

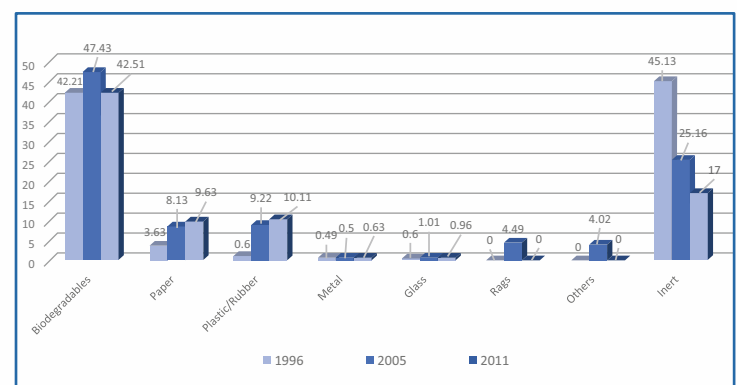
Biodegradable Waste: Constructing a greener tomorrow

“There are a few things CERTAIN in life - one is death, second is change and the other is waste.”

Human consumption generates a lot of waste and garbage. Discarding of reusable or recyclable products adds to the clutter of the dustbins. But what happens with this garbage is a thought, less pondered upon. The persistent increase in human population and rapid industrialization has mounted the continuing global problems of improper waste disposal. Cities worldwide are wilting under the aching load of tons of garbage and Indian cities are no better. The consequences of burgeoning population in urban centres are more noticeable in developing countries as compared to the developed countries. The population of urban India was 377 million (Census of India, 2011a), which accounted for 31% of the total population. The population residing in Indian urban regions increased from 18% in 1961 to 31.2% in 2011 (Census of India, 2011b). Central Pollution Control Board (CPCB) has reported that during the last decade Municipal Solid waste (MSW) has increased by 2.44 times (CPCB, 2013).

Planning Commission's Report (2014) reveals that 377 million people residing in urban areas generate 62 million tons of MSW per annum and it is projected that by 2031 these urban centres will generate 165 million tons of waste annually and by 2050 it could reach 436 million tons. To accommodate this amount of waste generated by 2031, about 23.5×10^7 cubic meter of landfill space is required and in terms of area it would be 1,175 hectare of land per year. The area required from 2031 to 2050 would be 43,000 hectares for landfills piled in 20 meter height. These projections are based on 0.45 kg/capita/day waste generation. This implies that in coming years we will fall short of land to create landfills looking at the rate at which the waste is being generated. But the problem remains more grim as all this waste reaches the landfills as “MIXED WASTE” including food waste, vegetable peels, plastic waste, glass, metals etc. There has been a drastic change in this composition of MSW over the past few years as shown in Table 1.

Table 1: Change in composition of MSW over two decades (%)



Source: Planning Commission Report (2014)

The percentage of biodegradable waste, as can be seen above, comprises a major chunk of the MSW and things would surely look better if there is a clear segregation between the dry waste and biodegradable waste. To understand the dynamics of MSW in India we need to roll back to the classification of waste and how the waste collection system works.

WHAT IS MUNICIPAL SOLID WASTE (MSW) COMPOSED OF:

We can classify waste as follows:

- Solid waste - vegetable waste, kitchen waste, household waste etc.
- E - waste - discarded electronic devices such as computer, TV, music systems etc.
- Liquid waste - water used for different industries, tanneries, distilleries, thermal power plants.
- Plastic waste - plastic bags, bottles, bucket, etc.
- Metal waste - unused metal sheet, metal scraps etc.
- Nuclear waste - unused materials from nuclear power plants.

Further we can group all these types of waste into wet waste (Biodegradable) and dry waste (Non - biodegradable).

Wet waste (Biodegradable) includes the following:

- Kitchen waste including food waste of all kinds, cooked and uncooked, including eggshells and bones.
- Flower and fruit waste including fruit peels and house-plant waste.
- Garden sweeping or yard waste consisting of green/dry leaves.
- Green waste from vegetable & fruit vendors/shops.
- Waste from food & tea stalls/shops etc.



