



Solid Waste: From Prodigality in Production to Prospects

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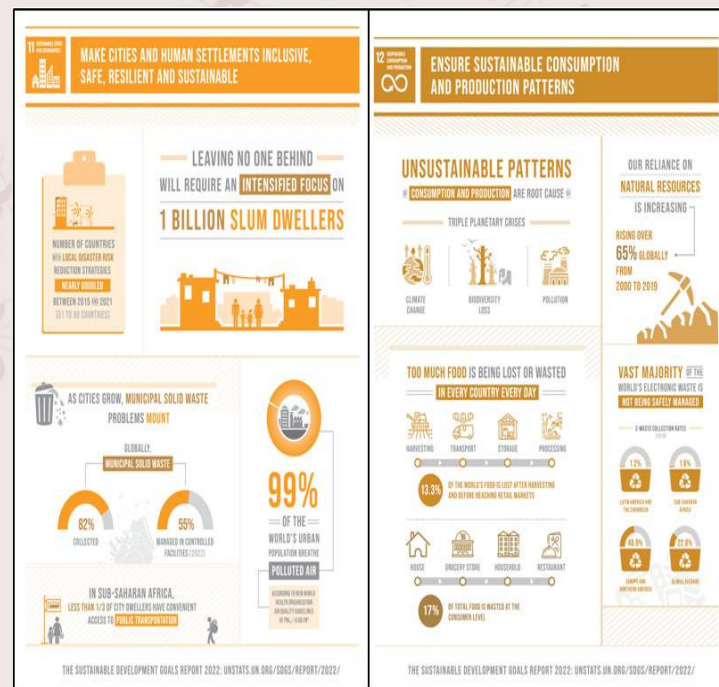
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Mr. Prithwi is an executive at a multinational company. Outside his office he was just an ordinary citizen with severe lack of civic responsibilities. He had no idea that food wrappers littered here and there could choke the sewers of the city. When asked if he had any idea where the solid waste collected from every household was disposed, he had no idea. But when he was taken to a dumpsite, and a landfill, he could not believe his eyes that a mountain has developed out of nowhere. Mr. Prithwi represents a vast majority of the population of this country who is unaware that almost all the problems plaguing us today have something to do with the environment. The two biggest urban environmental issues are vehicular air pollution and the ever-increasing generation of solid waste, the dangers of which, we common citizens, tend to overlook even today.

A wide spectrum of wastes is included within the sphere of solid waste, like municipal solid waste (MSW), electronic waste (e-waste), plastic waste (PW), construction and demolition waste (C&D), hazardous waste (HW) and even biomedical waste (BMW). Just as Mr. Prithwi was oblivious of the perils of solid waste, he was unaware that so many different types of solid waste exist. More waste often indicates less efficient resource utilisation or material usage pattern. This in turn is an indicator of unsustainable 'growth'. Here 'growth' means economic growth for enhanced 'ease of living'. More waste also indicates that more resources are used to mitigate the problems triggered from waste production, which again is against the basic tenets of sustainability. Among the seventeen Sustainable Development Goals (SDGs), set by the United Nations in 2015, waste management features prominently in the targets and indicators of both SDG 11 and SDG 12, most notably with commitments to prevent, reduce, recycle, and reuse – as well as to properly collect and discharge – urban solid waste and halve global food waste by the year 2030; and to properly handle and treat chemical and other hazardous waste throughout the entire life cycle in accordance with international standards by the year 2020. To achieve SDG 11, which is to guarantee sustainable waste services, we need to respect those who work in the trash industry and make sure they have quality employment. Promoting trash avoidance, reduction, as well as

recycling and reuse, as well as ecologically sound management (ESM) of all waste throughout the product life cycle are some of the goals included in SDG 12, which also includes objectives on lowering pollution and the associated health implications.

Moving along the lines of the UN, India welcomed the implementation of the SDGs through a well thought programme. One of those is overhauling and relaying the solid waste management rules in 2016. The following waste management rules were enacted by the Government of India.



SDG 11 and SDG 12 (Source: UNDESA, 2022)

1. Solid Waste Management Rules, 2016
2. Hazardous Waste Management Rules, 2016
3. E-Waste Management Rules, 2016
4. Plastic Waste Management Rules, 2016
5. Biomedical Waste Management Rules, 2016
6. Construction and Demolition Waste Management Rules, 2016

Sustainable waste management aims to reduce the volume of solid waste that is burned or dumped in landfills. Materials are used for as long as is practical. A more complete approach to sustainable waste management must focus on the whole lifespan of a product in order to decrease the negative environmental, social, and economic repercussions of 21st-century consumption. This is because waste begins even before items are generated in our present linear economy.

