

# IMPACT OF PLASTIC ON ENVIRONMENTAL POLLUTION

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“Plastic are high molecular weight organic polymers which can be moulded into desired shapes by the application of heat and pressure”. Plastic waste is a major environmental and public health problem in India, particularly in the urban areas. Plastic shopping or carrier bags are one of the main sources of plastic waste in our country. Plastic bags of all sizes and colours dot the city’s landscape due to the problems of misuse and overuse and littering in India.

## INTRODUCTION

A living organism cannot live by itself. Organisms interact among themselves. Hence, all organisms, such as plants, animals and human beings, as well as the physical surroundings with whom we interact, form a part of our environment. All these constituents of the environment are dependent upon each other. Thus, they maintain a balance in nature. As we are the only organisms try to modify the environment to fulfill our needs; it is our responsibility to take necessary steps to control the environmental imbalances. Environmental pollution is defined as the undesirable change in physical, chemical and biological characteristics of our air, land and water. As a result of over-population, rapid industrializations, and other human activities like agriculture and deforestation etc., earth became loaded with diverse pollutants that were released as by-products.

Plastic that are made up of polymers having only aliphatic (linear) C atoms in their backbone chains. e.g.: poly propylene. Plastics that are made up of heterochain polymers contain O, N, S in their backbone chains, in addition to C. e.g.: poly carbonate. Plastic behaviour of polymers is influenced by their morphology (arrangement of molecules).they are either amorphous or crystalline. Most thermosets are amorphous, while thermoplastics may be amorphous or semi crystalline. Plastics are a range of synthetic or semi-synthetic polymerization products that can be molded into a permanent object having the property of plasticity. Plastic are found extensive industrial applications. Plastics having a variety of properties are available at present. They have low specific gravities, ease of fabrication, resistance to low thermal and electrical conductivities. Many plastics can take range of colour to enable them useful for decorative purposes.

Plastic is now a regular material that is being used on a daily basis. Plastic is everywhere either in the form of food containers, financial transactions (Debit/Credit cards, plastic money),Plastics are widely used in making electrical instruments, telephones, panelling for walls,instrument boards, automoblibile parts, lamps, goggles, optical instruments, household appliances, etc. Plastic materials dumped into the earth prevent the production of nutrients in the soil. Because of this, the fertility of the soil is reduced and affects the agriculture sector. When its persistence in the environment can do great harm. It causes immune and enzyme disorders, hormonal disruption leading to endocrinal disorders and even infertility and is also considered as carcinogenic (cancer). Not only human health, it dangerously effects other animal life and alters the environment (air,water and soil) sustainability causing hazardous pollution. plastic bag wastes contribute to blockage of drains and gutters, are a threat to aquatic life when they find their way to water bodies, and can cause livestock deaths when the livestock consume them. Furthermore, when filled with rainwater, plastic bags become breeding grounds for mosquitoes, which cause malaria. In addition, plastics take many years (20-1000) to degrade and hence pose a disposal challenge for controlling the plastic wastage effective monitoring and provide various guidelines there is also a need for better education and awareness around plastic waste.

Ethylene oxide, xylene, and benzene are some of the chemical toxins present in plastic, which can have hazardous effects on the environment. It is not easy to dispose it off, and it can cause permanent harm to living beings. Several additives found in plastic such as phthalates, adipates, and even alkyl phenols have been Recognized as toxic materials. Vinyl chloride, which is Used in the manufacturing of PVC pipes, is classified as a carcinogen

## USES OF PLASTICS TYPES:

Plastics are widely used in This Types

### 1: Polyethylene Terephthalate (PET)

One of the plastics you are most likely to come into physical contact with on a daily basis, depending on how it is Made PET can be completely rigid or flexible, and because of its molecular construction it is impact, chemical and weather resistant and a terrific water and gas barrier.

**Common uses of PET:** Soft drink, water, cooking oil bottles, packaging trays, frozen ready-meal trays, First-aid blankets, polar fleece.

## 2: High Density Polyethylene (HDPE)

Incredibly strong considering its density, HDPE is a solid material that can tolerate high temperatures and strong chemicals. One of the reasons that HDPE is used so regularly is that it can be recycled in many different ways and therefore converted into many different things.

