

KNOTS

Tangled in Waste

From policy makers to ground level workers, a complete insight!



Vasundhara
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Eco Club, TERI SAS brings to you "KNOTS: Tangled in Waste", the tenth edition of Vasundhara magazine, curated to comprehend what constitutes 'Waste' that surrounds our ecosystem, its types and the management aspects, the formal knowledge of which is partly buried in our curricula. The information in the magazine is for general use only and has been compiled from various research papers, articles, and government databases. Some personal experiences and anecdotes have also been shared for which we extend our sincere gratitude to the contributors. The content is accurate to the best of our knowledge as of June 2022. We apologize for any inadvertent errors that may exist.

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Editor's Note

From finding traces of waste in pristine forests to observing microplastics in human blood, the issue of waste has become a matter of great concern. Our landfills have surpassed their lifespan, ocean waste dumping has continued for decades, our policies have failed, waste workers are neglected down of their rights, and the amount of waste on our planet is growing continuously.

Because the magnitude of the problem is so large, it is difficult to establish accountability. In such a case, the distancing of the waste away from its origin creates more problems. Our linear economy also plays a vital role in this. With the change in consumer patterns, the kind of waste we produce has also changed, in the past few decades, making the management of waste more difficult. Here, it is also necessary to understand that our primary problem is the proliferating production of waste, where the issue of waste management stands equally important.

We have a long way to go. The recent events (like landfill fire breakouts) prove that we are still lacking somewhere. We have reached a point where it has become a necessity to incorporate the culture of zero waste production in our professional and personal lives. It is also time that we revisit our policies regarding waste. We have to act now, as there awaits a mountain of waste ahead of us. Although the mountain of waste is enormous, we keep finding pennies in it. It is essential to use these pennies wisely. One of the most important pennies (solutions) is to look at "waste" as a "resource".

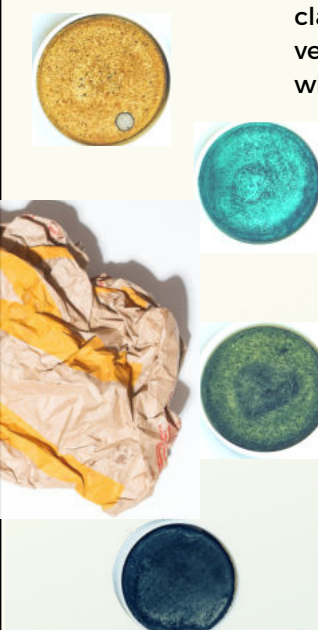
"Knots: Tangled in Waste", as the title of the magazine portrays, we have built a web of waste around us, in which we are constantly getting tangled, and the knots are tightening every second. This edition of Vasundhara aims to shed light on all the different aspects of "Waste" and present new and innovative ways to manage it.

- **Gauranshi Chamoli**
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THE INCEPTION OF WASTE

What is waste?

The answer to this is both general and specific. It can be something which is commonly classified by the public or something which is specific to an individual. For example, items like vegetable peels, leftover food, etc. may be a waste item to a person but useful to someone else who is interested in composting. In general, waste is any unwanted item, which we tend to discard or throw away. Although waste is broad-ranging, there are 4 major types of it, which we come across in our daily lives:-



- 1. Municipal Solid Waste:** It is the most common type of waste generated from municipal areas and forms the crux of solid waste management. It is also the most prevalent issue leading to overflow and burning of landfills.
- 2. Industrial Solid Waste:** A more toxic form of waste, it leads to land, air and water pollution if disposed off carelessly. Proper treatment techniques are a must for removing all the toxic metals and chemicals which are life threatening to different species.
- 3. Agricultural Waste and Residue:** These are generally by-products of the agricultural activities. While some of those like fertilizers or pesticides can be harmful, most of them have a huge energy potential as a biomass resource.
- 4. Hazardous Waste:** It is a combination of all the harmful and toxic waste present in each category. It can range from cement, glass, scrap metals, to syringes, plastics and electronic waste. Extra care is required for proper treatment and disposal methods to prevent any damage to the biodiversity and environment.

The 3Rs of Waste

Every management process needs a system of hierarchy. We need to prioritize the processes in order to reduce wastage and maximize efficiency. The 3R Initiative: **Reduce, Reuse and Recycle** has proven to be helpful in maintaining this system, both at the individual and governmental level.

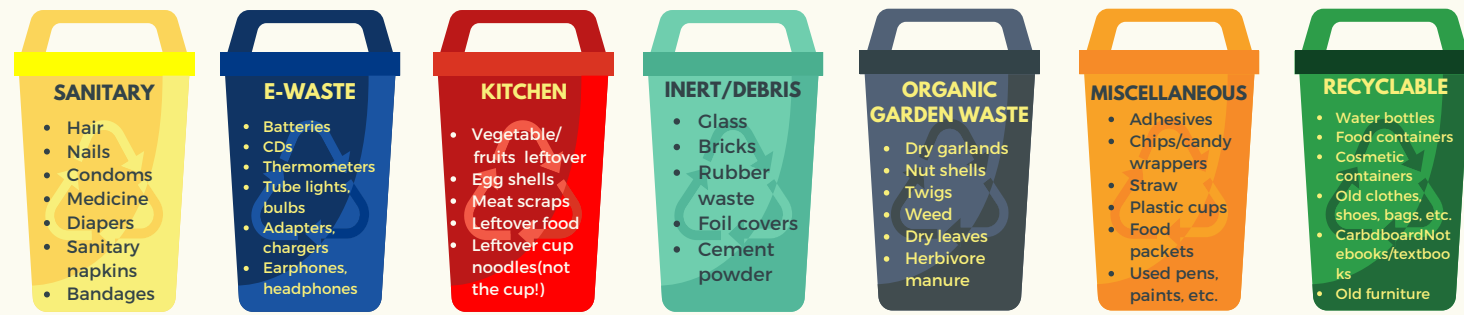
They are beneficial in mitigating the flow of waste into landfills and creating awareness amongst communities.



Reduce	Reuse	Recycle
Preventing use of bottled water	Rotating clothes from your wardrobe	Recycling plastic products like bags, cans, etc
Using cloth bags for grocery shopping	Finding a new use for an old item without discarding it	Donating metal products to scrap dealers
Saying no to plastic cutlery	Conducting a garage sale	Recycling Newspapers

Authored by Amulya Varma and Saptarshi Kar

SEGREGATION OF WASTE



What is a Circular Economy?

The term 'circular economy' has gained a lot of attention in recent years. The model is in sharp contrast to the idea of a linear economy wherein the raw natural resources that are taken from the environment are transformed into different products and thus get disposed off after being used. However, on the other hand, in a circular economy, the aim is to close the gap that exists between production and the natural cycles of the ecosystem. Such an economy consists of markets that provide incentives for reusing products, rather than scrapping them, and then extracting new resources from the environment. Thus, all forms of waste are returned to the economy, which not only helps in the protection of the environment, but also allows for wise use of resources, creation of jobs, development of new sectors and capabilities.

The circular economy is based on three principles- eliminating waste and pollution, circulating products and materials (at their highest value) and regeneration of nature.

A circular economy model is necessary in the current times as it helps in reducing the harmful impacts on the environment, by altering the manufacturing processes of businesses into sustainable ones. It also plays an essential role in promoting economic opportunities, individual empowerment, contributes to business growth, reduces the waste from a traditional linear economy and eases the transition to renewable energy systems.

International Conventions and the Legal framework

Since waste management and disposal have gained significant attention in recent times, familiarity with laws and regulations on waste management is of crucial importance. Multiple International Conventions have come into force over several years, for judicious disposal, reduction and management of waste.

The **Basel Convention**, which came into existence in 1992, consists of 180 member countries and aims to protect human health and the environment from any adverse consequences that may arise as a result of generation, management, movement and disposal of hazardous or other types of waste.

The **Waigani Convention** of 2001, stated the following objectives: reducing or eliminating the transboundary movements of hazardous waste, into and within the Pacific region, minimizing its production and ensuring its disposal in a sound manner.

The **Stockholm Convention**, 2004, is a global treaty, directed at protecting human health and the environment from toxic chemicals that may remain intact in the environment for considerably longer periods of time.

The **Vienna Convention** of 1988 and the **Montreal Protocol** of 1989, were designed to reduce the emissions of substances that may cause the ozone layer to deplete, and assess the

impacts of human activities on the ozone layer. The **Kyoto Protocol**, of 2005, holds certain developed countries responsible for reduction in their emissions of six main greenhouse gases.

In India, the management and regulation of waste is under the ambit of the Ministry of Environment, Forests and Climate Change, which work in collaboration with the State Pollution Control Boards. In the National Environment policy of 2006, not only the disposal, but recycling and treatment of waste were also treated as important objectives.

The **Environmental Protection Act, 1986**, confers powers on to the Central Government to regulate all forms of waste. It has put certain provisions in place that prohibit any individual from emitting pollutants, in excess of the prescribed environmental standards. As per the Polluter Pays Principle of Section 9(3) of the Act,

any expense for restoring the environment to its natural state, is to be incurred by the person, responsible for such degradation.

Under **The Hazardous Wastes Rules, 2008**, the occupiers of hazardous wastes are required to focus on safe and sound handling of environmental wastes and are required to send the hazardous waste to a recycler, authorized by the government, to dispose it off in a safe manner.

The **Plastic Waste (Management and Handling) Rules 2011**, **Bio-Medical Waste (Management and Handling) Rules, 1998**, **The E-Waste (Management and Handling) Rules, 2011**, **The Batteries (Management and Handling) Rules, 2001**, are some other legislations, put in place for controlling the use, manufacturing, recycling, disposal and management of different categories of waste.

Landfills on Fire, Distress in the Air

In the past few months, multiple landfills of India have encountered several incidents of fire outbreaks. Out of these, the two landfills of Delhi, namely the Ghazipur landfill and the Bhalswa landfill, have gained the most attention. Both the landfills were burning up continuously for many days. The Ghazipur landfill caught fire on March 28th, 2022, which went on for three days and then the waste dumped in Bhalswa landfill started burning up on April 26th, 2022, which continued for a week. Latterly, on May 20th, 2022, the Kodungaiyur dump yard, located in northern Chennai, also witnessed a fire incident. Amidst the heat waves, these fire incidents have raised several concerns for not only the government officials but also the locals.

It has been speculated that these fires were a result of spontaneous combustion of the organic waste dumped in the landfills. Landfills require a decent amount of oxygen for decomposition of

the waste. When the oxygen content of the landfills increases, substantial heat to cause a fire breakout can be produced. The thick smoke produced due to the landfill fire outbreaks is extremely harmful as it contains many hazardous components (toxins, leachates, greenhouse gases, etc.). In such cases, small mistakes can lead to massive consequences. In addition to that, the danger associated with putting down landfill fires is very high, and the fire-fighters are indeed facing many difficulties in carrying out their work, which again is a matter of worry.

The harm that the recent landfill fires have caused to various cities cannot be ignored. The increased number of fire incidents in the landfills of India is a serious issue of concern. It is the need of the hour to look into it and design systems to manage our landfills in a better manner.

THE CONCERN OF OCEAN WASTE:

Sources and Impacts

Waste is now no longer confined to the terrestrial regions of the earth, where most human activities take place, but is also a concern for marine ecosystems. We have impacted every corner of the earth, or perhaps we should say that we have deteriorated it all. Because humans do not reside in oceans, it is important to evaluate where the waste is coming from and what kind of impact it is having on the earth.

Here are some factors to consider:

Major Sources of Ocean Waste

Runoff and Intentional Discharge: When ground pollutants move to oceans through rainfall or snow, this is said to be the runoff. It has been observed that many manufacturing plants release toxic substances into the oceans. Further, sewage and plastic pollution also play a key role in marine waste. 80% of global marine pollution comes from agricultural runoff, untreated sewage, discharge of nutrients and pesticides.

Oil Spills: Sometimes oil transporting ships face leakage issues. Due to this, massive amounts of crude oil get into the oceans, which threatens aquatic life to a huge extent. The oil and gas sector causes thousands of oil spills annually.

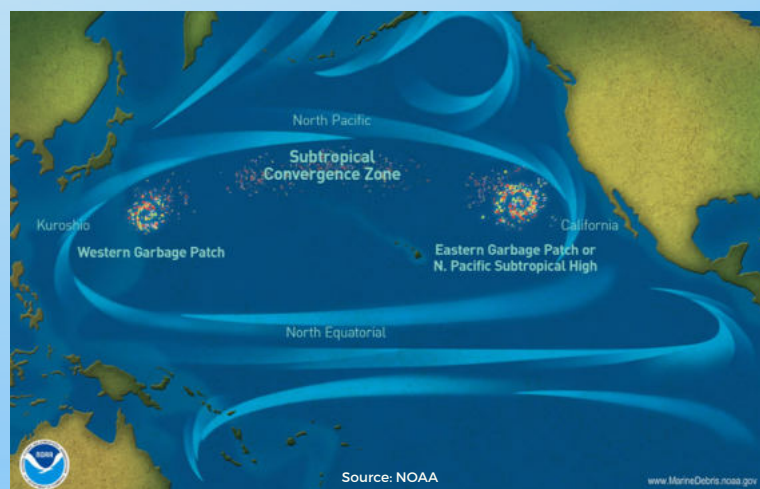
Littering: Be it deliberate littering into the water bodies, impacting oceans at a later stage or littering caused by atmospheric conditions (e.g., fast-moving winds), it contributes highly to oceanic waste. Out of over 300 million tons of plastic produced every year, at least 14 million tons end up in the oceans and it constitutes 80% of all the marine debris.