The Oxford dictionary defines waste as “materials that are no longer needed and are thrown away”. The phrase “thrown away” indicates that it is not used any more. Everything we use is from some form of natural resource. As already discussed, more waste implies more and more natural resource remaining unused. Just compare between the usage of fountain (or ink) pens vs the contemporary single use and throw pens. We discard the single use pens just after one use. The raw materials, energy and human resource required to produce the pen is no more in use after the initial refill is exhausted. But the fountain pens can be refilled and used for eternity if used carefully. In other words our unsustainable living is producing more waste. Waste management is another aspect where sustainable techniques will come in very handy. There are several approaches to improving sustainable waste management, but they all follow the waste hierarchy pattern of the four R's of trash - Reduce, Reuse, Recycle, and Recover. Reducing trash not only protects the environment, but it also saves money on disposal costs. Similarly, recycling and/or reusing garbage improves the environment by reducing the need to extract resources and lowering the possibility for contamination.

Therefore, it is essential to comprehend what constitutes sustainable waste management if we are to refine and improve our present waste management systems. No matter if the focus is on reducing end-of-life waste or removing engineering waste from the production cycle from the conceptual stage, new waste management approaches are required to effectively deal with present waste streams while also reducing the amount of garbage created.

Sustainable waste management is it really so important?

An important part of a larger circular economy is getting rid of waste in a way that doesn't hurt the environment. It takes a methodical approach to economic development instead of the take-make-waste paradigm. The goal of the methodical approach is to separate growth from the use of limited resources. Sustainable waste management not only helps find more immediate solutions to the many problems that garbage causes, but it also helps solve the bigger problems that come from a linear culture of consumption. If you don't follow the waste management hierarchy for sustainable waste management, things and materials that could be put to good use are burned at landfills or incinerators as part of energy recovery activities. This article talks about the most common types of solid waste that cities produce.

The saga of paper

The vast bulk of India's municipal solid waste (MSW) consists of paper and paperboard products. The careless use of these materials places an unreasonable burden on the natural world, despite the fact that they are often biodegradable and pose a lower risk to human health than plastics do. The manufacturing of new paper and card products, which also need a substantial amount of water and energy, is one of the primary contributors to deforestation



Wastage of paper

Source:<https://www.maxpixel.net/Ecology-Waste-Paper-Reuse-Trash-Junk-Recycling-72063>

because of the raw resources that are required in their manufacture. To keep up with the demands of the market, the recycling sector in India requires close to 14 million tonnes of waste paper. The quantity recycled in the United States is barely 30% of that total, while the overall rate of recycling is only 50% of the worldwide average. India may be known around the world as a hub for high-tech, but it's also a country where print media is doing very well. India's Audit Bureau of Circulation says that the number of newspapers and magazines sold each year has gone from 40 million in 2006 to nearly 63 million in 2016. Therefore, it is expected that there will be a continued high demand for wastepaper imported from other countries. In India only 20 % of wastepaper is collected and the rest goes for landfill. Out of 100 kilos paper used, only 30 % comes back for recycling.

When food gets wasted

According to the EPA, wasted food accounts for 21.59% of all municipal solid waste and has significant implications across a variety of domains, including the social sphere, the economy, and the natural environment. A report published by the UNEP's Food Waste Index Report in 2021 states that Indian households waste 50 kilograms of food per person per year or 68760163 tonnes a year. Around 1% of GDP is actually wasted in the form of food waste. According to the Govt. of India's Ministry of Agriculture, the waste in term of currency ranges around Rs. 50000 crore a year, due to food waste. Sustainable waste management could actually keep "waste materials" in the loop through donation or composting; however, our current systems send it to landfills, where it



Wastage of food

Source: <https://wastematters.theoutsider.in/>

decomposes and releases CO₂ and methane, both of which contribute heavily to global warming. In other words, sustainable waste management could actually keep "waste materials" in the loop. The UN Environment Programme's Food Waste Index revealed that 17% of the food available to consumers - in shops, households and restaurants - goes directly into the bin. Some 60% of that waste is in the home. In our country, just imagine the amount of food waste generated at marriage ceremonies, religious rituals, temples and other social gatherings. It is enormous and if looked deeply, it is unthinkable in a country like ours.

