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Single Use Plastics- Its Impact and Sustainability

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Abstract

Plastic pollution is used to compromise the safety of our food supplies, soils, water and wildlife. Globally, only nine percent of all plastic waste ever produced has been recycled. About 12 percent has been incinerated, while the remaining 79 percent has accumulated in landfills, dumps or the natural environment. India generates 95 lakhs tonnes plastic waste per year of which 38 lakhs tonnes is uncollected *i.e.* Single Use Plastics (SUP), ended in dumps, rivers and even our animals. Mismanagement of Single Use Plastics (SUP) shows environmental, economic and health impacts. Globally, a number of countries have taken up initiatives to ban Single Use Plastics in Phase out manner. In India, a massive community mobilization for Plastic Waste Shramdan and banning of Single Use Plastics has been organized under “Swachhata Hi Sewa” program in 2019-2020. Glass, paper and cardboards can be used as alternatives to plastics.

Introduction

Plastic is usually synthetic and is usually made from petrochemicals like oils, natural gas and coal although some plastic can be made partially or fully from natural materials. It plays an important role in our daily life as a low cost manufacturing option. It is used to protect the food we eat, to keep the medical equipments clean, to make the planes and cars lighter to save the fuel and green house gas emissions. But plastics persist in the environment in some shape or form for hundreds of years. Plastic pollution is used to compromise the safety of our food supplies, soils, water and wildlife. Plastic production is expected to become double in the next 20 years and almost quadruple by 2050 based on current trends. It is also assumed that by 2050 there will be more plastic in our oceans than fish (WEF, 2019). Globally, only nine percent of all plastic waste ever produced has been recycled. About 12 percent has been incinerated, while the remaining 79 percent has accumulated in landfills, dumps or the natural environment.

Single Use Plastics (SUP)

Single-use plastic, often also referred to as disposable plastic, is commonly used for plastic packaging and includes items intended to be used only once before they are thrown away or recycled (UNEP, 2018). This single-use material makes up between 26 - 36 percent of the world's plastic and is designed for immediate disposal. Common types of avoidable or replaceable single-use plastic items include carry bags, plastic drinking bottles, plastic bottle caps, food wrappers, plastic grocery bags, plastic sachets, plastic wrappers for consumer goods, multi-layer packaging used for

food packing (e.g. chips packets), straws and stirrers, other types of plastic bags, and foam takeaway containers. Main polymers used for producing single-use plastics are HDPE, LDPE, PET, PP, PS, and EPS. Plastics may be of two types namely Thermoplastics and Thermosets.

Thermoplastics

These can be melted when heated and hardened when cooled. It can be reheated, reshaped and frozen repeatedly. The most common thermoplastics are Polyethylene Terephthalate (PET), Polypropylene (PE), Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), Polystyrene (PS), Expanded polystyrene (EPS), Polyvinyl-chloride (PVC), Polycarbonate, Polypropylene (PP); Polylactic acid (PLA) and Polyhydroxyalkanoates (PHA).

Thermosets

Upon heating these undergo a chemical change and create a three dimensional network. After they are heated and formed, these plastics cannot be re-melted and reformed. The most common thermosets are Polyurethane (PUR), Phenolic resins, Epoxy resins, Silicone, Vinyl ester, Acrylic resins, Urea formaldehyde (UF) resins.

Nowadays, a number of traditional used products have been replaced by plastics (Table 1).

Table 1: Replacement of traditionally used materials with plastics

Product	Previous packaging materials	Current packaging material
Milk, edible oil	Glass, metal	3 or 5 layer film pouches
Toiletries (soap / shampoos)	Paper or glass	Plastic pouches or films
Cement, fertilizer	Jute	PP/HDPE woven sack
Toothpaste	Metal	Plastic lamitube

Plastic Waste Production-Global Scenario

The world produces more than 400 million tons of plastics every year of which 36 % is used for packaging, 16% for building and construction, 14% for textiles, 10% for consumers and institutional products. In 2015, plastic packaging waste accounted for 47% of the plastic waste (UNEP, 2018) generated globally, with half of that appearing to come from Asia. While China remains the largest worldwide generator of plastic packaging waste (China, MoC, 2017), the USA is the largest generator of plastic packaging waste on a per-capita basis, followed by Japan and the EU.

Plastic Waste Production-Indian Scenario

The Indian plastics industry made a promising beginning during 1957 with the production of polystyrene. Nineteen sixties and seventies saw significant progress and the industry has grown and diversified rapidly. The industry spans the country and hosts around 50,000 processing units, over 2,000 exporters and employs about 4 million people across value chain. About 85-90 of these units are small and medium-sized enterprises employing bulk of human resources. India generates 95 lakhs tonnes plastic waste per year of which 38 lakhs tonnes is uncollected i.e. Single Use Plastics (SUP), ended in dumps, rivers and even our animals. About 6 lakhs tonnes of plastic waste enters sea annually.

Opportunities with Plasticulture

- Yield improvement upto 50-60%
- Water savings upto 60-70%
- Prevention of weeds growth
- Soil conservation
- Protection against adverse climatic conditions
- Fertilizer savings upto 30-40%
- Reduction in post-harvest losses
- Conversion of cold desert/wasteland for productive use

Impacts of Mismatched Single Use Plastics

If we do not change our consumption patterns and waste management practices, by 2050 there will be around 12 million metric tonnes of plastic litter in landfills and in the environment.

Environmental impacts: It contaminates soil and water, chokes waterways and exacerbates natural disasters. By 2050, an estimated 99% of seabirds will have ingested plastic.