Ocean Mining: Deep Sea Ocean mining for the extraction of minerals and substances like Cobalt, Zinc, Copper, Gold, etc. cause depletion and contamination at the lowest levels of the ocean. As per the data till May 2018, the International Seabed Authority (ISA) which regulates seabed mining beyond national jurisdiction had issued 29 contracts for the exploration of deep-sea mineral deposits for more than 1.5 million sq. km. (about half the area of India) of the international seabed. But this exploration may give way to commercial exploitation soon.

IMPACTS OF OCEAN WASTE

Ocean waste has a plethora of impacts on the ecosystem. Higher levels of organic content and nutrients deplete the oxygen levels of the ocean, putting the survival of aquatic organisms and further human health at risk.

The ocean being a dynamic body with certain convergence zones, a huge portion of the waste, specifically plastics, tend to accumulate at some places, forming patches. The Great Pacific Garbage Patch, also known as the Pacific Trash Vortex is an example before us. It is a collection of ocean waste in the North Pacific Ocean comprising the Eastern and the Western Garbage patch as depicted in the figure:



These two areas of patches are bound by the North Pacific Subtropical Gyre. These patches are majorly made of microplastics, which make the ocean water resembling 'cloudy soup', as the most portion of the debris accumulated is non-biodegradable, it just photodegrades. In the gyre of the area about 20 million square kilometres, marine life is at huge risk. The loggerhead turtles mistaking plastic bags for jellies, and albatrosses mistaking plastic resin pellets for fish eggs, are a few examples. Moreover, the seals and mammals get entangled in the discarded plastic fishnets; the plankton and algae receive lesser sunlight due to blockage by the debris interrupting the entire food web of the aquatic ecosystem and many more such impacts. The noteworthy point is that 80% of this debris comes from the land sources, therefore, we as responsible youth have huge responsibility towards the reduction of waste and the promotion of sustainable behaviour.

Authored by Lovish Raheja

VOGUE to WOKE

A total of 22 million tonnes of microplastic can be spewed out of the fashion and textile industry per annum. These numbers are just trebling each year by our unconscious hurdling of clothes without any absolute necessity of buying them. The model of how we manufacture and acquire fashion has swiftly transformed, driven by an insatiable consumer hunger for newness and diversity. On average, a person buys a minimum of 5 sets of new clothes each year, and 2/3rd of them are discarded within the first year and end up in the landfills.



The fashion industry indirectly or directly affects the attainment of UN Sustainable Development Goals (SDGs). SDG 12 pledges to ensure that consumption and production are both sustainable. In terms of the environment, the garment sector has a direct impact on a number of Sustainable Development Goals, including SDG 6 on water pollution, the discharge of hazardous chemicals and materials, wastewater treatment, and water-use efficiency. SDG 13 emphasizes the need to "take immediate action to prevent climate change and its consequences." The fashion industry is a significant sector for this SDG, as textile production emits more greenhouse gases than all international flights and marine transportation combined.

For the first time ever, a fashion nuisance got acknowledged in the COP26 as being one of the major contributors to the increasing greenhouse gas. It took more than a decade for such a marginalized issue as it was earlier considered to gain significant attention on an international platform. Fashion for Global Climate change was created by the UN to have a global stance against its climate change potential. SDG 14 is concerned with marine pollution, due to washing off microfibers and microplastics into the oceans. Furthermore, cotton cultivation damages soil quality across the world, necessitating repair, as promised by SDG 15 objective three.

As suggested, switching over to slow fashion from fast fashion can essentially be the only possible way to save our planet by seeing the unfortunate. Fast fashion is being flagrantly publicized by the big names of the fashion industry which adds 92 million tonnes to the rubbish bucket of Earth each year (How Much Do Our Wardrobes Cost to the Environment? 2019). Fast fashion brands are moreover exacerbating this by the adoption of ill-operating systems of designing and manufacturing. The new collections being launched are no longer seasonal. The all-year-

round discounts on the products along with non-extended producer responsibility add more to the miserable condition of the Earth's environment.

But to our rescue is the advent of the culture of slow fashion. To decipher, it simply means a culture where it advocates for the creation of clothes with a concern for people, animals, and the environment. It helps in the efficient use of resources, and in lowering our carbon footprint. Essentially, slow fashion garners a holistic approach to sustainable fashion. Chemical waste, fossil fuels, and the incorporation of unsustainable methods into the manufacturing process are all issues that can also be addressed through a circular fashion which proposes that the raw material extracted from the environment for the manufacturing of goods should be kept in circulation, restricting waste generation.

Fashion has made tremendous progress in terms of sustainability over the previous few decades, but there still lies opportunity for improvement in the future. The fashion industry may still need to improve on a number of crucial environmental and ethical aspects.

Authored by Isha Narayan and Urvika Goel

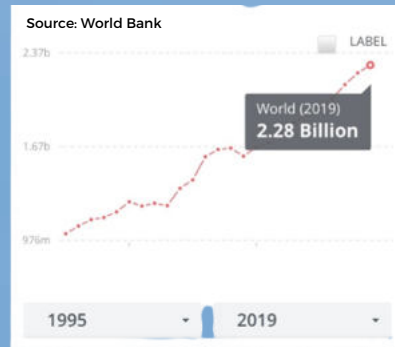
THE TOUR DUMP

The tourism and hospitality sector is one of the fastest-growing industries in recent years. Studies show that the carbon footprint of the industry is projected to grow exponentially in the near future. Enhanced pressure on natural resources, fragile landscapes, biodiversity, local communities, and the waste management associated with popular tourist destinations worldwide are among the major emerging challenges. The sector is intimately connected to the environment we live in, which makes it important to acknowledge its impact on the Sustainable Development Goals of Agenda, 2030.

80% of tourism takes place along the coastal areas worldwide. Unless there is a robust conscious effort in realising the hazardous impacts of mismanagement of waste generated at the destinations, this problem could lead to the collapse of the flourishing industry. Contamination of groundwater, piling up of waste, and indiscriminate disposal of waste leading to ocean pollution as we know it today, are some of the major concerns which essentially compromise the sanitary and health conditions of the local communities and the sanctity of the place.

As a part of sustainable tourism, the role of citizens and bulk generators in waste management has been emphasized. Swachh Paryatan, a mobile application launched in 2016, introduces a novel concept of clicking pictures of waste generated by tourists and uploading them on the app. This helps in generating awareness as well as promoting sustainable tourism. Another action taken by the Government of India under the Swachh Bharat Mission is to achieve no waste tourist spots which attract foreign tourists as well. As a part of it, Swachhata Awareness activities in tourist spots, schools, and colleges are performed. The People's Majlis of Maldives resorted to adopting a green tax on tourists and the revenue generated from it would be used for waste disposal.

Tourism is one such sector that can enhance and



protect nature. However, when tourism compromises the environment's sacredness, it does not reflect well on the occupation. It is one such industry that is

to overconsumption, and the pandemic has added complications of its own, such as an additional waste management burden. As a result, tourism has been responsible to generate twice the amount of waste generated by the localities. For instance, the trash collector installed in the Baltimore River, which is an eco-friendly machine running through solar and strong river currents, in the U.S. is an example of sustainable waste management. The Global Tourism Plastics Initiative, which emphasises a change toward a circular economy for plastics, brings together the tourism industry around a single goal of tackling the fundamental cause of plastic waste. The Initiative is signed by 93 firms and organisations, including internet platforms, lodging providers, tour operators, waste managers, and supporting organizations. Zurab Pololikashvili, UNWTO (UN World Tourism Organization) Secretary-General said about sustainable tourism: "Addressing plastic pollution is essential to sustainably restart tourism, preserve destinations and contribute to climate action." Year 2019 saw 2.28 billion travellers worldwide.

Authored by Khushi Rani and Neha KN



A GLANCE AT THE LEGAL AND POLICY FRAMEWORK ON WASTE MANAGEMENT

"ALL THAT WE THROW MUST GO SOMEWHERE"

MANAGE YOUR OWN WASTE



The waste is new gold but if unmanaged or not managed well, the same can lead to detrimental impacts. The basic step of management starts at the home or individual level, however, for cumulative waste, large-scale management is highly crucial. The way waste will be managed depends a lot on the legal provisions and policies that shape the whole framework of the task. Presently, the issue of waste is being addressed at multiple levels, i.e., from the international level to the local level. It is important to note that the present policy design to a huge extent has been the result of international laws and conventions. The history of the same regarding the issue of waste begins with the Stockholm Conference, where waste and its trade were considered, a serious global issue requiring the cooperation of all the countries. From there, the Convention on London Convention, Oslo Convention, Paris Convention (specifically for marine waste), and Basel Convention, etc. are a few examples, particularly addressing the issue of waste. Further, the most ambitious set of goals for sustainability is the United Nations Sustainable Development Goals 2015. Most of the goals relate directly or indirectly to the proper management of waste be it health and well-being, clean water and sanitation, sustainable cities and communities, climate action, life below water, life on land, etc.

These legislations and policies have transformed into national frameworks and priority shifts. For example, the idea of waste hierarchy in India has

been adapted from UNEP Guidelines for National Waste Management Strategies. Coming to the Indian context, there are various acts and policies for waste management existent such as the Bio-medical Waste Management Rules 2016, The Hazardous and Other Waste (Management and Transboundary Movement) Rules 2016, The Solid Waste Management (SWM) Rules 2016, The E-Waste (Management) Rules 2016, The Polychlorinated Biphenyls Order 2016, The Regulation of Persistent Organic Pollutants Rules 2018 etc. are the most recent ones. Most of these and many other rules in India derive their power from Environmental Protection Act (1986).

These rules and regulations are aimed at the systematic management of various kinds of waste.

However, the present status of waste is still worrying as most of these rules are not being implemented at the ground level. There is a lack of proper monitoring, supervision, and obligatory mechanisms to deal with the issue. For example, SWM Rules 2016 has the provisions for hierarchical waste management to reduce the waste generation and further utilize the waste to proceed towards a circular economy approach, the duties of all waste generators, including common citizens have been defined and mandated. But, most of the municipal bodies and village panchayat in India neither practice their duties nor obligate their citizens to.

After Swachh Bharat Campaign, many cities have achieved 100% door to door collection at least on paper but what happens to the waste after that is still worrying. As per an ORF occasional paper (2020), most of the waste is disposed of in low-lying areas without adequate measures being taken.

Therefore, effective planning, the development of monitoring, and the development of financial mechanisms are a few of the keys at the institutional level. Further, public awareness and work on behavioural aspects are necessary, without achieving which, we would not be able to mine the true gold and sustain a healthy environment.



Authored by Lovish Raheja



What Really Matters!

with

ASHISH JAIN



Mr. Ashish Jain is the founder director of Indian Pollution Control Association (IPCA), an NGO focused on promoting waste management practices at individual, group and national level. He has implemented projects on EPR compliance, Solid Waste Management, Air Quality Monitoring and Environmental Conservation. He has been successful in planning and executing various local and national level projects on Solid Waste Management. He is also passionate about creating social awareness on waste segregation and creating a sustainable environment.



Q1. With regard to Solid Waste Management, how far has IPCA achieved in proper collection and segregation of wastes from Municipal Areas in Delhi?

IPCA was conceived in 2001 and India got its first rule on Solid Waste Management in 2000. So, this journey of working on Solid Waste Management has been going on for twenty years now. The rule says that, it is the responsibility of the citizens to segregate waste. We are working with the community, the different stakeholders, educating them to segregate waste. We implemented a number of Decentralized Solid Waste Management Programs in Delhi and NCR regions last year. We have been providing door to door collection services to 25,000 dwellings of Delhi NCR. So far, we have achieved more than 80% of source segregation in our project locations. We are also working on other campaigns such as, 'My 10 kg plastic'. We run special vehicles for the collection of plastic waste. Our collection ranges across the different zones of Delhi, Ghaziabad, Noida, Meerut, Gurgaon, etc. We also collect plastic waste from Chandigarh, Jammu, etc. and are planning on replicating this in other parts of the country as well. In another campaign, 'Bottles for change', we are working with a similar concept. We receive requests from stakeholders through an app, that has been developed and maintained by our partner, 'Bisleri'. The materials we then receive from the individuals, are sent through our vehicles, and the waste collected through these two campaigns, is then sent for recycling, to our recycling facilities.

Q2. Recently, burning of landfills has become a major issue in terms of environmental pollution and is severely affecting the health of the general population as well. This is mainly due to the uncontrolled overflow of trash into the landfill sites. According to you, what steps could be taken both at the government and the individual level, to mitigate the flow of trash in the landfills?

As per the order from NGT, the municipalities have to eliminate the dump yards as well as the 'legacy waste' from these dump-yards. Many municipalities have been excreting the old legacy waste and taking out the RDF and other organic matters, and further sending it to the processing facilities. A lot of efforts are being made by various stakeholders. But we also need to understand the quantum of the problem.

“The solutions to these problems cannot be found in a day or two, it is going to be a long process.”