The problem of inefficient management of solid waste starts with the effect of food production, which is responsible for more than a quarter of the world's greenhouse gas emissions and more than 70% of freshwater withdrawals. It is quite doubtful that garbage collection systems will be able to keep up with the vast volume of rubbish that is created on any given day unless we can find a way to curb excessive production at its point of origin.

Boon to bane: Plastics

Plastics are the third-largest component of municipal solid waste. Plastics have become the poster child for the hazards of a linear economy, since single-use items are suffocating land and ocean environments. Plastic waste is a concern for a number of reasons, including the petrochemicals that need to be recovered in order to make new material and the projected \$2.5 trillion in damages and



Unorganized plastic waste disposal

Source: <https://www.maxpixel.net/Waste-Disposal-Worker-Landfill-Garbage-Recycling-6525291>

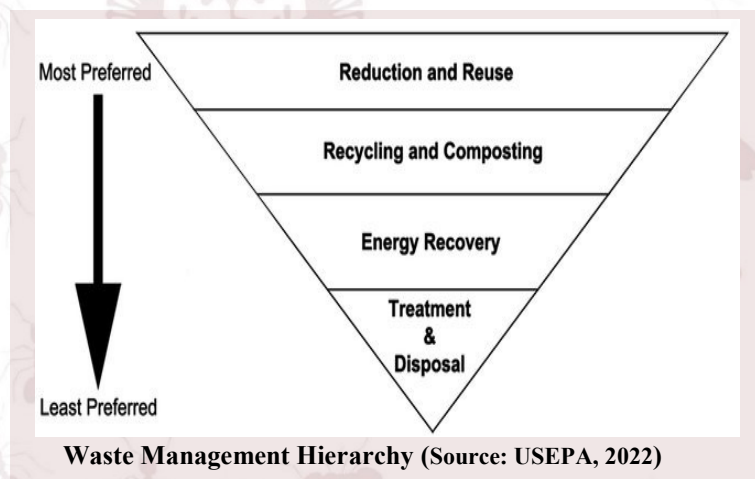
wasted resources. To practice sustainable waste management, it is necessary to cut down on and eliminate the usage of items made of single-use plastic while simultaneously raising the percentage of garbage that is recycled; this is only 8.5% at the moment.

The pyramid of waste

The waste management hierarchy is the foundation of sustainable waste management. This hierarchy prioritizes preventing waste, reducing waste, reusing waste, recycling waste, recovering energy from waste, and only then treating or disposing of garbage. It seeks to prioritize activities for the most effective use of resources, putting behaviors that are renewable and produce less waste at the top of the pyramid. In this section, we examine why the waste management hierarchy is so important for environmentally responsible trash management.

5Rs of waste reduction

The prevention of waste and the reduction of the quantity of garbage produced should be your top concern. Maximizing efficiency while simultaneously cutting down on consumption is one way to accomplish this goal. To begin, companies and people should choose goods



whose production calls for the least amount of available resources (including the packaging). In addition, consumers should try to steer clear of products with a single use or that are disposable whenever it is possible to do so. These kinds of materials are the epitome of linear waste, which describes a process in which resources are extracted, processed, and distributed only

to quickly become waste. The 5 Rs of waste management thus may be summarized as Refuse, Reduce, Reuse, Repurpose and Recycle.

If it is not possible to prevent the consumption of a product, then there should be an emphasis placed on buying things that can be repaired or reused, and there should also be education centred on how to reuse waste products. Reusing existing materials is favored over alternative choices that are lower in the hierarchy because it does not need the processing of new materials, which requires time, money, and often other resources. Reuse, which is also one of the core elements of the zero-waste concept, may come in the form of having shoes mended, giving clothing and stuff for others to use, and even studying recipes for food leftovers as an alternative to tossing them away in the garbage.

If it is not possible to reuse an item, recycling is the next best alternative to consider. Since we are now dealing with materials that have reached the end of their useable life in their existing form, this is the point in the process when it begins to look like traditional waste management. Recycling, along with its close cousin reuse, maintains the circulation of

materials, so obviating the need to harvest virgin resources and mitigating some of the adverse effects of just throwing garbage away.

Because it takes time, money, and resources to convert garbage back into materials that may be used, recycling is seen as a less attractive alternative than the other two possibilities.

Having said that, the benefits that are associated with recycling vary greatly from one material to another. For example, the cost of recycling aluminium more than covers the cost of recycling aluminium itself, and recycling aluminium saves more than 90% of the energy that would have been required had it been made from virgin metal. Glass, on the other hand, only saves 10 to 15% of the energy that would otherwise be used to dispose of garbage, but it is still a more environmentally friendly option. Composting is considered to be part of this level of the hierarchy due to the fact that it enables organic waste to be diverted from landfills and converted into a substance that may be helpful in the cultivation of fresh produce.