**Common uses of HDPE:** Cleaning solution and soap containers, Food and drink storage, shopping bags, freezer bags, pipes, insulation, bottle caps, vehicle fuel tanks, protective helmets, faux-wood planks, recycled wood-plastic composites.

## 3: Polyvinyl Chloride (PVC)

Cost effective to produce and highly resilient to chemical and biological damage, PVC is easy to work with and mould into shapes; making it an extremely practical material. In terms of properties, PVC is one of the most versatile. It can be used to create rigid, lightweight sheets, like Foamex, but it can also be used to make faux-leather materials like leatherette and pleather.

**Common uses of PVC:** Signage, furniture, clothing, medical containers, tubing, water and sewage pipes, flooring, cladding, vinyl records, cables, cleaning solution containers, water bottles.

## 4: Low Density Polyethylene (LDPE)

At general living temperatures LDPE is a highly non-reactive material, which explains why it has become one of the most common plastics in use at the moment. It can withstand temperatures approaching 100°C, and though it is not as strong as HDPE (its high density counterpart), it is certainly more resilient.

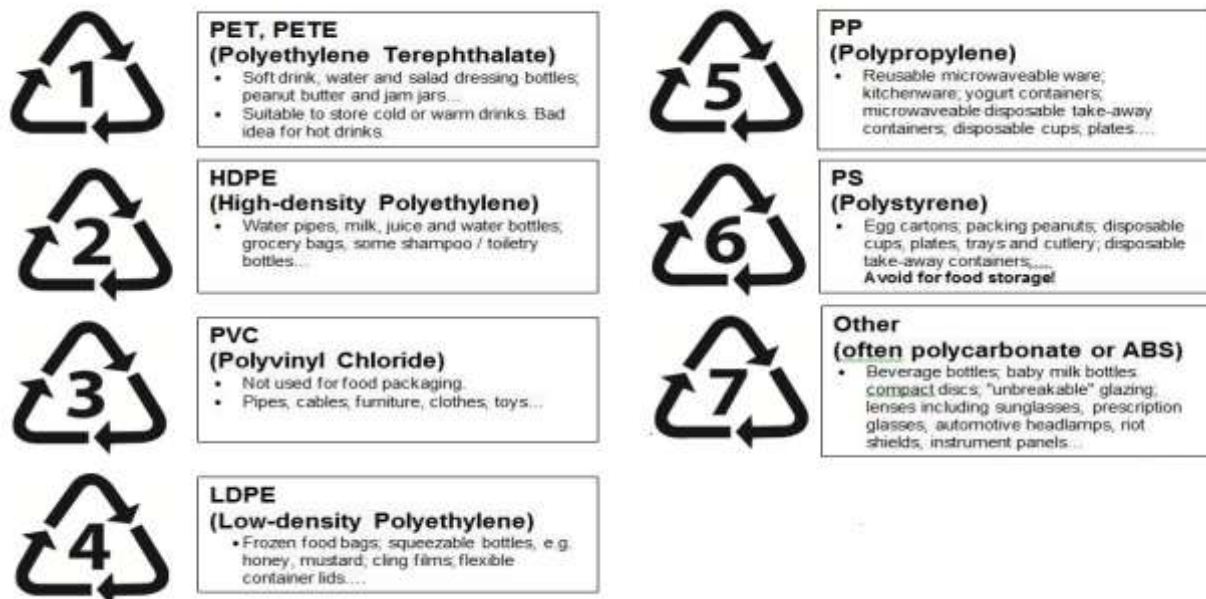
**Common uses of LDPE:** Trays, containers, work surfaces, machine parts, lids, '6-ring' drink holders, drink cartons, protective shells, computer hardware casings, playground fixtures (slides and the like), bin-bags, laundry bags.

## 5: Polypropylene (PP)

Strong and flexible, polypropylene is a very hard wearing plastic that, when melted, is one of the most effective materials for injection moulding. Having said that, it has quite a high tolerance to high temperatures, relative to other plastics, and is considered to be a food safe material.