If we take the example of any of the landfill sites in Delhi, such as Ghazipur, Okhla, etc., even if we work at the maximum capacity, it may take 5-10 years to take out the entire legacy waste. There are no alternatives to this problem. The only solution is that each and every individual should develop a composting facility at home. However, people are not that aware, and are neither keen on having composting facilities at

home. Even though covering the entire population under this goal is a pretty optimistic thought, it is the need of the hour. By segregating the waste at its source, and not littering, we can actually reduce the amount of waste reaching the landfills. We can only reduce the risk and the quantity, but cannot eliminate the entire problem. The high density of the population is a major cause of all these issues. So whatever technology, solutions, or systems we implement, it will never be enough.

Q3. Big buildings like offices, shopping complexes, universities, etc. are daily generators of bulk amounts of waste. What measures would you like to suggest to help in the transition of these areas into zero-waste campuses?

Any entity or a premise generating more than 100 kgs of waste in a day is considered a 'bulk waste generator'. Each municipality has its own set of by-laws. Through these laws, we fix the responsibilities of a bulk waste generator. So, as per the Municipality Act, the bulk waste generators are responsible for cleaning and managing their own waste. The municipalities do not collect waste from the bulk waste generators, such as hospitals, hotels, etc.

“They can install systems within their premises, for community composting, collect the organic waste, treat it, and can utilize the end product themselves or sell it off for other purposes, such as, horticulture, etc.”

The remaining dry waste is sold to the waste traders. If these by-laws are executed with their full strength, then we can reduce the huge quantity of the waste, reaching landfill sites. The bulk waste generators need to take this issue seriously. Our organization has helped them in installing composting facilities and we are also educating them on the advantages of segregating waste on-site, and hence, channelizing the dry waste to the respective recyclers.

Q4. IPCA in association with Tetra Pak India has successfully established recycling of Tetra Pak cartons. Are there

any other waste products on which IPCA is focusing its recycling initiatives?

Last year, we set up a recycling facility for MLP, i.e., Multilayer Plastic waste, including tetra pack, low- and high-density polythene. We are treating these three categories of waste, and making chip-boards and plastic boards out of them. These boards are just as good as plywood or compressed wooden board. We can also fabricate a huge number of products from these boards. MLP is generally considered a non-recyclable plastic commodity. Therefore, it does not have any commercial value, and hence people are not interested in collecting, segregating or recycling it. Other plastics are collected and recycled as they have some commercial value. We have set up the MLP facility, with the intention, that we can create demand for MLP and thus pay those who will supply the waste to us.



Q5. Do you have any message for our team and the students of TERI SAS?

Solid Waste Management can prove to be a huge career opportunity as it has a lot of prospects for the students. We have to focus on bringing this segment at par with the other industries. With a professional approach, we can take this segment to greater heights. Once an individual opts for a career in Solid Waste Management, it will lead to creation of job for another individual. Currently, millions of people working in this segment are a part of the informal sector. So, it is our moral and social responsibility, to convert the informal sector into the formal sector. This will inspire the youth to bring about a change in the society.





WOMEN AND WASTE

Being the second-most populous country in the world today, India is grappling with managing its resources effectively to live up to the expectations of 1.2 billion people. Of the 153 countries evaluated, India stands at 112th position in the World Economic Forum's 2022 Global Gender Gap Index. Dearth in opportunities, low scores for political empowerment, and economic participation for women are the main drivers.

As per the Global Gender Gap Report, India is the only country where the economic gender gap is greater than the political gender gap. In a country where waste is mostly managed by the informal sector, it becomes imperative to look at the gender aspects that influence the whole process of segregation, collection, transportation, processing, and disposal of waste. United Nations India Business Forum's report shows that more than half of the work done by women in India is unpaid, and nearly all is informal.

Being mostly involved in household chores of cooking, taking care of children and family, monitoring the health and welfare of women waste workers is important for the well-being of the entire family. Although we get to witness a few instances of women working as "Pourakarmikas" in Bangalore's BBMP as formal waste collectors and street sweepers, this is yet to be functional at the country level, where mostly men are registered as owners of the processing plants and are preferred for most of the works apart from few mundane jobs like sorting, cleaning, packing and sifting of waste which are reserved for women.

With different roles in managing waste and access to opportunities in employment in the waste sector compared to men, women are most often left economically insecure despite the long hours and the risks they work with. Similar to Southeast Asian nations, in India, waste work ranks lowest in the hierarchy of urban informal occupations. Quite often, unskilled persons, migrants and the poorest of the poor, and

women and children predominantly work as formal waste collectors and recycling collectors, as they are unable to find any other employment. However, an added aspect of the caste system relegates the lowest of castes to waste collection deepening the related social stigma in India.

Mostly the concerns expressed are related to the potential harm waste can cause to the environment without considering the risks and costs of occupational hazards in the waste management sector. Unmanaged waste, particularly excreta and other liquid and solid waste from households and the community poses a serious health risk and contributes to the spread of infectious diseases. Being housekeepers and in charge of the management of household wastes, women are exposed more to human excreta or other raw waste materials as compared to men. Because of this, women suffer from diseases such as hepatitis, diarrhea, and eye/skin infection, and the chances of them falling sick increases and also leads to the weakening of their immunity. Along with this, on continuous and repeated exposure to bioaccumulative chemicals from the waste, they remain in the body of the women for a much longer time and can be passed on to their children, as a result of which the child suffers from various problems like chronic diseases or deformities, etc.

Also, noncommunicable diseases (NCDs), which are closely linked to hazardous chemicals, account for 60% of all deaths worldwide, and according to a WHO Global report, 18 million women died from NCDs alone in 2005. NCDs are already the most serious global threat to women's health. WHO estimates that the number of women diagnosed with breast cancer will rise to 222 million by 2030. So it has become the need of the hour to create a better and safe environment for people working with waste by providing them with protection tools like masks, footwear, gloves, and sorting machinery.

There are many NGOs and organizations working

for the welfare of women in the waste management sector. Women of Waste-ISWA is one such organization that was founded by women to advocate for and highlight the work and accomplishments of women. This organization determines the relationship between gender and sustainable waste management and resource recovery systems, and its major goal is to improve waste management strategies and also increase the employment of women in this sector.



WIEGO carried out a project on Gender and Waste in Latin America to shed light on the indiscrimination being faced by women in this sector. They conducted an educational workshop that aimed to give women waste pickers a better understanding of the practical techniques they need to challenge the deeply ingrained gender hierarchies that exist in their homes and workplaces. **Garbage Concern Welfare Society** is a Mumbai-based organization formed in 2005 working toward the conservation of the environment. They reach out to the urban poor and inculcate environmental education related to waste management, health and sanitation, the Green Manager program, and Green Space Development. The **United States Agency for International Development (USAID)** is working for the empowerment of women and their role in solid waste management and recycling.



Source: Garbage Concern Welfare Society



POLICIES IN PLACE:

Extended Producer Responsibility and Plastic Waste Management in India

Plastic waste management has become a pressing issue because of non-biodegradability and amount of single-use plastic, which has become a part of our lifestyle and is being dumped into oceans. With growing concern among consumers, a conscious choice of avoiding single-use plastic is gaining attention. However, we still have a long way to go when we talk about the circularity and recyclability of plastic. Especially for a country like India, which is overpopulated, most of the population lives below the poverty line. Let us look at the government of India's pursuit in addressing the same through policies. Producers, importers, and brand owners are responsible for ensuring that their plastic packaging waste is processed through recycling, reuse, or disposal (such as co-processing, Waste-to-energy, Plastic to-oil, roadmaking, or industrial-composting) under the Extended Producers Responsibility (EPR) regime. That was implemented in the Plastic Waste Management Rules in 2016.

For the proper implementation of EPR in India, the Fourth Amendment to the Plastic Waste Management Rules notified on February 16, 2022, gives the Guidelines on Extended Producer Responsibility for Plastic Packaging' in its Schedule II of the Rules by the Ministry of Environment, Forest and Climate Change (MOEFCC), Government of India. According to the guidelines, the Producers, Importers and Brand Owners (PIBOs) must register on the centralized online portal of the Central Pollution Control Board (CPCB).

Furthermore, PIBOs operating in more than two States have to register with CPCB. Those operating in one or two States/ Union Territories (UTs) have to register with the concerned State Pollution Control Boards (SPCBs). Plastic Waste Processors (PWP) include recyclers, waste to energy plants with co-processing cement plants, plastic waste to oil units, and industrial composting. PWP play an essential role by providing the PIBOs with certificates that they can use to fulfill their EPR obligations in plastic waste management. PWP also have to register with the concerned SPCB/PCC according to the provisions of Section

13(3) of the Plastic Waste Management Rules, 2016, on the centralized portal of CPCB. The main idea behind the portal is to help improve accountability, traceability, and transparency of fulfillment of EPR. The portal is expected to have seven modules that allow PWP and PIBOs to register, issue certificates and exchange credits, and monitor real-time transactions between PIBOs and PWP and additionally, levy environmental compensation, provide system-generated reports and make annual filing returns easier for stakeholders. The two PIBO and PWP registration modules have been launched on the website. The remaining modules will be added in the near future.



Categories of Plastic Waste under EPR:

- Category I:** Rigid plastic packaging
- Category II:** Flexible plastic packaging of single layer or multilayer (Includes more than one layer of plastic with different types)
- Category III:** Multi-layered plastic packaging (it should have at least two layers, one of plastic and the other of material other than plastic)
- Category IV:** Plastic sheets used for packaging (This includes bags made of compostable plastics)

EPR targets

Eligible Quantity in MT (Q) for PIBOs target is the average weight of virgin plastic packaging material (category-wise) purchased and introduced in the market in the last two financial years (A), plus the average quantity of (B), pre-consumer plastic packaging in the last two financial years. (Note: "Pre-consumer plastic packaging waste" means plastic packaging waste generated in the form of rejection or discard at the stage of manufacturing). Post-consumer plastic packaging waste" means plastic packaging waste generated by the end-use consumer after the intended use of packaging is complete. Reduction is made in the quantity of plastic packaging supplied directly to some other PIBO (C). So, the final Q is (A + B) - C.

The EPR Target category-wise is as follows:

Category	Year	EPR Target (as % of Q)
I	2022-23	25%
II	2022-23	70%
III	2023-24	100%

PIBOs obligation targets were low in the early years, emphasizing on increasing stakeholder engagement. The objectives will be expanded in the future to encourage greater plastic reuse and recycling, resulting in system circularity.

Responsibilities of PIBOS

1. Register at CPCB Portal
2. Submit an Action plan
3. Fulfil obligations as mentioned in the guidelines

PIBOs are alone responsible for carrying out their obligations. If the objective action is not met, environmental compensation is imposed.

Even though the government has come up with the amendment to make it mandatory for PIBOs and PWP to register on the portal, the portal is still in the trial stage, as mentioned on the website of CPCB. All the seven categories are still not uploaded on the website. And there is no notification from the government's side when all the seven modules will be added. The target of the GOI for the year 2022-23 is the registration of 70% for Category II. However, this is quite an aspiring target. The difference between category between I and II from 25% to 70% is quite high. So, the proper maintenance of the database and updating of the CPCB portal is required from the government's side.



Consumption Pattern related to Waste

As we learnt that EPR is an environmental protection strategy that makes the manufacturer of the products responsible for the entire life-cycle of their produce and especially for the take-back, recycling and final disposal. It is observed that consumers also play an important role in closing the loop of the product they consume. EPR (Extended Producer Responsibility) puts the producer accountable for the environmental impact of the product they produce, but the compliance of this responsibility largely depends on consumers as well.

Cooperation, coordination, and communication of consumers with the producer/company to act responsibly with the product consumption and disposal play a key role in fulfilment of producer's responsibility. In these times when the consumption patterns are rapidly moving towards fast consumption and disposal due to consumerism and urbanization, it is becoming alarmingly important to manage the waste generated in the process. Producers and consumers co-exist in the market and waste management process can only be efficient if both work together in tandem.



The graphic features a bright yellow background. On the left, the text "Spotless Indore" is written in a bold, black font, with a stylized orange splash behind it. To the right, the text "No.1 INDORE" is displayed in large, white, sans-serif font against a dark orange rectangular backdrop. Below this, a photograph shows a blue municipal waste truck with a yellow bin, labeled "DOMESTIC HAZARDOUS WASTE".

Indore has been ranked the cleanest city in India in Swacch Survekshan surveys since 2017. It has become the cleanest city in India by mastering **Segregation at the source**. Currently, the city is segregating its waste into six categories:- 1. Biodegradable, 2. Non-biodegradable (excluding plastic), 3. Plastic, 4. Sanitary, 5. Domestic hazardous, and 6. Electronic. During the pandemic, it also installed yellow bins in which people could put their masks and gloves. The 100% door-to-door collection is done by using GPS-enabled tipper vehicles. These vehicles are continuously observed by monitoring cells, and penalties are imposed on drivers for any off-route deviations. Tippers are assigned for waste segregation in all 85 wards to the designated garbage transfer station.

Indore has a successful Material Recovery Facility where garbage material is sorted into categories depending on its recyclability value. The city also separates non-recyclable sections by calorific value, permitting only waste with a high calorific value to be used as refuse-derived fuel (RDF). Biodegradable waste has been prevented from reaching the dumpsite every day, by using aerobic composting and anaerobic digestion. It helps in reducing greenhouse gases in the environment. Consistently, 800 km of streets are cleared by machines, footpaths, and road dividers are washed, the majority of water is the reused water from the sewage treatment plants set up by the IMC. The city is not only Open Defecation Free but has also earned the first Water Plus Certification in the country. Littering and spitting in public areas are rare. There are no waste dumps, and the roads and sidewalks are spotless. There are no stray animals roaming the streets, and the city's walls are devoid of hoardings.