Economic impacts: It causes economic loss in tourism, fishing and shipping industries. High cost of transport to centralized plant of lightweight foamed plastics is due to difficulty in recycling at local plants. Future costs of removal of accumulated plastic litter in the environment will be enhanced.

Health impacts: It blocks sewage systems and provide breeding grounds for mosquitoes, raising the risk of malaria transmission. It releases toxic chemicals and emissions if burned. Chances of food chain contamination will be more.

International Initiatives to Combat Plastic Waste Pollutions

Canada: In 2018, it introduced a regulatory ban on single-use bags of 50 microns or less. Some Canadian provinces incentivise recycling by collecting it for free and charging a

fee for the collection of each garbage bag.

USA: In 2016, a regulatory ban on disposable food containers made from expanded polystyrene and non-recyclable/compostable material. In 2018, it introduced regulatory ban on single-use plastic straws and stirrers (takes effect mid-2019).

UK: In 2018, it introduced regulatory ban on microbeads, cotton buds (Scotland only) and plastic straws, in addition to introducing a tax on single-use plastic bags.

European Union: In 2016, France introduced a regulatory ban on single-use plastic shopping bags. In 2017, the ban was expanded to include produce barrier bags. In 2018, EU adopted the first-ever European Strategy for Plastics in a Circular Economy. The strategy aims to eliminate plastic pollution and change the way plastic is produced and consumed in the EU. Member states will have flexibility in how targets are met. In 2019, EU Parliament approved a new law banning single-use plastic by 2021. Specific items the EU intends to ban include straws, plastic plates and cutlery, plastic balloon sticks, plastic cotton bud sticks, takeaway food containers and polystyrene cups.

India: In 2018, it announced a commitment to eliminate the use of all single-use plastic by 2020.

New Zealand: In 2018 a regulatory ban on single-use plastic bags (with handles) up to 70 microns. This includes biodegradable and compostable bags (takes effect mid-2019).

South Africa: In 2003, the Government of South Africa introduced a ban on single-use plastic bags less than 30 microns thick. The new regulation was combined with a nominal levy on retailers. After only three months the levy was reduced to partly because of the pressures from plastic-bag producers.

Ireland: In 2002, it introduced a tax on plastic bags at points of sale, known as the "Plas Tax".

Priority Actions to Minimize Single Use Plastics

- Improve waste management systems through segregation of sources, effective collection of the segregated waste, transport and storage, cost effective recycling of materials and less land-filling and dumping in the environment.
- Promote eco-friendly alternatives to phase out single use plastics by introducing economic incentives including tax rebate, research and development funds, technology incubation support, public-private partnerships, support project to recycle single use items and stimulate creation of micro-enterprises to drive job creation and economic growth.
- Educate consumers to make environment friendly choices like incorporation in school curriculums, awareness campaigns and public pressure to drive public and private sector decisions.

- Enable voluntary reduction strategies through promotion and adoption of reusable bags as alternatives to plastic bags and voluntary agreement between government and retailers/producers.

- Ban or introduce levies on the use and sale of Single Use Plastic items.

Indian Initiatives to Combat Plastic Waste Pollutions

Most of the states around 18 have banned plastic carry bags and selected states like Maharashtra, Tamil Nadu, Odisha, Madhya Pradesh have also banned 'one-time use and throw away plastic items' like cutlery, plates, cups, straws, etc. A massive community mobilization for Plastic Waste Shramdan and banning of Single Use Plastics has been organized under "Swachhata Hi Sewa" program in 2019-2020 through large scale for cleaning of public and tourist places, markets, statues, hospitals and bus stands.

11th September to 1st October 2019: Awareness generation across towns and villages, preparations for collection, disposal of plastic waste Shramdaan for general Swachhata.

2nd October, 2019: Nationwide shramdan for plastic waste collection and segregation.

3rd October-27th October, 2019: Recycling and effective disposal of the collected plastic waste.

States already banned on plastic products are listed below-

Himachal Pradesh: Non-biodegradable plastics bags and disposable plastic products.

Karnataka: Plastic bags.

Punjab: Single-use plastic carry bags and containers.

Haryana: Plastic Carry bags.

Kerala: Plastic bags <50μ.

West Bengal: Plastic bags <40μ and blanket ban in certain areas.

Sikkim: Plastic wrappers, plastic bags and disposable Styrofoam.

Delhi: All kinds of disposable plastics.

Maharashtra: Plastic carry bags, PET bottle (less than 200 ml), disposable items, decoration item.

Alternatives to Single Use Plastics

- Use of plastic alternatives such as glass, paper and cardboard.
- Converting plastic waste into polyfuel which is a high calorie fuel which is an alternative to Kerosene.
- Converting plastic waste into fertilizer which increases the yielding capability of crops.
- Converting plastics into electricity which is a good option

for our country with scarcity of electricity.

- Plastic waste added to bitumen in road construction has proved to extend life of road and improve quality.
- Using plastic waste as additive to furnaces in cement kiln and power plants should be mandated.
- Converting plastic waste materials into value added items.



Figure 1: Value addition of plastic juice bottle with dry orchid flowers

Conclusion

A Roadmap can be prepared while banning on single use plastics. Shifting to more eco-friendly alternatives may be a lengthy process. In the mean time, circular thinking and waste management systems can be strengthened to help in reducing plastic pollution.



Figure 2: Value addition of plastic mineral water bottle with epiphytic orchid cultivation

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