Dry waste (Non - biodegradable) includes the following:

- Paper and plastic, all kinds.
- Cardboard and cartons.
- Containers of all kinds excluding those containing hazardous material.
- Packaging of all kinds.
- Glass of all kinds.
- Metals of all kinds.
- Rags, rubber.
- House sweeping (dust etc).
- Ashes.
- Foils, wrappings, pouches, sachets and used Tetra Pak cartons (rinsed).




CHALLENGES WITH CURRENT MSW MANAGEMENT SYSTEM



In India, majority of ULBs do not have appropriate action plans for execution and enactment of the MSW (CPCB, 2013). Unfortunately, no city in India can claim 100% segregation of waste at dwelling unit and on an average only 70% waste collection is observed, while the remaining 30% is again mixed up and lost in the urban environment. Out of total waste collected, only 12.45% waste is scientifically processed and rest is disposed in open dumps (CPCB, 2013). Environment friendliness, cost effectiveness, and acceptability to the local community are major attributes to achieve efficient solid waste management system. The major challenges faced in India are mentioned below:

1. Segregation of waste: There is no organized and scientifically planned segregation of MSW either at household level or at community bin. Sorting of waste, is mostly accomplished by unorganized sector and seldom practice by waste producers. Segregation and sorting takes places under very unsafe and hazardous conditions. The effectiveness of segregation is reasonably low as unorganized sector segregates only valuable discarded constituents from waste stream which can guarantee them



comparatively higher economic return in the recycling market. On a number of occasions, due to improper handling the segregated constituents get mixed up again during transportation and disposal (CPCB, 2013). Lack of segregation deprive proper scientific disposal of waste (Singhal & Pandey, 2000).

2. Collection of waste: Waste produced by houses is usually transferred into community bins that are fabricated from metal, made from concrete or in combination of both. Street sweepings also finds its way to community bins. These community waste bins are also used by other essential commercial sectors in the vicinity along with household waste except in cases where some commercial complexes or industrial units engage municipal authorities for transfer of their waste to disposal site by paying some amount (Kumar et al., 2009).

3. Reuse/Recycle of waste: This entails activities like collecting those materials from the waste, which could be gainfully retrieved and utilized for making new products. Since unsegregated waste is dumped at community bins, its optimal recycling is not possible. However, rag - pickers usually sort it out and sell recyclable material like plastics, glass, etc.

4. Transportation of waste: Modes of transportation for MSW used in India are: bullock carts, hand rickshaws, compactors, trucks, tractor, trailers and dumpers. In smaller towns trucks having 5 - 9 ton capacity are used without adequate cover system. Stationary compactors, mobile compactors/closed tempos, and tarpaulin-covered vehicles transport about 65%, 15%, and 20% of waste respectively. The maintenance of these vehicles is usually done in workshops run by ULBs. Most of these workshops can do minor repairs only. No wonder, in the event of breakdown of these vehicles, the overall collection, transportation, and disposal efficiency is affected drastically.

5. Disposal of waste: In India, almost every city, town, or village adopts unscientific techniques of disposal of MSW. Amongst 59 cities, 40 cities have shown increase in waste generation, 7 cities show reduction and it was more or less same for 6 cities (Kumar et al., 2009). The following disposal practices are in use in the hierarchy.

(a) Open dumping of waste: In India, MSW generated is usually directly disposed on low lying area, violating the practices of sanitary land filling. Almost no ULB has adequate sanitary land filling facility and MSW is dumped in the outskirts of town along the roads. Unscientific dumping is prone to flooding and major source of surface water contamination during monsoon and ground water contamination due to percolation of leachate (Dahiya, & Chandra, 2006).

(b) Waste on Landfills: Land filling would continue to be an extensively accepted practice in India, though metropolitan centres like Delhi, Mumbai, Kolkata and Chennai have limited availability of land for waste disposal and designated landfill sites are running beyond their capacity (Sharholi, Ahmad, Mahmood, & Trivedi, 2008). According to CPCB, 2013 report, till date, India has 59 constructed landfill sites and 376 are under planning and implementation stage. Apart from this, 1305 sites have been identified for future use.

The problem does not end with the requirement/availability of land

but also links with various environment and health hazards such as air, water and land pollution, endangering the health of animals and aquatic life besides impacting humans.