Efforts to make Indore the cleanest city in the country were not possible without consciousness among the local public. People themselves come forward to protest if they see garbage strewn around or someone littering in public. The benefits of this attitude are evident across the country.



Messages from the Faculty



Dr. Arun Kansal
Dean Academic and Professor
Coca-Cola Department of
Regional Water Studies, TERI SAS

Urban solid waste reveals the culture of its residents and affects their health and the surrounding environment. While its management was largely neglected in past, it is now receiving attention at the highest levels. The challenge, still confronting us, is the growing quantity and complexity of waste, reducing needless consumption, the fast pace of urbanization, and the consumption-based linear economy. Most types of waste can be converted into economically valuable products and by-products. However, the success of such ventures hinges on integrating the informal sector into waste management. The use of decentralized waste management will reduce waste for transportation and thus municipal cost. It is time for all stakeholders to set up proper and integrated waste management systems, backed by legal and regulatory measures. Youths of the country are an important constituent of such an initiative. I extend my heartiest congratulations to the team of Vasundhara Magazine and contributing authors who have compiled interesting articles on this important theme for the benefit of people, students, and aspiring professionals in the field.



Dr. Kamna Sachdeva
Associate Professor
Department of Natural and
Applied Sciences, TERI SAS

Waste is the by-product of human consumption. This sector has many facets; which include wastewater, sludge, food waste, and most gargantuan, urban solid waste. Managing these types of waste is a challenging task for regulatory bodies, nevertheless, the resource value of this waste should not be discounted and underestimated. The poor waste management practices can exert strain on other fragile domains of the environment. It is directly linked to air pollution, climate change, and ecosystem destruction. The wastewater sector is another area of concern where innovation and strong will is required for sustainable solutions. Decentralized waste management and recycling & reuse of urban wastewater for industrial use is the key. These approaches not only help in managing the waste quantum but also maintains the sustainability of resources in the light of increasing urbanization and population growth. A lifecycle-based approach is required to redesign the value change of product, so that waste minimization or waste recycling can be achieved. This cognitive shift along with commitment toward SDG 11, leading our way to a circular economy. The commitment of UN habitat member countries under the new urban agenda demands promoting waste to energy, access to sustainable waste management, and diminishing landfills.

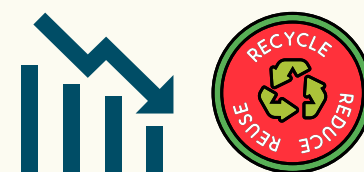


Make cities and human settlements inclusive, safe, resilient and sustainable



Dr. Amit Singh
Guest Faculty
School of Vocational Studies and
Applied Science, Greater Noida

Waste and its impacts are guided by two basic mechanisms - the sheer quantity of it and the overall nature of the stressor(s) it contributes. Thus, at some point in time, every kind of waste will become hazardous as its quantity builds up. Contrary to the general perception, even biodegradable waste can be as hazardous as non-biodegradable ones if the volume grows massively and it accumulates faster than the rate of degradation. The current set of rules and regulations are potent and do focus on generics as well as specifics of this problem but it is the magnitude that is creating greater problems. Due to multiple agencies involved, and poor auditing or monitoring controls, the problems have persisted for quite some time now. Moreover, as most of the regulations focus on the 'polluter pays principle, waste generation at the hands of consumers still grows unchecked. Waste management is a financially and technologically intensive process, involving high energy input costs. Increasing the proportion of renewable energy in waste management and waste-to-energy conversion are some of the solutions being used currently but the scale of the problem is constantly growing as well. Therefore, the primary focus of all waste management has to be on 'Reduce' rather than 'Reuse' and 'Recycle'. Wasteful and unsustainable production, designs, processes, and consumption needs to be targeted holistically within the framework of circular economies to resolve this crisis.



Dr. Ranjana Ray Chaudhuri
Assistant Professor
Coca-Cola Department of
Regional Water Studies, TERI SAS

The per capita urban waste (municipal solid waste) generated varies from 0.2kg to 0.6kg per day in Indian cities, depending on the consumption pattern of the city. According to the UN, India's urban population will cross 600 million by 2030, and the per capita urban waste shall exceed 1.0 kg per day. Interestingly, the composition of urban waste is also likely to change with a reduction in organic waste due to unsustainable consumer behavior. This rise will need innovative measures to convert solid waste to resources before it reaches the landfill. The mounting landfill sites, frequent landfill fires in summers, and groundwater pollution near landfills manifest the challenges that municipal solid waste management faces in India currently. The Greenhouse Gas (GHG) emissions from landfills are among the largest anthropogenic sources in urban India. The municipal solid waste rules 2016 (India) recommend the waste hierarchy pyramid of Reduce, Reuse, Recycle, and Recovery (of energy), with disposal being the last resort of waste management. Most importantly, these rules are valid for cities and urban agglomerations like Delhi NCR. In addition to the previously notified rules related to plastics, e-waste, biomedical, hazardous, and construction & demolition waste by the Ministry of Environment, Forest, and Climate Change (MoEFCC), the RRRR model is expected to reduce the burden on landfills. Ultimately with the new thinking on the circular economy, India too can develop a framework for zero waste hierarchy.

"RESOURCE" not "WASTE"

Understanding the Transformation

In the post-World War II era, mass consumption and production of goods and services, became a common phenomenon. As a result, the generation of surplus due to mass consumerism, led to accumulation of waste, to the extent that, waste management has now become a global concern. Thus, resource recovery from waste comes at the disposal of the problem of waste that persists. The valuation of waste as a resource depends upon the society's value system. For instance, as described in the works of O'Brien, the waste regime in which a certain waste (in this case, food) has become a resource (used for the production of biofertilizers and renewable electricity generation), and the social relations associated with waste production, have shifted from a public service provided by municipalities, to one in which households generate raw materials for further capital accumulation—and provide the unpaid labor to sort them.

The worldwide search for wastes and their harvesting, to turn them into secondary resources has grown into a multibillion-dollar global business. According to several estimates, the global recycling industry generates \$500 billion in annual revenue and employs more people than any other industry except agriculture. The low cost of shipping containers on the "back run" (from West to East or North to South) of global shipping routes makes the business more profitable. The ability to ship relatively small consignments of discarded goods back in containers, rather than hiring bulk carrier ships has enabled many small-scale entrepreneurs to enter the global waste goods trade, just as containerization has enabled global logistics for production. After they've been imported, low labor costs and lax environmental regulations allow for greater material separation,

segregation, and sorting. The latter is crucial for extracting value from resource recovery, as the degree of purity of the grade, as well as its inverse—the degree of contamination—is crucial for manufacturers to accept the material for further processing (i.e., recycling).

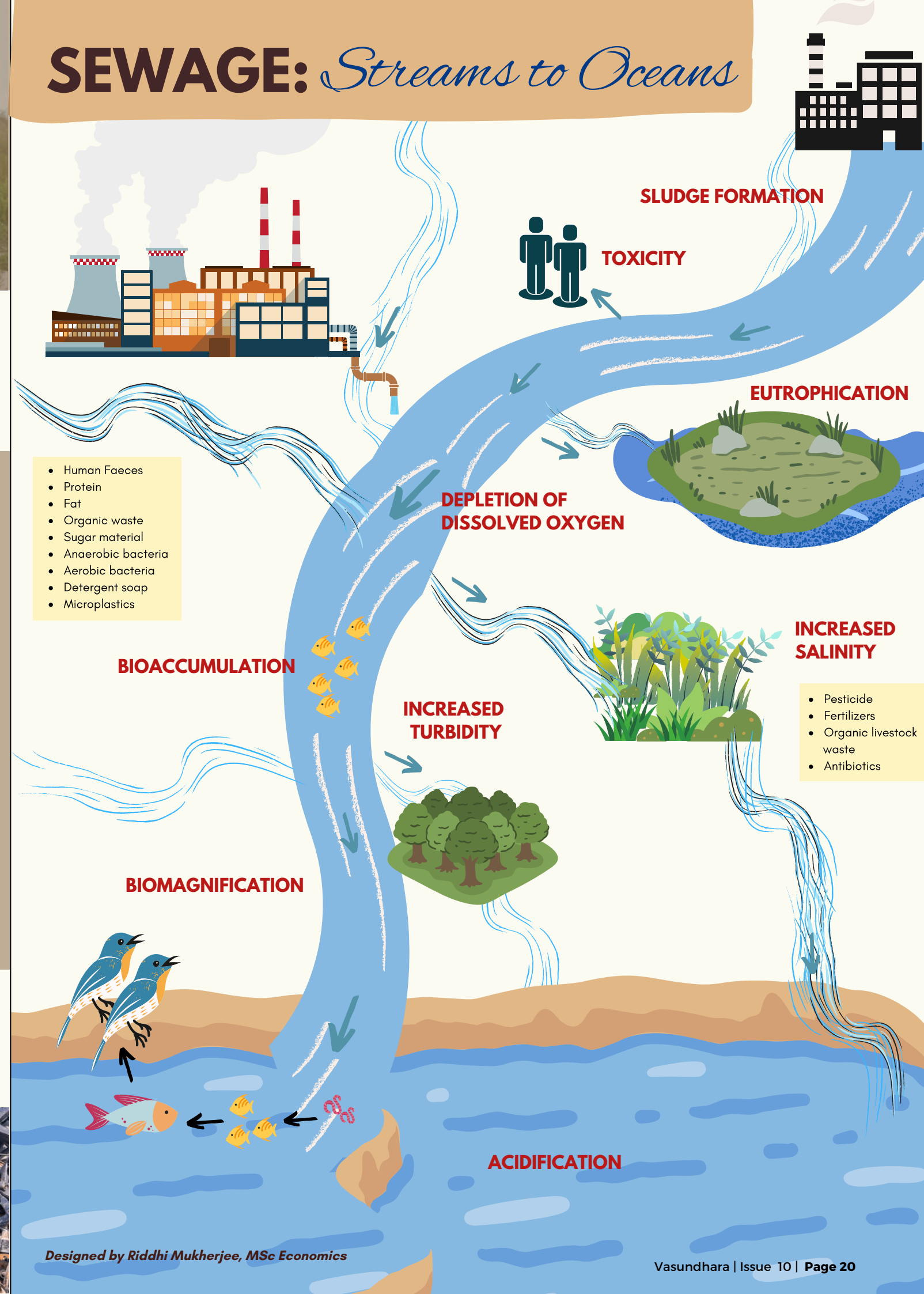
For example, high-risk Chinese traders source scrap yards in the United States to collect scrap metal and wire to be filled into containers and exported to China. They can buy and sell 50 containers per month, given, the market is right and prices are high, valuing around \$10,000 to \$100,000 per container. Price is linked to the demand, and scrap metal—as well as scrap paper and plastic—are highly demanded both in China and India. Even in vertically integrated operations, cable and wire chopping plants in the United States and Europe will rarely accept used wire with less than 60% metal content. As a result, wire with less metal content, such as Christmas tree lighting, is purchased by Chinese traders, shipped to China, and eventually ends up in places like Shijiao, in southern China, where 20 factories process more than 9,000 tonnes of such wire each year. These factories not only supply secondary copper to other factories that make more wire, power cables, and smartphones, but they also shred the insulation for slipper sole manufacturers. In places like the United States, however, there is no demand for Christmas tree lighting from manufacturers. Hence, if China did not exist, all of this would end up in a landfill.

Similarly, the economies generating significant waste can bring about changes in their business operations to transform waste into resources, which can then act as capital for furthering economic activities and generating employment opportunities.

Authored by Kriti Sharma



SEWAGE: Streams to Oceans



Designed by Riddhi Mukherjee, MSc Economics

In Conversation With **MEHRNOOSH AZODI**

Dr Mehrnoosh Azodi is a chemical and waste policy specialist and gender equality delegate at the Luxembourg Institute of Science and Technology. She is an environmental engineer and an industry engagement consultant, having given her consultations to the International Council of Chemicals Association on the matters like UN SDGs and implementation of Strategic Approach to Chemicals Management (SAICM). She has also been the lead author of the SAICM Global Assessment of the Chemicals and Waste Management for two consecutive periods of 2014-16 and 2017-19. She also played a major role in the development of SAICM's strategy for private sector engagement beyond 2020.

Disclaimer: The content of this interview is solely the opinion of Dr Mehrnoosh Azodi and does not represent the views of the Luxembourg Institute of Science and Technology (LIST). Additionally, Dr Azodi is not representing LIST in this interview.



Q1. What motivated you to pursue a career in Environmental Engineering and the policy side of it? What challenges do you see ahead in your path to achieve the policy ambitions?

I studied chemical engineering in my BSc, which was taught in a very traditional way. Over a four-year programme, we had only a couple of optional courses during which we learnt about the environment. I took those courses but not every other student did. Meanwhile, I read about the chemical accidents and environmental disasters such as Bhopal gas disaster in 1984, the hole in the ozone layer in the 70s, the Love Canal in 70s in the US, etc. The gap was clear. For decades human civilization had established the most effective engineering tools to exploit the earth's resources and taught these to the engineers. Until the environmental movements of 70s and 80s, little thought had been put into protecting the environment and human health. I became more and more interested to change my academic direction. Therefore, I worked on environmental research during my PhD at McGill University, Canada and after graduation started working for the UNEP.