Waste to energy

The subsequent process is known as energy recovery, and it involves transforming waste into useful forms of energy such as heat, electricity, or fuel such as biogas. This is accomplished through a variety of processes such as incineration (with energy collection), gasification, pyrolyzation, anaerobic digestion, and landfill gas (LFG) recovery, which shares some similarities with the final step of waste management. These processes are referred to collectively as waste management.

Combustion is a common method of energy recovery for non-hazardous waste, and while it is obviously less preferable than reuse or recycling, it does reduce the physical volume of waste that will be sent to landfills, and it also provides energy from the burning process that would otherwise require the use of fossil fuels to generate. Reusing or recycling waste is obviously the more preferable option for recovering energy from non-hazardous waste. There are now 75 facilities in the United States that can recover energy from the burning of municipal solid waste (MSW). Each of these plants creates around 550 kilowatt hours (kWh) of energy for every tonne of garbage that is burned. Despite all of this, energy recovery is not one of the zero waste goals, and many people working in the waste management business believe that it is an unacceptable compromise. The total estimated energy generation potential from urban and industrial organic waste in India is approximately 5690 MW. But unfortunately, the total installed capacity is only 0.2 GW.

Finale

Treatment or disposal is the last phase in the hierarchy, and it is also the one that is least desired. In most cases, this refers to landfills or incinerators that do not include energy recovery. Although this will always occur with some garbage, it should be prevented for as long as feasible by using environmentally responsible management practices.

Sustainability and Waste Management: A not so difficult riddle

There are some straightforward approaches that can be used to initiate the process of implementing sustainable waste management in homes and businesses. The following are some pointers that will help you determine how and where waste is being generated so that you can take action to address the problem.

NO to single use items

Replace single-use items with reusable ones. Instead of cardboard coffee cups, get mugs or glasses. It's also important to note at this point that even at commercial composting plants, many seemingly green items — such as compostable coffee cups — can't actually be composted, and instead break down in landfill. Switching to a greener alternative could save the planet as well as money. Unfortunately we have 'progressed' from fountain pens to use and throw pens. Are we really moving forward as a civilization?



Single use plastic dumps

(Source: <https://bengaluru.citizenmatters.in/centre-plastic-waste-amendment-rules-2021-karnataka-ban-67846>)

Analogue to digital

As was indicated before, the single most significant component of municipal solid waste is paper and paper products. Changing as much paper documentation as possible over to digital forms is a reasonably simple approach for organizations to increase their ability to manage trash in a sustainable manner. Invoices may be sent and received digitally rather than in hard copy, meeting minutes could be stored in a shared document rather than being printed out, and banking could be moved online. But being more digital has its side effects and that is more and more e-waste generation.

Proper bins: waste segregation at source

It is quite probable that an organization will produce a wide variety of garbage, and one strategy for fostering more environmentally responsible waste management is to make it possible for all workers to participate in the process. This may be as easy as placing recycling and composting bins next to ordinary garbage cans and ensuring that there are services available to effectively handle the waste produced. In the state of West Bengal, several municipalities including the Kolkata Municipal Corporation, Howrah Municipal Corporation, Barasat Municipality. Waste compactors are also installed to reduce the volume of the solid waste collected.



Waste Compactors in Kolkata installed by the Kolkata Municipal Corporation

(Source: <https://aitcofficial.org/aitc/kmc-uses-modern-disposal-system-to-make-the-city-vat-free/>)

What's waste for me may be treasure for another

Because reusing something is preferable than recycling it, one excellent strategy for improving a company's environmental footprint is to investigate the possibility of donating any resources that would otherwise be thrown away. This might be outdated hardware from offices, out-of-promotion products from businesses that sell things other than food, out-of-stock items from places that sell things other than food, or even components from renovations. If the appropriate structure is put into place, waste management in both commercial and residential settings is capable of being maintained throughout time. But what's more vital to keep in mind is that the repercussions of not controlling waste are just too significant to ignore.

Mr. Prithwi is not the only one who has come a long way from an ignorant citizen to a responsible person. He disposes the correct solid waste in the correct manner. He has influenced his colleague friends, Mr. Agni, Mr. Salil and Mr. Akash, who has now taken the onus of spreading the words of sustainable solid waste management for a better future.

Further Reading:

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