MUNICIPAL SOLID WASTE MANAGEMENT RULES:

The source segregation of waste has been mandated and responsibilities of waste generators have been laid down in the Solid Waste Management Rules 2016. The aim is to channelize waste to wealth by recovery, reuse and recycle. As per the rules, "all residents welfare and market associations, gated communities and institutions with an area >5000 sq. m should segregate waste at source into valuable dry and wet waste and handover recyclable material to the authorized waste pickers/ authorized recycles/ Urban Local Bodies(ULB). The bio - degradable waste shall be processed, treated and disposed off through composting or bio-methanation within the premises as far as possible. The residual waste shall be given to the authorized recycles as directed by the local authority."

"IPCA'S ANSWER TO THE HURDLES IN SOLID WASTE MANAGEMENT: PROJECT S.O.R.T"

In order to deal with the challenges faced by current waste management system and in sync with the SWM Rules 2016, IPCA has proposed a solution to reduce waste by source segregation and composting of organic waste. IPCA in association with **Swarn Lata Motherson Trust (SLMTT)** has launched Project "**Segregation of Organic Waste for Recycling and Treatment (S.O.R.T.)**" in Delhi NCR. The project aims at minimising waste by source segregation and composting through a Sustainable Approach of Solid Waste Management.

The project is conceptualized with the objective to maximize utilization of resources, to reduce waste, which would indirectly result in less air, water and soil pollution, reduce pressure on landfill sites and reduce cost on transportation. The project envisages to:

- Motivate community participation in qualitative segregation of waste at source to increase recycling rate of waste material.
- Enable operation of Aerobin for composting of organic household waste to minimize the pressure on landfill or informal dump site.
- Increase recycling rate of municipal solid waste through efficient segregation.
- Educate waste generators/consumers on efficient waste management.
- Promote local self - responsibility for a clean environment.

S.O.R.T.: ENVIRONMENTAL FOOTPRINT

- Burying organic waste in landfill is a big problem and it's not just because of the resources we lose. When organic waste is dumped in landfill, it undergoes anaerobic decomposition (because of the lack of oxygen) and generates methane. When released into the atmosphere, **methane is 25 times more potent a greenhouse gas than carbon dioxide.**
- In landfills, organic wastes decompose anaerobically to produce bio gas (predominantly methane, a significant greenhouse gas)



and leachate that contains nutrients and soluble organic. The untapped nutrient rich leachate has the potential, if not handled well, to pollute groundwater and may release and mobilize heavy metals from landfills (Waste 2020, 2001). Some organic wastes such as sludge and bio-solids may contain heavy metals or nutrient pollutants. Uncontrolled disposal of bio solids may lead to site contamination or water pollution. To protect our water resources, we need to prevent pollution arising from uncontrolled treatment and disposal of organic waste.

- Under this project, IPCA prevented around **8.87 tonnes** of organic waste to reach Dhalaos/Landfills, which otherwise would have contributed in many environment and health hazards. (This way eliminated **16,870.10 kgs** of CO₂ which is equivalent to **1,506.26 days** of electricity consumption for one household or it is equivalent to **4.13 years** of electricity consumption for one household.
- Under this project, IPCA harvested around **570 kgs** of organic manure and **323 liters** of leachate, both were used in open parks and garden.

SUSTAINABLE CYCLES O.R.T.

S.O.R.T. SOCIO - ECONOMIC FOOTPRINT:

Project S.O.R.T helped stakeholders in many ways:

- Approximately 45 waste collectors got training on waste segregation, waste management and Aerobin operation for the better management of organic waste. Now, most of the waste collectors are working as Aerobin Operators and are generating additional income from this job.



- Under this project, IPCA is building the capacity of residents and maids/servants living in the project area. Till now 37 workshops have been conducted with 144 maids/servants and 6280 residents.
- IPCA also contributed in creating awareness on source segregation by conducting door to door campaigns in different societies where **7792 residents** got information regarding Aerobin and waste segregation till now.
- To make segregation a household practice, IPCA reached out to people through street plays which were meticulously strategically organized in selected societies.
- Till date, IPCA has been successful in involving around 400 students in waste segregation and Aerobin operation. IPCA's mission is to capacitate the youth with all new technologies for sustainable development as they are the flag bearers of our future. The students from schools and colleges were taught about segregation of dry and wet waste through innovative methods of learning like workshops, presentations, fun learning games and interactive sessions with experts in areas of waste management.