There are numerous challenges to overcome in this area. First, environmental sustainability and circular economy should become integral part of every science and engineering discipline. Our engineers and scientists need to learn how to think circular. Another challenge is the economic models upon which our world functions. As far as our economy is based on infinite growth and expansion, we will have environmental crisis. We

live in a system that is circular in every sense where no waste is generated. Waste is a human-made concept, and our civilization is linear in every sense in complete contrast to how the nature has evolved to function, maintain itself and thrive. Personally, as a policy specialist I find that Education and innovation is key and can provide many solutions to today's planetary crisis.

"Education and innovation is key and can provide many solutions to today's planetary crisis"

Q2. Having been a UN consultant, how do you perceive the issue of chemicals and waste at the international level correlating to the Sustainable Development Goals (SDGs)?

Sound management of chemicals and waste is gaining more and more international recognition. There are four international conventions and a framework that oversee sound chemical and waste management including Basel Convention on hazardous waste, Rotterdam Convention on pesticides, Stockholm Convention on persistent organic pollutants, Minamata Convention on mercury, and SAICM (Strategic Approach to International Chemicals Management) respectively. Even though there remain challenges in the implementation of these treaties and frameworks, a great progress has been made so far. The SDGs are comprehensive in a sense that they cover all sectors of activities including the chemicals and

waste. There is SDG 12 on sustainable consumption and production and its target 12.4 requires the member states to achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment by 2020. Moreover, target 12.5 addresses waste by requiring to substantially reduce waste generation through prevention, reduction, recycling and reuse. SAICM, being multi-stakeholder and multi-sectoral, is THE framework on chemicals and waste that works closely with the chemical industry.

Q3. Could you throw some light on your understanding of international policies/legislation frameworks related to waste management including the Minamata Convention and SAICM? How do these frameworks function and affect or induce change on the ground level? What challenges do you think persist in the implementation of these policies or frameworks in your experience?

SAICM is now going through an exciting process called intersessional process leading up to the Fifth session of the International Conference for Chemicals Management (ICCM) that will decide on the mandate and programme of work of the SAICM for beyond 2020. ICCM has several functions among which are to receive reports from all relevant stakeholders on progress in implementation of SAICM, that has demonstrated many challenges. The voluntary nature of it makes implementation slow, inconsistent and not universal. SAICM's objectives are broad even though comprehensive in accounting for nearly every aspect of chemical management, yet this broad scope adds to the complications of implementation for many countries that lack in human and technical capacity. Moreover, the lack of sufficient financing to support capacity-building projects and the implementation of policies, projects and programmes is another challenge. Currently, Member States to the United Nations can apply through Global Environment Facility or the Special Programme for the implementation of SAICM. Minamata Convention on Mercury is a global agreement that entered into force in 2017, which mandates the Parties to the convention to work towards the control of the mercury supply and trade, reduce the use, emission and release of mercury, raise public awareness, and build the

necessary institutional capacity. Minamata Convention assists the implementation by provision of best available techniques (BAT) and Best Environmental Practices (BEP) to their Parties and signatories. Many challenges remain in the implementation of Minamata Convention, one is formalizing the artisanal and small-scale gold mining (ASGM). The ASGM is the world's largest source of anthropogenic mercury emissions and releases, risking the miners' health and the environment, due to absence of any official protection or regulation by the state.

Q4. As a chemicals and waste policy specialist, could you shed some light on gender aspects consideration in waste management policies?

There are different aspects to the interlinkages of gender inequality and waste management. One is the inequality in the job market. Despite the unacceptability for women to work in the waste sector in many parts of the world, women are largely involved in informal waste management in low- and middle- income areas.

"The inequality in this sector results in marginalization of women, who earn less than men doing the same work."

UNEP has released a series of videos looking into this issue, GENDER AND WASTE NEXUS is available on YouTube. UNEP works with the stakeholders to develop intelligent policies that can help address these issues. Every waste management system should take the needs of both men and women into account in every level of decision making, policy development and implementation.

Q5. What message would you like to give to our readers?

The fact that student bodies such as yours, write about the environmental sustainability, is an indication that youth are on the right pathway. Often, traditional academic curriculum in engineering and sciences do not teach sustainability, circular economy or environmental protection, although recently this is changing. Despite this, remember that every process or product that you develop means exploiting resources, consuming energy and generating waste at the end. As an engineer or a scientist, can you integrate circularity in your design or your engineering solutions even if it is not required? Can you think how to minimize waste generation or close the loop and be more energy efficient?

Major Landfills and dumping grounds of India –

AHMEDABAD, GUJARAT: PIRANA LANDFILL

The Pirana Landfill, located in Gujarat shows sign of good waste processing infrastructure. Ahmedabad waste municipal corporation claims that they successfully process around 1200 tonnes of waste every day.

NAGPUR, MAHARASHTRA: BHANDEWADI DUMPING AREA

Over 1200 MT (million tonnes) of garbage that the Nagpur city and surrounding areas generate everyday, 70% of mixed garbage is being dumped in the Bhandewadi dumping area.

MUMBAI, MAHARASHTRA: DEONAR DUMPING GROUND

Located in the suburbs of Shivaji Nagar, Mumbai since 1927, Deonar Dumping ground is the oldest and the biggest dumping ground in India. The landfill receives waste generated by various cities in India, including Mumbai.

PUNE, MAHARASHTRA: URULI DEVACHI & PHURSUNGI LANDFILL

Every day 500 tonnes of dry and wet waste from Pune city and the surrounding area is dumped in the Uruli Devachi and Phursungi landfills. It has negative impacts on nearly 160,000 people living around the dump yard.

BENGALURU, KARNATAKA: MAVALLIPURA LANDFILL

After the Mavallipura Landfill of Bengaluru lost its utility serving the city for multiple decades, the site was closed by the Karnataka High Court in 2012. Nevertheless, the landfill continue to be filled with waste and shows several negative impacts on the people living in and near the Mavallipura area.

COIMBATORE, TAMIL NADU: VELLALORE DUMPYARD

Total dissolved solid (TDS) (contaminants larger than 2 microns) level around Vellore Dumpyard, Coimbatore is between 880ppm (parts per million) and 3,936 ppm. The TDS level inside this junkyard is 18,108 ppm.

CHENNAI, TAMIL NADU: KODUNGAIYUR DUMPYARD

Spread across an area of 258 acres, the Kodungaiyur dump yard of Chennai receives nearly 2,200 tons of waste every day. A major fire breakout at the landfill in mid-May has generated fear and concerns in the minds of the people working and living around the landfill.

HYDERABAD, TELANGANA: JAWAHAR NAGAR DUMPYARD

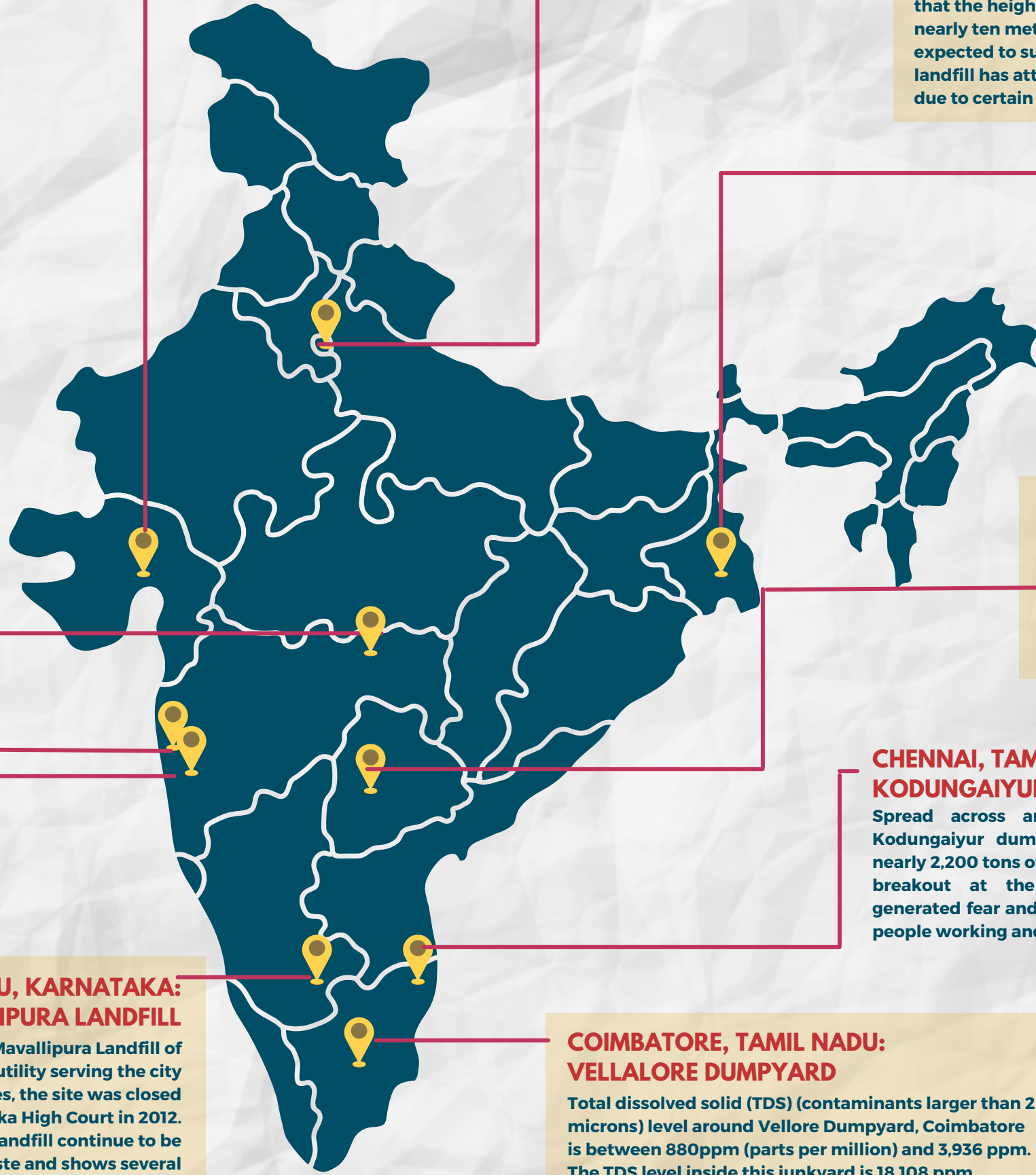
The foul, nauseating smell from the Jawahar Nagar dumpyard signals danger to the more than 50,000 residents living near Jawaharnagar Colony.

KOLKATA, WEST BENGAL: DHAPA WASTELAND

Set up in 1987, the Dhapa Wasteland has over-served the people of Bengal, as it lost its utility many years ago. To reduce pressure on Dhapa Wasteland, the Kolkata Municipal Corporation has been trying to lookup an alternative site in West Bengal for many years now.

DELHI: GHAZIPUR LANDFILL

With constantly increasing height, Ghazipur landfill of Delhi stands at a height of 65 meters tall as of now. Recent studies on the landfill estimate that the height of the landfill rises by nearly ten meters every year, soon expected to surpass Qutub Minar. The landfill has attracted much attention due to certain recent fire incidents.



Who picks up your waste?

Arguably the first and the most important step of cleanliness is putting one's waste in a dustbin. From that dustbin, the waste is collected by a certain waste-worker and taken away. **Then what? What happens to that waste? Where does it go? Who deals with it?**

Most of the time, the waste, dumped in various dustbins is taken far away from its origin. There it is managed by people, who did not produce it. The distancing of waste away from its origin not only creates a fake sense of accomplishment but also takes away the accountability from the one, producing the waste. So, are we honestly managing our waste or merely making our personal spaces clean? Very often, places that seem clean are places with people capable of sending their waste away. From small cities to big countries, this phenomenon of waste distancing can be observed at various levels, where the powerful can be seen exploiting the weak.

Apart from this, people who work with the waste, generally come from a lower caste-class background. These people are often not treated well and have to face discrimination. They have to work with different kinds of waste, often toxic in nature, and face multiple health hazards. When talking about waste, it is essential to talk about the people working with it and take their opinions into deliberation. Following are some excerpts from the interviews of various people working directly with waste.

Devender Singh, 33, Junk dealer, Odisha

"I go door to door and collect old stuff from people's houses, like old newspapers, bottles, cartons, clothes, etc. and then sell it. I don't earn a lot through this but this is kind of the only job I can do. When I was a kid, I would go with my mother and sell utensils, while people gave us old clothes and newspapers in return. Those days, people very often would give us things for free but now things have changed. Now, nothing comes for free. People have stopped using second hand stuff, nobody uses newspaper envelopes anymore. So, my business is running in loss, obviously."



Vishal Singh, 49, Social worker, Rajasthan

"When talking of waste, most people forget about the construction waste. Rajasthan has huge granite mining sites, which are used by several companies. This produces a great amount of construction waste, which should be a matter of concern. It destroys agricultural fields, pollutes water bodies, etc. The people that work with this kind of construction waste are not paid well and are prone to various chronic and acute diseases."

