

## FRESH THINKING FOR SMART CITIES

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March 2016 for Swarajya

Citizens want clean cities above all.

Clean cities are an outcome of good governance and cooperative leadership. That is key to ensuring that doorstep collection of waste is regular, punctual, dependable and visibly designed for receiving and transporting 'wet' food wastes unmixed with any other 'dry' recyclables like plastics. Citizens readily cooperate when they see that the city is serious about keeping wet and dry wastes unmixed during primary collection and delivered to separate destinations like recycling centres.

Kolar for example, a 1.5 lakh city 3 hours east of Bangalore, was able in just one month in June 2014 to achieve 100% doorstep collection and about 70% waste segregation at source into unmixed 'wet' waste and 'dry' recyclables, thanks to the excellent and united commitment of its District Collector, its appointed Commissioner and its elected President (mayor). Today, twentytwo months later, Kolar continues to be a dustbin-free dump-free city, earning Rs 30,000 a month profit from decentralized stack composting, auctioned to farmers for soil enrichment.

Nineteen South Indian towns today are similarly near zero-waste, as both 'wet' and 'dry' wastes are converted to useful resources. The secret is micro-planning of doorstep-collection routes, providing non-mechanised pushcarts that enable further waste sorting at each doorstep and giving the doorstep collector teams full rights to the sale value of dry recyclables. Keeping the collection teams unchanged and undisturbed reduces absenteeism and improves collection performance and citizen satisfaction. At least 10% or more of these teams should be drawn from wastepickers or self-help groups.

Every Smart City can very rapidly achieve similar results. All these steps and many more are described in detail in a practical guidebook on the Swachh Bharat website: <http://swachhbharaturban.gov.in/writereaddata/sbm-newsletter-Nov.pdf> . If unable to open this, ask [almitrapatel@rediffmail.com](mailto:almitrapatel@rediffmail.com) for a copy of the SWM Guidebook.

Smart Cities also need to manage their collected wastes without creating pollution in their surroundings. Wherever they are currently unloading their wastes, they must immediately ensure nuisance-free conditions there. This can be done by unloading the waste in long parallel heaps called wind-rows and turning these weekly, four or five times, to stabilize the waste. It is a simple step that requires some pre-planning, like parking-lot management. Using the same equipment and labour now engaged for just dumping and leveling, the weekly turnings of windrows expose all parts of the waste to

air. This prevents airless conditions in which methane is formed (leading to repeated fires as at Deonar in Mumbai) and leachate formation which contaminates groundwater all around open dumpsites. Compare a rotten tomato drying open in the sun to a similar one inside a plastic bag, releasing smelly liquid.

This airing and turning of biodegradable waste stabilizes it to a humus-rich odour-free soil-like material, like leaves decomposing on a forest floor in thin layers. *Adding composting biocultures or a dilute 5% solution of fresh cowdung speeds up the process and helps control smell.* Such stabilised waste is the first step in every composting operation, in which it is screened to tea-powder fineness (below 4mm) and then enriched and bagged for sale if required.

The stabilised waste is useful as-is and need not await installation of a compost plant. It only needs to be free of plastics, by screening if necessary. Cities must show its usefulness by using it in all their parks, tree pits and road dividers. Farmers can take plastics-free stabilised waste free or at nominal cost as an organic manure to enrich their soils. It is as useful as farmyard manure (FYM) which is today in scarce supply countrywide. Farmers value FYM not for its nutrient content of NPK (Nitrogen, Phosphorus, Potash) but for its water-holding capacity and its rich microbial content which enables plant roots to absorb nutrients.

Conversion of stabilised waste to certified City Compost will be of great benefit to the residents of Smart Cities who will enjoy cheaper, better and healthier farm produce. This is because the use of city compost, which is free of weed seeds, saves weeding labour and the cost of re-sowing and drought-proofing crops when rains are irregular. The humus-rich city compost restores vitality to soils whose carbon has been depleted by over-use of urea and chemical fertilizers. City compost also acts as a sponge to absorb the 50% of urea which is normally lost as farm runoff because plants cannot absorb all of it instantly. So farmers can save costs by improving the efficiency of urea applied. They also need to use less pesticide because city compost promotes strong root systems that improve plant immunity and natural resistance to pests. The colour, flavor, size and keeping quality of fruits and vegetables also improves with increased organic matter in the soil.