**Common uses of Polypropylene:** Clothing, surgery tools and supplies, hobbyist model, bottle caps, food containers, straws, crisp bags, kettles, lunch boxes, packing tap

## RECYCLING SYMBOLS ON PLASTICS



## CAUSES

- As plastic is less expensive, it is overused. When it is disposed of in landfill sites, it does not decompose at a fast rate, and hence pollutes the land or soil in that area.
- Most people tend to throw plastic bottles and polythene bags away, even after a single use. This drastically increases its pollution rate on land as well as in the oceans, mainly in the developing and underdeveloped countries.
- Plastic bags, plastic bottles, discarded electronic components, toys, etc., clog the water bodies like canals, rivers, and lakes, especially in the urban areas.
- Every year, about 100 million tons of plastic are produced all over the world. Out of this, 25 million tons of non-degradable plastic gets accumulated in the environment.
- Out of the entire quantity of solid municipal wastes in the world, about 20% consists of plastic and associated harmful polymers..

**EFFECTS**

- a) The rural areas are more prone to this type of pollution and the related effects, as a majority of the people from these areas use plastic on a large scale.
- b) Many stray animals end up eating plastic bags and bottles due to improper disposal systems, and this can cause their death.
- c) During the rainy season, the plastic rubbish that has fallen on the road gets washed away into the nearby water reservoirs, canals, and drains, leading to their choking up and overflowing. Also, the water quality gets spoiled due to the addition of these synthetic materials.
- d) When dumped in landfills, plastic materials interact with water and form hazardous chemicals. If these compounds seep down towards groundwater aquifers, they degrade the water quality, leading to groundwater pollution.
- e) Plastic pollution in marine water bodies leads to innumerable deaths of aquatic animals, and this also affects the aquatic plants to a considerable degree.
- f) Blockage due to plastic accumulation may form shelters for the breeding of mosquitoes and other harmful vectors insects, which might cause numerous diseases in humans.
- g) The quality of drinking water on our planet is deteriorating, as plastic releases some toxic chemicals such as Styrene Trimer, Bisphenol A, and a by-product of Polystyrene. These products are worsening the drinking water situation with every passing day. Bisphenol A is a harmful chemical that damages the reproductive system of animals.
- h) Bio-accumulation of plastic inside animals is one of the most recent effects of plastic pollution. Over many years, the accumulated plastic releases harmful chemicals, and also breaks down into small pieces, causing extreme discomfort to the animals. After their death, the body might decompose, but the plastic fragments may remain as a threat to other animals.
- i) Wind carries and deposits plastic from one place to another, increasing the land litter. It also gets stuck on fences, trees, towers, buildings, etc., and any animal that comes in its vicinity might even get tangled and suffocate to death.
- j) Burning plastic leads to contamination of the atmosphere, due to the release of poisonous chemicals, leading to air pollution. Recycling requires laborers, who are at the risk of developing skin and respiratory problems due to inhalation of toxic chemicals