Shanti Devi, 54, Janitor, Uttarakhand

"The production of waste in the mountains has increased to a great extent in the past few decades. Earlier, we used to collect waste only from big institutes, schools, offices, etc. Other than that people used to manage their waste themselves. Now, we collect waste from almost all the houses in the city. It was easier to deal with the waste when the most part of it was biodegradable. Our pigs used to eat the food waste and rest was burnt. The amount of non-biodegradable waste has increased so much that it has become very difficult to deal with. We can't burn all of it, people stop us from putting it into the river, and the dump yards are filling up quickly. For some time now, we have been putting the waste on the mountain sides of broken roads. People are complaining about that as well. What else are we supposed to do?"



V. Shrilekha, 47, Janitor, Andhra Pradesh

"There is no lie in it that the waste of the city has been increasing at a very high rate but what do I have to do with it? I am just doing my job. I collect waste from people's houses and dump it in the dump yard. People complain about the waste and our work a lot, they don't want us around. Honestly, most people don't respect us, but trust me, if we don't do our work, dealing with waste will become much more difficult."

A social worker, Maharashtra

"Well, Maharashtra beaches are not beaches anymore, they have turned into actual dump yards. As a kid, I used to enjoy walking on the beaches a lot but now I cannot bear standing on the beach even for a second. You cannot walk on the roads without stepping on the waste. Then, sewage is a big problem. During monsoon, many people fall sick because of the toxic waste that reaches their homes along with the sewage mixed water."

P.V. Krishnan, 52, Social worker, Kerala

"Waste has become inevitable. If you ever get to look at the waste collections of Kerala fishermen, you will be shocked. The amount of waste, the Chinese fishing nets catch in each round is insane. Kerala beaches used to be very clean but now you can encounter waste there as well. Sewage is another problem. There are multiple water bodies, which have been completely ruined because of it. Even in the interior regions, there is hardly any place left with no waste."

Arun Kumar, 22, Janitor, Uttar Pradesh

"I have never looked upon at waste as a problem. Yes, sometimes working with a certain kind of waste, especially human faeces, is problematic, otherwise, it is fine. It is good that people are producing waste; the more waste people produce, the more work we get. We reuse some of the items that seem to be in good condition. Apart from that we either burn it or dump it in some dump yard. It is true that the waste in the dump yards is increasing rapidly, I believe, it would get reduced when the animals and insects eat off some part of it"



It is evident that the people working with our waste are working under unfavorable conditions. Their interviews also showcase that they are not well informed of the situation or well trained for their work. They do not have a decent work environment and are working under unjust and vulnerable conditions for minimal incentives. The phenomenon of waste distancing makes a certain section of the society (waste-workers) responsible for the whole society's waste, which is unjustified. Things are easy for us as of now, as we don't have to deal with our very own waste, but for how long? Soon, we will have to encounter a massive heap of waste, and we have to be ready for it.

UNRAVELLING THE SCIENCE BEHIND THE SOLUTION

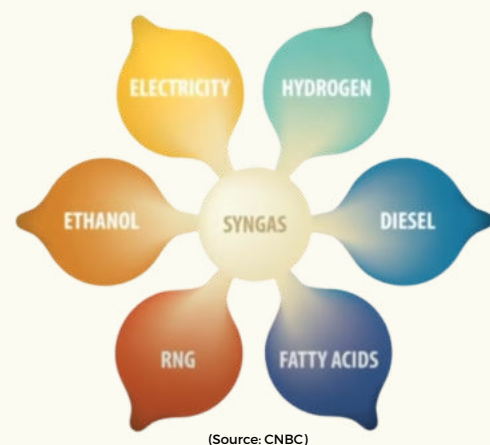
Every year, the world produces 2 billion tonnes of waste, enough to fill 8,00,000 Olympic sized swimming pools. By 2050, it is estimated that the total waste will pile up to 3.4 billion tonnes, overstressing all the landfills and the current recycling waste management programs all around the world. The only solution to this imminent crisis is **Innovation**.

Innovation combined with technology can be the most effective solution for this forthcoming havoc that would become too difficult for us to mitigate in times of environmental crisis.

Based on current practices, we have classified waste management into 3 broad categories:

- Waste to Energy
- Recycling
- Sewage waste management

Let us dive deep into each category and explore innovative novel solutions that are taking over the world, in terms of fighting this anthropogenic pollutant.

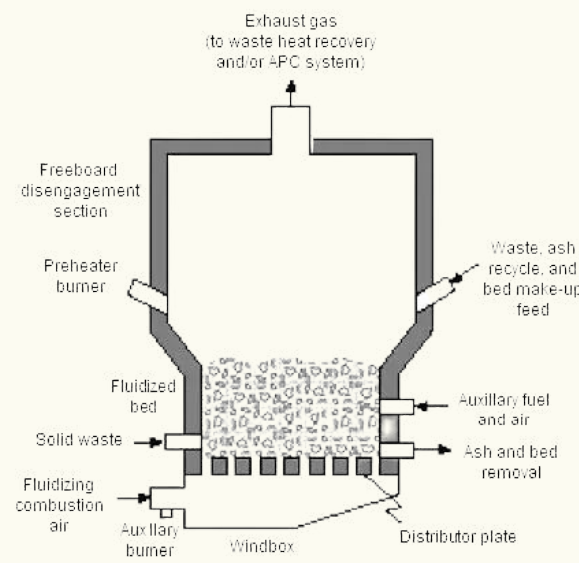


Waste to Energy

Gasification: An old technology, recently being repurposed, in which trash is not burned. Instead it is converted into gas known as Syngas, a process which is both economical and eco-friendly. Syngas, obtained through gasification, can be used to produce diesel, hydrogen, electricity, ethanol etc.

Hydro Thermal Carbonization: The process is similar to how mother nature takes millions of years to change dead plants and animals into coal. In a biofuel facility, waste material is also converted into coal using Hydro Thermal Carbonization (HTC). It is used for everything from carbon sequestration to replacing concrete and cement in the construction industry.

Fluidized bed technology: The technology mainly is used to process sludge or municipal waste. It has high efficiency of processing and low residual value. The FBT always recovers energy and flue gas treatment can also be done through this process.



Conceptual view of Fluidized bed system
(Source: Waste to Energy International)

Recycling Technologies

Scientists are looking for newer and innovative ways to recycle plastic to be able to enter the product into the coveted 'Circular Economy' category. The Tech world, like in any other industry, is revolutionizing and advancing the recycling movement world over. Here are 4 interesting tech-driven solutions that we simply must stay updated on:

1. Which is the second-most used plastic in the world of which only 1 percent is currently

recycled? Polypropylene! One scientist has made a notable advancement in plastics' "end of life" challenge. John Layman, head of material science at Procter & Gamble and chief technologist and founding inventor of PureCycle Technologies, developed a revolutionary process to remove color, odor, and contaminants from polypropylene plastic waste and transform it into a 'virgin-like' resin.

2. 'The New Raw' is using parts of recycled plastic products to 3D print urban furniture such as benches. The Zero Waste Lab in Thessaloniki is a part of the ambitious "Zero Waste Future" program of Coca-Cola in Greece. The lab is equipped with a robotic arm and recycling facilities where citizens can bring their plastic waste, design urban furniture and get actively involved in the recycling process. The website is a masterpiece by itself and deserves an honorary mention! - <https://www.printyour.city/>



3. Aronax Technologies, a company based out of Spain, has found that using a magnetic additive to recyclable plastic can create better air and moisture insulation, while still making it possible to recycle.

4. Win the U.K. – Mura Technology! It is a recycling facility which will be the first in the world capable of recycling all types of plastic. Mura's HydroPRS process utilizes the Cat-HTR technology. Filmmaker Sir David Attenborough appeared in a video campaign for a new plastic recycling technology, which employs supercritical water, heat and pressure to convert waste plastics into valuable chemicals for all plastic types.

Sewage Waste Management

In the current scenario, perhaps the most important parameter of waste pollution in water is sewage. Sewage is generally discharged from localities through a sewer system. After compatible treatment levels and procedures, it can be released back into water bodies or soil.

With the increasing challenges of implementing traditional methods to treat sewage due to the increase in quantity and contaminants, focus is now shifting towards effective, efficient and emerging innovative technologies.

1. **Membrane Filtration:** It is an essential method for removal of dissolved contaminants. For biological treatment of Industrial Wastewater, Membrane Bioreactor Filtration Technology is being extensively used.

2. **Nanotechnology:** The compactness and adaptability of this technology makes it a perfect choice for application in sewage treatment. R&D of nano membranes for decomposition of toxic compounds and segregation of minerals is ongoing.

3. **Automated Variable Filtration:** It is a state-of-the-art technology where the filter itself is cleaned by the filtered influent. Along with its smart features, it is an economic and efficient measure of sewage treatment and disposal.

4. **Microbial Fuel Cells:** It is a technology to extract electrical energy from the organic matter using the process of electron transfer. Under developmental stage, it can be a very useful method in the future for harnessing the energy potential of the millions of microorganisms present in sewage.

Although management of sewage is still a persisting issue, implementation and proper usage of these treatment technologies will help in mitigating the effects and pave the way forward towards a cleaner future.



A Trail of Waste

Hello there! I am Montu, a juvenile monkey of the Doonwala troop. Today I'm here to tell you a tale. But first I have a question, what is the first thought that you get when you think about animals? Perhaps you imagine pristine forests, green grassland, deep seas full of thriving wildlife, or maybe a farm or your pets, isn't it? Let me stop you right there! This isn't that kind of a story. This is a tale of how the waste that humans so thoughtlessly discard entraps us into a web of problems.



One fine evening, Macca, our leader found a place between the edge of our forest and the human settlement, where people offered us a variety of fruits to eat. We didn't have to forage for food anymore, it just came by so easily! As the word spread through the jungle about this free for all buffet, more and more animals started coming by. This created a problem; the food wasn't enough anymore! Our next stop was deeper into the human settlements. There, we found a treasure trove of piles of food hidden amongst an array of human articles. They called it a dump yard, for us, it was a food court!

Nevertheless, there was a catch! This food was often wrapped in some unpalatable wrapping. This wasn't a major problem for us because we can use our hands to separate out the inedible things but other animals like cows, deer, civets, martens, elephants and birds like storks and vultures weren't so lucky and often gulped/pecked up that stuff along with food. Then, mysteriously, a lot of us started falling sick and dying unnaturally.

The birds that visit us seasonally often tell me how the world is changing for the worse and this isn't an isolated case, most places around the world are seeing similar tales unfolding before them. Another problem is that we find more and more of the forest floor littered with those wrappers.

The mighty humans have created just as mighty of a package of problems by the simple act of creating and recklessly disposing "waste" all over the world. The story doesn't end at merely food-related waste, their smoking factories spew waste into once pristine water bodies and fertile soils, let's not even get started on the toxic mining and coal waste amongst others.



I and my other faunal friends cannot solve these problems, but the one group of mammals, "mankind" that can actually do something about it are the mighty humans. Now, only their intellect and love can save us and our environment.

WASTE MANAGEMENT



Individual Level

Remember to carry your own water bottle, cloth bags, and containers (if possible) when stepping out.

Try to SEPARATE your waste at the source site.

Try composting food waste at your home/workplace.

Buy products with minimal packaging.

Restrain from buying sachets as they're non-recyclable.

Segregate your dry garbage and give it to a kabadiwala for free or provide it to a dry waste collection center.

Avoid using plastic straws, cups, or other plastic cutlery items.

Try to buy in bulk

Opt for no plastic cutlery delivery when ordering from online food delivery apps/websites.

Avoid bracketing clothes (ordering different sizes to try and return ones that don't fit) when buying online during the sale season.



Institutional Level

Conducting regular waste audits to find out the type and volume of waste generated. Accordingly, allocating the collection bins.

Consistent marking and labelling (in terms of the color of bins used) at the college campus to aid to the right choice-making when dumping.

A Green Team could be formed to inspect, educate and make sure that the campus abides by the proper disposal steps.

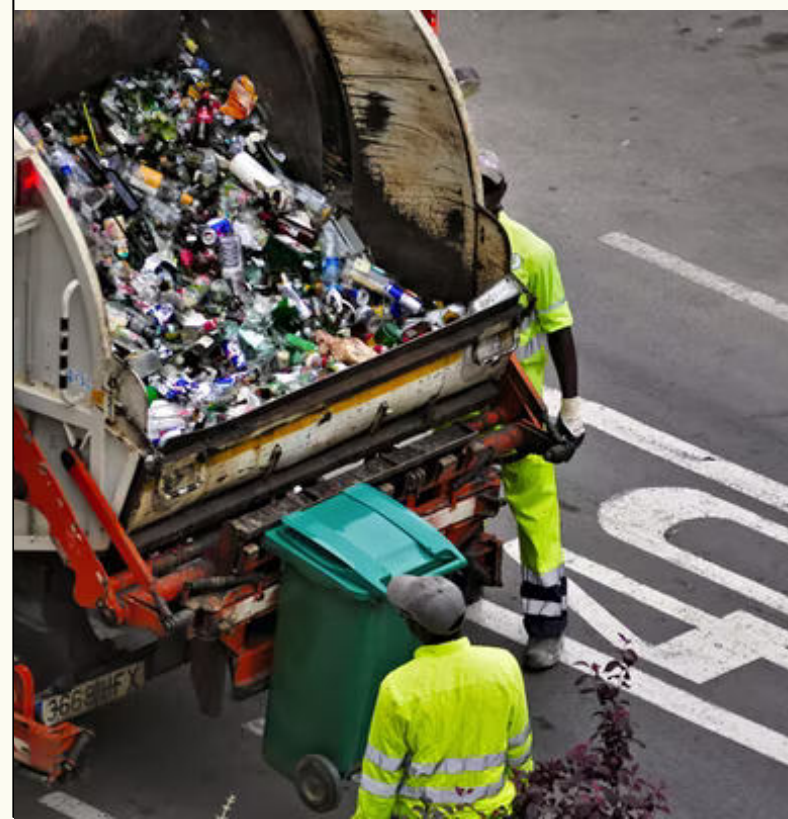
The paper used by staff and students could be collected through collection boxes and used to print on both sides and for crafting purposes. Could also be given to recycling units.