From the resident's side:

1. Ms. Vandana (Resident, Sunshine Helios)

"It has been our good fortune to be associated with IPCA. It is only because of their persistent efforts that today we can call our Sunshine Society truly a Green society."

Thank you!



2. Pooja Mehrotra (Resident, Sunshine Helios)

"IPCA and SLMTT are bringing together new age waste management techniques at our doorstep. This is going a long way in spreading awareness across housing societies in Noida. The revolutionary initiative of 'zero waste' society will go a long way in bringing in a cleaner and greener environment. IPCA has been a great facilitator. Sunshine has been fortunate to be associated with it!"



3. Ms. Karuna Bhalla (Resident, Sunshine Helios)

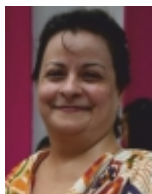
"Aerobin has ushered an eco-friendly revolution to make a zero waste society. To add greater value to this concept is having organic manure out of green waste in 40 days. It is only because of their persistent efforts that today we can call our Sunshine Society truly a Green society. Sunshine Helios expresses deep gratitude to IPCA for this endeavour towards a greener community."



4. Ms. Monica Bhattacharya (Resident, Pocket B, SFS Flats, Mayur Vihar, Phase III)

"Today there are large scale problems looming over our urban lives and in any city the most difficult to manage problem is of waste management. This is not only menace of garbage everywhere but is also linked to multiple other problems like global warming, citizen's health, municipal costs, plastics going to water bodies and rivers and so on, there is no end to this list. We don't see enough resources being allocated by the authorities in tackling this issue. So, it is obvious that the human race is going to leave an extremely poor environment for the next generation and generations to come thereafter.

With this information I planned to do my bit as a citizen and started looking for options. This is when I came in contact with Mr. Ajay Garg of IPCA, that there is a project called SORT, being run by IPCA and supported by Swarn Lata Motherson Trust. After learning in detail about SORT, I joined the campaign by facilitating the implementation of this project in our society in Park View, Pkt B, SFS Flats, Mayur Vihar, Phase 3, New Delhi. Initially, we faced lots of problem in implementing the project but with the support of IPCA, we are heading towards the success of project in our society. I wish this project a great success."



5. Ms. Neeru Sharma (President, Saket Dham)

"IPCA has taken a great initiative in the field of Solid Waste Management and it is need of the hour because we are surrounded by the heap of waste, there is no clean air, water. By this initiative, problem will be solved to some extent. Talking about Aerobins, these are very hygienic, no bad odour, no flies problem."

6. Ms. Kanika Pandit (President, RWA, New Friends Colony)

"IPCA has come up with very innovative idea of source segregation under the project SORT to create a sustainable solid waste management. In the initial phase of the project it was difficult to convince people to segregate their waste but we kept on pushing them by sending volunteers for regular reminders and monitoring. Due to awareness campaigns of IPCA, almost all the residents of our society are segregating their waste in wet and dry categories. We are very grateful to IPCA who helped us in making our society ZERO WASTE SOCIETY. We wish a great success to this project."

7. Mr. Deepak Virmani (Resident, Delhi Officer Flats)

"This is a great step towards the problem of solid waste management and we are very thankful to IPCA and SLMT to implement project SORT in our society. Since waste management has become one of the biggest problems in our country and if proper action would not be taken it will lead to conversion of our earth into a dump yard. We highly appreciate IPCA and SLMT for taking an initiative to solve the problem of solid waste management and manage our waste at source itself."

8. Mr. Amar Singh Bhandari (President, RWA, Indraprasth villa)

"Solid waste management is a great problem in India. This project has made me environment conscious and motivated me to segregate my waste everyday. I am happy to see that my waste is not a waste anymore rather it has become a source of nutrients to plants. I would like to see not only societies but also every household segregating the waste at home so that our Delhi can also become a clean and green city."



S.O.R.T.

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3-5, DDA Shopping Complex, Hargobind Enclave, Vikas Marg Extn., Delhi - 110092 | Tel.: 011 - 42207478
E-mail: info@ipcaworld.co.in | www.ipcaworld.co.in