For these reasons, the Central Govt from January 2016 is actively promoting the combined use of city compost with urea through a market promotion assistance of Rs 1500 per ton, to make it more affordable to farmers. This will be routed through existing fertilizer companies which have each been allotted different States to promote its use. They also have an obligation to co-market available city compost along with chemical fertilisers.

As the current production of city compost is a minuscule fraction of the millions of tons of urea sold annually, there is a great need to increase the national supply of city compost. Smart Cities provide a great opportunity to do this. Ideally, fertilizer companies should be encouraged and enabled to themselves set up compost plants in Smart Cities initially, to ensure compost quality and timely supply chains to their customers.

The fertilizer companies have great in-house resources and funds for project planning and execution of their own compost plants. As these are all pollution-abatement units, they should be entitled to rapid depreciation benefits even if their compost plants are off-site and not located within fertilizer plants but in or near the cities producing the organic waste which is their raw material.

Smart Cities also need to urgently address the problems created by historic waste piled up in mis-managed dumpsites. Today there are several examples of removing these dumpsites down to ground level for re-use of the site, either for improved waste-processing or for any open-space use if engulfed by urban growth. Container yards, parking lots, bus-depots, sportsgrounds come to mind. Such biomining or bioremediation is done by loosening layers of old waste, picking out large objects before forming into wind-rows for turning and volume reduction through waste stabilising, preferably with addition of composting biocultures, then gravity-screening with a blower to recover plastics and other recyclable fractions. About 10-15% by volume remains on site in the form of slightly raised ground levels.

This biomining becomes costlier and more difficult for dumpsites where raw waste has been covered with layers of earth for cosmetic reasons, totally in violation of the MSW Rules which permit land-filling only of waste-processing rejects and inerts. The raw waste covered by soil becomes even more airless than an open dump and continues to generate methane and leachate for 25 years or more.

For the same reason, capping an open heap is a disastrous option, leaving a time bomb for the future. All dumps in India till date are in former quarry pits or on bare ground and have no bottom or side liners, so putting a waterproof capping on top of them is meaningless and merely forces landfill gases into the surrounding soil. At Malad in Mumbai, this has proved so harmful that every kind of electronic item fails very frequently, forcing IBM to move out of the toxic Mindspace complex constructed near a capped dump. Mindspace residents still suffer many types of unwellness until they move elsewhere.

Construction and Demolition waste (CnD waste) today amounts to one-third of urban waste. Like mixed garbage, it is totally useless unless segregated, when it similarly yields many useful resources. Smart Cities must mandate Waste Management Plans as

a precondition for giving plan sanctions, with areas earmarked for temporary storage of different fractions to promote zero-waste construction. Excavated topsoil should be kept for landscaping and lower soils used for brickmaking or plinth filling or road shoulder improvement. Broken bricks are useful as soling for walkways or for terrace surkhi waterproofing. Cement blocks, plaster, readymix-concrete waste are all most useful for crushing into manufactured sand (M-sand), which costs one-third of scarce river sand and saves river ecology. Broken ceramic tiles and sanitaryware can be crushed to aggregate for blockmaking. Gypsum can be recycled. Waste plastics, sacks, shuttering, wood and nails etc, kept unmixed with the above fractions, can be given to scrap dealers.

Smart Cities must protect themselves against flooding by not allowing indiscriminate filling up of low-lying areas with soil or debris. Indian cities need to require, as in the West, dry Detention Ponds (lowlying playgrounds) or wet Retention Ponds (partly-filled ornamental lakes), both of which can temporarily hold storm-water for slow release to prevent flash floods. See <http://www.lccdnet.org/wp-content/uploads/2011/04/Ponds.pdf>

Flood control also requires good governance to prevent encroachment or garbage-choking of its major open drains which often link one waterbody to another. The beautiful Nala Gardens of Pune are the example to follow, where storm-water drains are redesigned for greenery and walking paths beside low-flow channels within the wider storm-drain that can accommodate flash flooding. These recreational green ribbons will be a valuable contribution to the quality of life in Smart Cities.