College staff and members should be encouraged to bring their own mugs and containers if possible to reduce cutlery waste.

To reduce food waste, hold sampling sessions and use student feedback to build new menus and portion sizes.

Placing compost bins is an environmentally beneficial and educational way to dispose of fruit and vegetable waste that may be used for the garden in the campus.

Setting a zone to promote donations by staff and students like books, stationery, etc.





PLANET OF THE MASKS

Source: The Economic Times

It has been two years since everything changed. We have all read in the history books about the pandemics of the past, but never before have we experienced one on a global scale that really tested our medical advancements and shifted our normal lives in a different direction.

2020 was the year when COVID 19 brought a halt to our daily social lives. We shifted from taking commute and going to school or work to sitting in front of our laptops and attending online classes and meetings. As with all previous pandemics, it put our frontline workers and the medical fraternity in the direct line of fire. Social distancing, frequent sanitization, the wearing of masks, PPE kits for health workers, etc. became the new social norms. All of these led to an increase in medical waste, which is quite aptly termed Covid Waste.

With the global spread of the virus, the production of surgical masks, Covid test kits, and PPE kits increased. The subsequent production and shipment of vaccines worldwide have also contributed to a rise in this waste. Most of the PPE kits are made out of plastic and the improper dumping of the kits and masks is

adding to the plastic pollution which we already have. According to WHO, the 8 billion vaccine doses currently administered to date have generated 144,000 tonnes of waste.

In the context of the Indian scenario, it can be considered somewhat of a challenge for the biomedical waste management sector. Although the Central Pollution Control Board (CPCB) had issued detailed guidelines on the segregation and management of these wastes, it has been quite a common sight to see masks, face shields, gloves, etc. being disposed of as a part of household waste or simply lying in a clutter on the roadsides. There has also been a lack of monitoring of data through the CPCB Biomedical Waste Management (BWM) App. There are approximately 106,000 bedded healthcare facilities still pending to update their data on the app.

In November 2020, only 100,000 Covid positive households all over India had updated their data on the app. All of these factors prompted us to infer that India is falling behind in catching up with the rise in both Covid 19 cases and its associated waste.

GENERAL TYPES OF WASTE

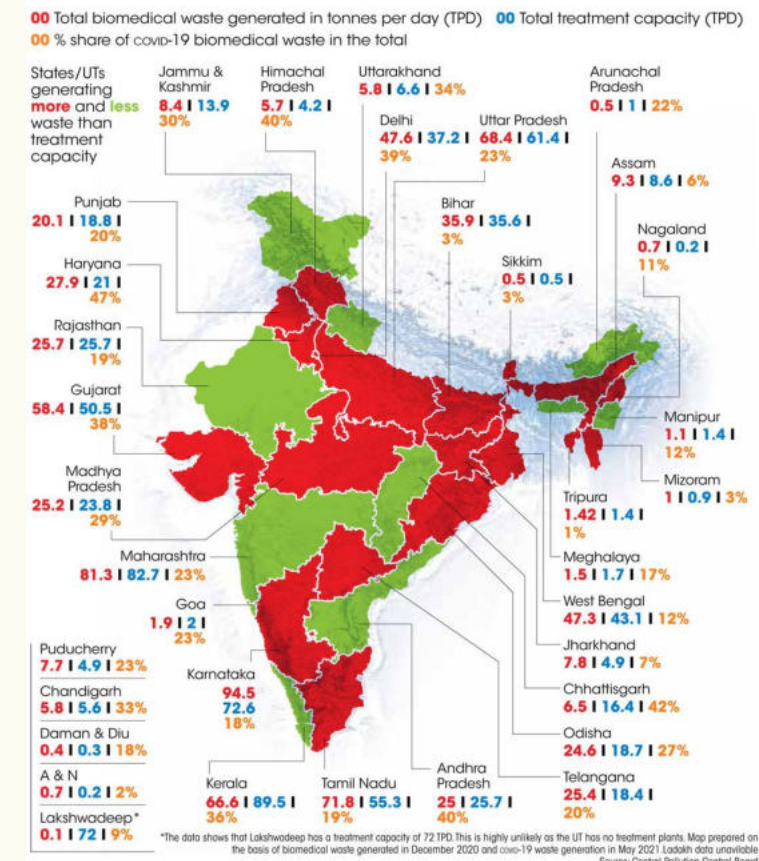
ITEM	TYPES OF WASTE
Mask	Infectious
Gloves	Infectious
Gown	Infectious
SARC-CoV2 Rapid Antigen Test	Non-hazardous
PCR Testing Cartridge	Chemical
Vaccine Vial	Non-hazardous
Vaccine Needle	Hazardous
Plastic Packaging and Containers	Non-hazardous

In the initial phase of Covid 19, when almost the entire world was under lockdown, one might argue that it had brought some positive changes. Emissions from the industrial and transportation sector had significantly reduced thus mitigating the effects of climate change to a certain point. However, these were certainly balanced out by the negative effects of Covid waste affecting the environment. For this reason, WHO has provided a certain scalable and practical solution that can lead to more sustainable management of Covid waste in the healthcare sector.

- Reducing the amount of PPE kit use and focusing more on hand hygiene.
- Promoting the use of smaller, sustainable packaging materials.
- Development of reusable, recyclable, and renewable PPE kits.
- Investing in the 3R model of waste management in the healthcare sector.
- Reduction in exports and supporting local products.
- Investment in non-combustible waste treatment technologies.

TOO MUCH TO HANDLE

As many as 22 states/UTs have generated more biomedical waste than their treatment capacity during the pandemic's second wave



The picture of Seahorse dragging a mask captured by Nicholas Samaras won the Ocean Photography award of 2021. It vividly depicts the troubling reality and impact of Covid waste on the nature and environment.

Source: Greek Reporter

PENNIES IN A DUMP OF WASTE

Reverse vending machine (ZELENO)

To deal with the dumping of plastic waste bottles, aluminum and steel cans in the open, the reverse vending machine was introduced. It aided municipal corporation in successfully dealing with waste and enabled people to receive rewards after successful disposal of these wastes.



Source: Akshar School

Plastic Waste as School Fees:

Akshar School in Guwahati, founded by the duo, Parmita Sarma and Mazin Mukhtar in 2016 is one of a kind, where children vow not to burn plastic and deposit at least 10 to 20 plastic items per week as school fees. This was done to solve dual issues, enabling poor children to enjoy their right to education while minimising the adverse environmental and health impacts of burning plastic waste.



Source: NDTV

Sanitation Awareness Park

Ambikapur has made a significant effort to achieve the distinction of being Chhattisgarh's cleanest city. It has no dumping yards, segregates 90% of its waste, and generates Rs. 13 lakhs as monthly revenue from recycling. Other than that, in May 2016, the city converted its 15-acre landfill into a "Sanitation Awareness Park". To address the two major issues of hunger and waste management the municipal corporation has introduced a garbage café, where people can get free food in exchange for one kilograms of plastic.



Source: Climate Home News

Roads from Plastic

About one-fourth of the waste that is generated in Bangalore comprises of plastic waste. Ahmed Khan, Founder of KK Plastic Waste Management, devised a novel and revolutionary approach to use waste to create better and stronger roads by combining it with bitumen. Up till 2015, Bangalore Mahanagara Palika was successful in using plastic to construct 40% of the city's roads. In 2019, this project was taken up by BIAL as a part of "plastic beku" campaign to lay roads



Source: The Better India

Fabric from waste

Aditya Banger, co-founder of Aditya Fibers, has been sourcing plastic waste from all over India. The process takes one or two days but the fabric produced is stronger than regular cotton and is more durable. The plastic fiber is spun into yarn and mixed with cotton to make a fabric that is then sold to other companies.



SWaCH, Pune:

Solid Waste Collection and Handling (SWaCH Seva Sahakari Sanstha Maryadit), Pune, is India's first self-owned cooperative of waste pickers. In 2016 SwaCH enabled the recycling of 50,000 tonnes of waste. SWaCH members also collectively compost several tonnes of waste per day and operate biomethanation plants in the city.

India's Recycle Man: Binish Desai's Brick

The pandemic brought forth many challenges, one of which was the growing piles of PPE waste. In this situation, Binish Desai stepped up and invented Brick 2.0, which converts discarded face-masks into bricks. This is the second version of his waste to bricks inventions, the first one being P-Block bricks made from industrial paper and gum waste.



Source: The Hindu



Source: The Washington Post

Saving Lives Using Coconut Waste:

Alhaji Siraj Bah's adoptive family was killed in a mudslide caused due to deforestation, induced by the excessive demand of fuelwood. This inspired him to use abundantly available coconut waste to make briquettes. His company, Rugsal trading is recycling coconut waste to prevent future landslides.



ORGANISATIONS WORKING ON WASTE



Clothes Box Foundation (pan-India)

To donate (through self courier or availing pick up facility) your preloved/used clothes, contact the Clothes Box Foundation via the following mediums:

- Website: <https://clothesboxfoundation.org/>
- Email Id: info@clothesboxfoundation.org
- Whatsapp: 7838371356



bE-Responsible (Bangalore)

For responsible disposal of your E-waste, be-Responsible through its Bangalore One Centres conducts e-waste collection drives. The contact details are as follows:

- Website: <https://bengaluru.citizenmatters.in/bangalore-one-centres-e-waste-20541>
- Contact: 9880791171/9845176883



Robinhood Army

Have you got excess meals at your house/workplace/organisation? Robinhood army feeds the hungry by channelizing the surplus to the deficits. They can be contacted via the following modes:

- Website: <https://robinhoodarmy.com>
- Email Id: info@robinhoodarmy.com
- Whatsapp: 89719 66164



Share At Door Step (SADS)

To donate shoes, bags, furniture, clothes, etc, contact SADS by scheduling a pick up. Following are the details to reach them out:

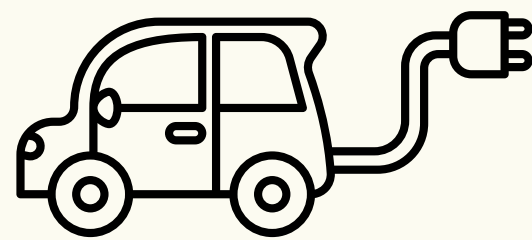
- Website: <https://sadsindia.org/>
- Contact: 8884784742



Knowledge Upgrade

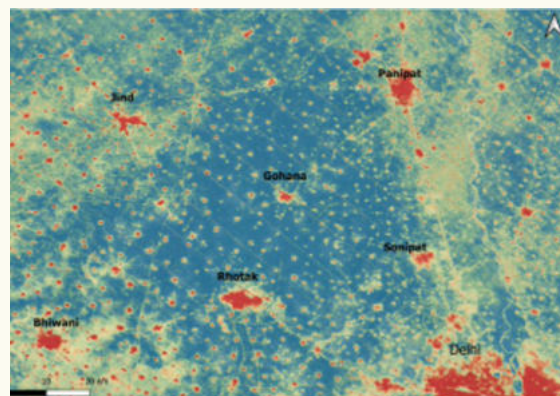
Made in India E-Bike Batteries

inGO Electric, founded by Nikhil Gonsalves, has successfully manufactured the first made-in-India Li-Ion Battery Cells for Electric Vehicles. The last missing piece to their indigenous E-Bike puzzle, these will be installed in their Tron and Flee model of e-scooters. For their latest version of Tron, they are looking at a battery range of 80 km and a top speed of 25 kmph, backed by a 2KWh battery and 250 W motor.



Heat islands around Delhi

The Jet Propulsion Laboratory (JPL) of NASA has recently shared an image depicting the spread of heat islands around Delhi. The image taken by their satellite instrument ECOSTRESS shows nighttime temperatures reaching up to 40 °C within the urban heat islands. Scientists state that climate change is the main contributing factor towards this unusual phenomenon and it would only increase and lead to formation of more heat islands in the coming days.



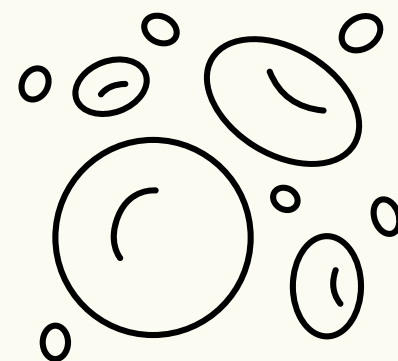
Highest Floating Solar Farm

The world's first high altitude solar farm is located in a man-made reservoir near Bourg-Saint-Pierre in the Swiss-Italian Border. It consists of 2240 solar panels arranged in 5 rows of eight. The solar farm floats on the surface of the water and then rests on the empty lake bed when the water is drained out. It was very low environmental impact due to the absence of aquatic life. The neighboring alpine region factors contributes to an increase in 50% of energy generation from this farm.



