his workspace — a hall with a conveyor belt in the middle and bins on both sides. Inside the bins are an assortment of refuse: empty milk packets, shampoo bottles, and yoghurt containers among them.

Each day, about a tonne of such “dry waste” (waste that isn’t biodegradable) arrives, and Mr. Sadashiviah’s team sorts it. Plastic goes into one bin, metal into another, while paper goes into yet another. It’s a tiring job, but one that keeps Bengaluru from drowning in its waste.

Mr. Sadashiviah runs a dry waste collection centre (DWCC), one of Bengaluru’s 189. Without them, much of the 250 tonnes of the city’s daily plastic waste would end up in landfills. Now, with the DWCCs separating the plastics, they can be recycled. The sorting at the DWCCs was made possible in 2012, when the city made it mandatory for all households, commercial establishments and industries to segregate waste.

Segregation, or the separation of organic waste from plastic, paper and metal, is the foundation of recycling. Yet, the vast majority of India’s 8,000 cities and towns don’t do this. As a result, a million tonnes of plastic waste ends up in landfills and in the environment each year.

Segregation at source has been legally required across India since April 2016, when the Ministry of Environment, Forests and Climate Change notified the Solid Waste Management rules. Yet, almost three years later, some of the top solid-waste generators, including Delhi, Mumbai, Kolkata and Chennai, don’t even have data on segregation, according to an April 2018 study by the Indian Council for Research on International Economic Relations (ICRIER).

Among the handful of big cities that do segregate, Bengaluru and Pune lead, with about 50% segregated at source. A few small cities perform well too. For example, Tirunelveli in Tamil Nadu segregates 100% of waste, while Panaji hits about 90%.

There are several reasons for the variability in the level of implementation among cities, says Megha Shenoy, a researcher at Bengaluru’s Ashoka Trust for Research in Ecology and the Environment. In Bengaluru and Pune, segregation began with citizen initiatives. In 2012, after Bengaluru’s Maavalipura landfill began overflowing, city resident Kavitha Shankar succeeded in getting the Karnataka High Court to order the city to enforce segregation, and provide DWCCs in every ward.

The Pune story began in the 1990s, with two professors at the Shreemati Nathibai Damodar Thackersey (SNDT) Women’s University. While researching the livelihoods of waste pickers, they found them to be working in hazardous conditions. To ensure safer working environments, the professors encouraged residents of an elite neighbourhood to segregate their trash. This eventually led to the establishment of a waste-pickers cooperative, which collects garbage from 55% of the city’s households today.

Meanwhile, in cities such as Tirunelveli and Suryapet in Telangana, city administrators took up the baton, according to Utkarsh Patel, a co-author of the ICRIER study.

In cities like Mumbai, where segregation is extremely low, the informal sector plays a crucial role in keeping plastic out of landfills. The sector includes waste pickers, who riffle through garbage

dumps to retrieve plastic, and '*kabadiwallahs*', or itinerant buyers. "The informal sector has been subsidising municipalities in recycling waste for years," says Pinky Chandran, a trustee at Hasiru Dala, a cooperative of waste pickers in Bengaluru.

This is why, despite India's poor record at segregating, the country has traditionally been among the largest recyclers of polyethylene terephthalate (PET) — the plastic used in soft-drink bottles. According to a 2017 study by the National Chemical Laboratory Pune, India recycles 90% of its PET waste annually, while the number is 72.1% in Japan and 48.3% in Europe. This is all down to the country's almost 4 million waste pickers. Once they retrieve the PET, they turn it over to recycling companies, who make items including polyester and denim.

Along with PET, products made of polyethylene and polypropylene also find favour with waste pickers. But their value to waste pickers depends on how heavy these items are. Collecting a thick polypropylene basket is worth the effort, because it fetches more money, but collecting a thin polypropylene carry bag is not.

Even recyclable plastics, like polypropylene, become useless when they are soiled, because washing them raises the cost of recycling substantially. This is why segregation is critical to prevent soiling, and recovering such plastics isn't a technological problem, but a civic one. "As a polymer technologist, I have no answer to it," says Syed Amanulla, a plastics researcher at Bhubaneswar's CIPET Institute of Plastic Technology.

But there are technological challenges too. One of the most troublesome waste categories, technologically speaking, is multilayered plastic, used for wrapping everything from potato wafers to shampoos today. Another is thermoset plastics. In contrast with thermoplastic, which can be melted into other items, thermosets burn upon heating. Together, these plastics cannot be recycled and pose major environmental threats.

So, what do cities do with them? Those with poor waste management put them in landfills. Cities that segregate do one better: they use them as fuel in cement kilns. For example, out of the 4,800 tonnes of solid waste Bangalore generates a day, about 68 tonnes of multilayer and non-recyclables are turned into bricks of Refuse-Derived-Fuel (RDF). These are then shipped off to cement kilns.

But environmentalists say that burning plastic for fuel should be the last option. When plastic is burnt, industries must extract fossil fuels again to make new plastics. "By burning it, you are destroying it, which means you mine for new material," says Ms. Chandran. This increases the carbon footprint of the product.

Secondly, burning plastics without emissions is tough. In cement kilns, for example, RDF must be incinerated at more than 1,000°C to prevent the release of pollutants such as dioxins and furans. For this, pollution-control boards must monitor cement kilns, and this monitoring is often not stringent.

Yet another problem with RDF is the economics. To create the fuel, plants must segregate waste. This adds to the cost of the fuel, making it unattractive compared to coke. These barriers have kept RDF-use from taking off. Bengaluru, for example, has had numerous standoffs between its cement manufacturers and the city municipal corporation, because the former often refuse to accept RDF for fuel.

In 2017, Indians generated about 72 million tonnes of municipal solid waste per day, ICRIER estimates. Out of this, about 6.5 million tonnes was plastic. The solution to this giant environmental problem is within reach. "Even a layperson knows what needs to be done. Waste

has to be segregated at source. Yet, few States have done anything,” says Dr. Amanulla.

For segregation, greater civic awareness is a must. But municipalities must also set up the infrastructure and notify their solid-waste management policy under the 2016 rules. So far, only a few cities have done this.

Another feature missing from the Indian landscape is the idea of “extended producer responsibility” (EPR). Under the 2016 Plastic Waste Management rules, plastic producers were required, within six months, to set up infrastructure to recycle the items they manufactured. Yet, EPR has not taken off in most cities, says Ms. Chandran.

The islands, comprising only 0.25% of country’s geographical area, has 11,009 species, according to a publication by the Zoological Survey of India

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