Water-weeds choking both urban and rural surface waters are an unregulated waste which cities are forced to deal with, at great annual deweeding cost. Water plants thrive on the phosphorus in detergents, which was the cause of eutrophication of Lake Erie. This led to a 1973 US-Canada treaty limiting phosphorus in detergents to 2.2%. India needs similar legislation. Until then, Smart Cities should mandate sale and use of only low-phosphorus detergents within their city limits. Read fascinating insights into the problem and its solution in [http://www.colorado.edu/conflict/full\\_text\\_search/AllCRCDocs/94-54.htm](http://www.colorado.edu/conflict/full_text_search/AllCRCDocs/94-54.htm)

It is also very important to protect lakeside wetlands from the greed of land developers. Sewage treatment plants may remove pathogens and reduce the oxygen demand of treated water, but nitrogen and phosphorus are not removed and will pollute the surface waters into which they are released. Only natural wetlands will remove these nutrients through plant uptake.

Smart Cities should also opt for decentralized sewage treatment, mandating this for group housing above say 20 families and for bulk generators like hotels and party halls, hospitals, institutions and commercial complexes.. Onsite solid waste management

facilities should be similarly mandated for all these. Onsite 'wet' waste management is now possible with a variety of small-scale composting or biogas options. The clean unsoiled 'dry' waste goes to scrap dealers for recyclers. Google Wake Up Clean Up Bangalore for several options.

Currently, metallised multifilm packaging for snack foods is unrecyclable for plastic products because of a thermoset layer of polymer between otherwise-recyclable thermoplastic layers. Smart Cities need to strictly enforce Extended Producer Responsibility (EPR) for end-of-life packaging by those using such flexible packaging. Shredded multifilm and even shredded thermocole (expanded polystyrene) can be used to improve bitumen road life by two to three times, when coated onto hot stones by a half-minute of pre-mixing before bitumen is added. Cities must mandate such 'plastic roads' as in Tamil Nadu and Himachal Pradesh, but the collection, shredding and supply to hot-mix plants of non-recyclables must be enforced as an EPR responsibility. Another upcoming development, also from Madurai, is a synthetic stone which can consume large quantities of otherwise nonrecyclable plastics and does not need Government policies for its consumption.

Domestic sanitary waste like used baby and adult diapers and sanitary napkins are an increasing problem waste for both urban India and rural areas where they are now being distributed as a populist measure. These should necessarily be made with only compostable non-woven outers and compostable bottom barrier-film. Ideally, such sanitary waste should be collected daily but separately from the daily-collected 'wet' waste, and sent to existing biomedical waste facilities or for deep burial.

Smart Cities must similarly make their own Rules to minimize the hazards arising from different potentially toxic wastes. For example, all flex banners and hoardings should be PVC-free, as now mandated in Kerala. Karnataka has just banned all kinds of plastic including for flex, banners, hoardings, buntings and flags. All fluorescent lights sold or used in Smart Cities should be only low-mercury ones, in use throughout EU. All paints and toys allowed to be sold or used should be lead-free. In this way, Smart Cities can become pollution-reduction models for their States and other cities and towns, apart from being leaders in solar lighting, rainwater harvesting, waste-water recycling and reuse and similar mainstream ideas.

But the precondition for all the measures described above is good governance, long-term planning and consistent implementation and enforcement. Our present system does not allow for this, with city managers and officials transferred at whim almost overnight, no spending discretion at lower levels to encourage creative problem-solving, plus a mistrustful colonial tender system which very often gives preference to an L1 who is the Lousiest One.

It is time to consider whether our Smart Cities can also pioneer administrative changes that will allow for fixed-term appointment of a manager with a proven track record in civil society as in USA, instead of only from a pool of bureaucrats. Think about electing a competent and caring mayor by public vote instead of along party lines by councilor majority. Think about selecting the most experienced and best performers by invitation rather than only tenders. Create a climate of trust by giving imprest accounts to all levels equal to their day's or week's or month's salary for lowest to highest ranks in the field, to speed up decision-making and action. Such fresh approaches will truly make role models of our Smart Cities.