The Microplastic Invasion

From soil to air to food to even the bottom of the Mariana Trench, microplastics are everywhere. And they have finally made their way into the human body. Scientists have discovered tiny pieces of the almost invisible plastic in the human blood. From the Dutch study conducted on 22 volunteers, half of them showed traces of PET plastic. This raises a grave concern that microplastics could also be making their way into human organs and can be potentially life threatening.



COVID induced forest fires

A new study from the University of Cambridge evaluated an increase in forest fires inside protected conservation areas of Madagascar. The rise happened for five months in 2020 due to COVID led lockdowns which halted the on-site management process. As Madagascar is widely considered as a biodiversity hotspot, a suggestion was proposed to include a minimum limit of staff at all times under an essential service.



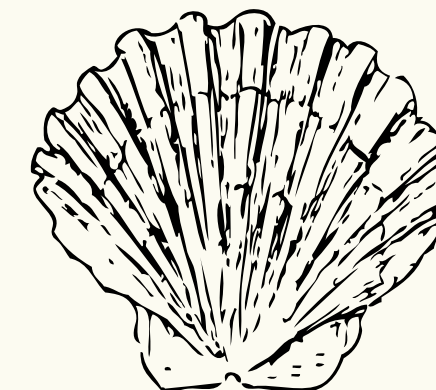
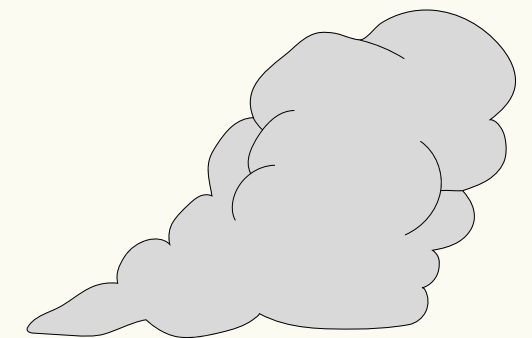
The Wooden Skyscraper

Skelleftea, a city in Sweden, is already known for its wooden construction. But in the midst, a 20 storey high wooden skyscraper is already the center of attention. Being an anomaly in the carbon dominated construction industry, the Sara Cultural Center is made from over 12,000 cubic meters of wood. It is claimed that the building will sequester 9 million kilograms of carbon dioxide throughout its lifetime and store excess energy and supply it as well.



Soaking up toxic air pollutants

A new material capable of absorbing toxic pollutants from air has been developed by researchers from University of Limerick. The sponge-like porous material can capture trace amounts of benzene from the air while using less energy than the existing materials. Further research is underway on increasing the range of volatile organic compounds which could be captured by this material.



The scintillating method to scallop fishing

In an accidental discovery, scientists have figured out a sustainable way for scallop fishing without damaging the sea beds. The team at Fishtek Marine had designed small underwater pot lights to lure in crabs and lobsters in the trap pots. But, it was observed that scallops were more attracted towards these LED lights. This invention has the potential to set up a whole new inshore fishing industry while reducing the damage from industrial scale scallop fishing.

SPACE JUNK

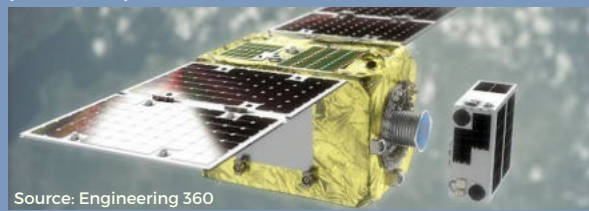
Space, an endless infinity, has a large amount of junk. Currently, 128 million objects larger than a millimeter, are orbiting around the Earth. Even a flake of paint, as small as a millimeter in diameter, traveling at high speed is enough to cause damage to television, communication, GPS satellites, and the astronauts.

On October 4th, 1957, Sputnik 1, the first satellite, was launched into space. It burned out 3 months later. Since then many satellites launched after that have not been burnt, leaving a virtual junkyard around the earth. In 2009, a crash between 2 satellites added 2000 new pieces of debris. Now, that debris is orbiting the earth and if we don't find a quick solution to this problem space would be soon inaccessible.

There are 4 ways thought of by scientists to reduce space debris: **Magnetic Capture**, **Laser Broom**, **Harpoon and Net**, and **Claw Capture**.

MAGNETIC CAPTURE

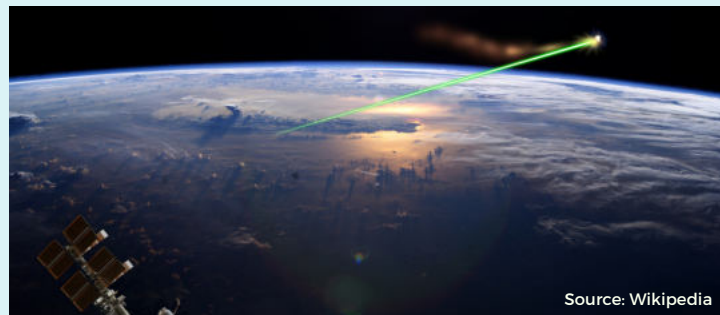
Magnetic capture introduces the concept of magnetic docking through which the janitor satellite pushes the junk into the atmosphere to burn. Astroscale, a startup from Japan in August 2021 was successfully able to demonstrate how magnetic docking will take place in space.



Source: Engineering 360

LASER BROOM

It is one of the most feasible ways to mitigate space junks as it uses high energy laser pulse radiation to burn a satellite in space. This technology is more cost-efficient than the other technologies as the lasers will be projected from a ground station over a satellite.



Source: Wikipedia

HARPOON AND NET

The idea took inspiration from the roman gladiator wielding both net and a spear. This net and a spear act as a capturing tool for the janitor satellite, which will push the debris back to the atmosphere to burn. In 2019, Airbus was successfully able to test this technology.



Source: E&T Magazine

CLAW CAPTURE

Clean space 1, is an initiative by the Swiss space program to use claw capture technology. The idea behind the clean space mission is to send a janitor satellite to space to capture debris from space and bring it back into the atmosphere, where it can burn up.



Source: Science. org

The governments around the world really need to invest in these technologies to prevent the havoc that space junks can create for the future space related programs.

CAREER GUIDE



LTI- Larsen & Turbo Infotech

LTI is a global technology consulting and digital solutions company, helping more than 458 clients, with operations in 33 countries. It aims to enable the clients to improve the effectiveness of their business and technology operations, and deliver value to customers, employees, and stakeholders.

Location: Mumbai, Maharashtra

Duration: Full-time

Compensation: Not specified

Designation: Associate

Field: CSR and Sustainability

Requirements: Individuals familiar with handling of a database and experienced customer service representatives, with the ability to generate and experiment with new ideas to solve work problems, thus providing innovations to customers, that enhances business value and implementing them

For more details, check:

<https://careers.ltifotech.com/job/Mumbai-Specialist-CSR-&-Sustainability-MH/810834401/>



ISS- Institutional Shareholder Services

ISS empowers investors and companies to build for long term and sustainable growth by providing high quality data, analytics and insight. The sustainable finance team of ISS ESG provides critical Second Party opinions on Green, Social and Sustainability-linked bonds.

Location: Mumbai, Maharashtra

Duration: Full time

Compensation: Not specified

Designation: Associate

Field: ESG Analyst

Requirements: A minimum of 1-2 years of relevant work experience relating to sustainability/ ESG Consulting, environmental consulting, along with financial analysis and data interpretation. Knowledge of investment carbon foot printing and climate impact assessments of investments would be an advantage.

For more details, visit:

<https://www.issgovernance.com/about/about-iss/#1574276741161-7ca718d3-32ae>



Centre for Science and Environment

CSE is a public interest research and advocacy organization based in New Delhi. It researches into, lobbies for, and communicates the urgency of development that is both sustainable and equitable. CSE accepts students from universities, schools, and colleges all over the world as per their project requirements.

Location: New Delhi

Duration: Varies as per the project

Compensation: Nil

Designation: Intern

Field: Policy Advocacy on Environmental Issues

Requirements: No specific educational background. Students can get associated for part fulfilment of their course requirement.

For more details, check:

<https://www.cseindia.org/internship-at-cse-1392>



Global Movement ~ Sustainable Internship Program (SIP)

Tree And Human Knot is a Global movement with a vision to re-enforce sustainability on Planet Earth and thrive to grow with its innovative intrapreneurial projects with a presence in India and Italy.

Location: Remote

Duration: 45 days- 3 months

Compensation: Not specified

Designation: Intern

Field: Sustainability

Requirements: PG/Ph.D./Master aspirants or experienced professionals who thrive towards an entrepreneurial career and have a passion to work in sustainability and development.

For more, details, visit:

<https://www.risingindia.in/sip>



THE ART OF COMPOSTING



- COMPOST**
- Sharp objects
 - Meat scraps
 - Plastic waste
 - Daily products
 - Cat/dog manure
 - Processed/cooked food
 - Other items:
 - + Pesticide treated plants
 - + Infected plants
 - + Oily vegetables/fruit peels
 - Coal ash
 - Sanitary Waste

Steps:

1. Choose a good spot for compost preparation, maybe a hole in the garden or use a big bin (the bin must have air holes).
2. Put all the brown (sawdust, dry leaves, twigs, etc.) and green (vegetable peels, plant trimmings, etc.) into the hole/ bin.
3. Water up the material. It is important to keep the mixture moist throughout the process.
4. Mix up the material. Keep mixing it on a regular basis (ideally once in two weeks).
5. Keep the mixture covered with a scrap of thick cloth, bin lid or top it up with garden soil. It is important to retain heat in the hole/ bin.
6. Once ready, mix the compost with your garden soil and plant a beautiful seedling on it.

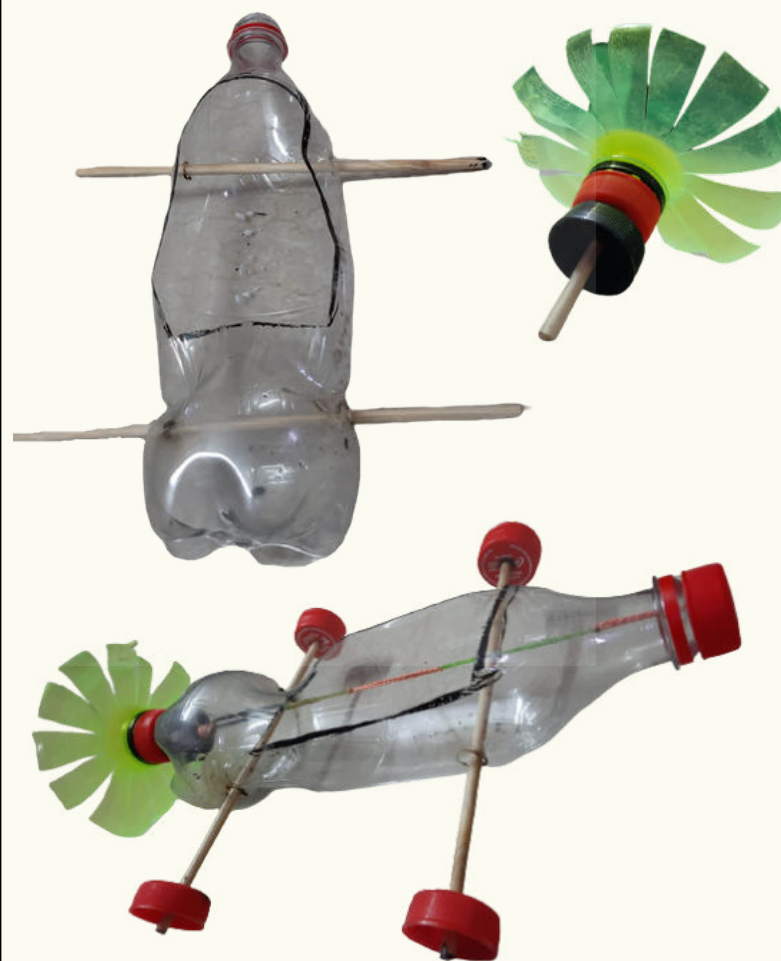


Things going in a compost: Vegetable - fruit peels, eggshells, coffee grounds, used tea leaves, wood chips, sawdust, hair, shredded paper, nut shells, herbivore animal manure, hay, straw.

ELASTIC BAND POWERED PLASTIC BOTTLE CAR

Things you need:

- Plastic bottles (2)
- Bottle caps (6)
- Matchsticks (1)
- Fevicol (1)
- Marker Pen (1)
- Rubber Bands (5/6)
- Sticks (3)
- Paper Cutter (1)



Steps: -

1. A portion is marked on the bottle and subsequently cut off by the paper cutter.
2. 4 holes are made on the bottle and the sticks are inserted to form the axle of the wheels.
3. Holes are also made on the bottle caps and joined together with the sticks by Fevicol to form the wheels.
4. The top of the other plastic bottle is cut off and shaped to form a propeller.
5. A hole is made on the other bottle cap and glued with the stick. The rubber bands are joined with the stick in a manner to provide the elastic momentum.
6. A hole is made on the bottom of the bottle and the stick is inserted.
7. The propeller is finally joined at the end and the elastic band powered plastic bottle car is formed.



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