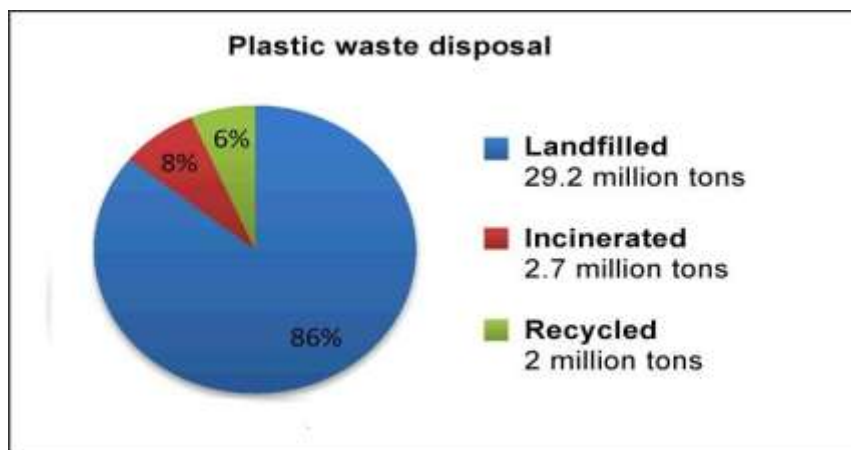
**PLASTICS, HUMAN HEALTH AND ENVIRONMENTAL IMPACTS**

Plastics have been with us for more than a century, and by now they're everywhere, for good and for ill. Plastic containers and coatings help keep food fresh, but they can also leave behind neurotoxins such as BPA in the human body. PVC is used for everything from pipes and flooring to furniture and clothes, but it contains compounds called phthalates that have been implicated in male reproductive disorders. Studies have also shown that childhood exposure to environmental pollutants can have significant negative effects later in life, including reduced labor force participation and even earnings. To reduce plastic waste and negative effects, recycling programs have been implemented in many parts of the world, but remain underutilized. Much is due to the nature of plastic itself, which often can only be "downcycled" rather than recycled — a torn plastic bag might eventually be transformed into a lunch tray, but it will never be a plastic bag again. Many cities and states have begun more serious efforts to restrict their use, but the subject remains a matter of considerable debate. While plastics also contain substantial energy, the vast majority ends up in landfills. Immense quantities of plastic are also sent to the developing world together with e-waste, where "recycling" frequently involves open-air burning.

Most plastics per se have some impact on human health to a greater or lesser extent. Specific chemicals that have raised serious concern as causing potential harm to humans are phthalates (Diethylhexyl phthalates – DEHP), BPA (Bisphenol A), and heavy metals such as lead, cadmium and mercury (albeit plastics is a small source of such metals to our environment). The toxins leach into our environment over the service life of the plastic object and we unknowingly "consume" them through direct contact with plastic or through food that has been exposed to plastics. Additionally micro-plastics in the oceans attract certain chemicals such as persistent organic pollutants (POPs) such as DDT which become ingested by fish, accumulate through the food chain, and end-up consumed by us

These toxins are ubiquitous in our environment: 95 Percent have detectable levels of phthalates in our urine ( Huffington Post), while a 2011 study that investigated the number of chemicals pregnant women are exposed to in the world. Found BPA in 96% of women (Wikipedia on BPA). While heavy metals such as mercury are found at such levels in certain fish and shellfish that Pregnant women and children are recommended to only eat restricted amounts (US EPA). Depending on the Toxin in question health implications include cancer, such as breast cancer, endocrine disruption (influencing how are hormones function), impacts on the nervous system and mental development, behavioural issues such as ADHD and allergies





### HAZARDS DUE TO PLASTIC

- I. **Littering of the landfills** and other open spaces with plastic garbage becomes unhygienic and ugly, Once they are used, most bags go into landfill, or rubbish tips. Each year, more and more bags are ending up littering the environment. Once they become litter, plastic bags find their way into our waterways, parks, beaches, and streets. And, if they are burned, they infuse the air with toxic fumes.
- II. **Littering of plastics** in the form of plastic bags causes blocking of the cities, municipalities sewerage systems leads to spreading of water borne diseases and increasing the cost of sewage maintenance systems.
- III. **Soil fertility is also affected due to plastic material** as it forms part of manure remaining in the soil for years without natural degradation.
- IV. **Death of animals** due to suffocation, stomach and intestine related diseases is a common feature mostly in developing economies due to improper disposal of plastic food bags that are eaten by animals and killed every year due to these bags. Many animals ingest plastic bags, mistaking them for food and therefore, die. And worse, the ingested plastic bag remains intact even after the death and decomposition of the animal. Thus, it lies around in the landscape where another victim may ingest it.
- V. **Plastic waste is finding its way into the rivers, oceans and seas** of the world due to which the rich marine life is facing serious health hazards. Marine animals like fish, sea birds, otters and other marine species are swallowing these plastic wastes as food items that are leading to a premature death of these precious marine species.
- VI. **Pollution of environment by industries** manufacturing the plastic materials is another serious issue that is facing the environmentalists and the governments globally. The manufacturers of plastic materials are polluting the environment by disposing of the plastic waste and chemicals used in the process of manufacturing plastic material into nearby water channels and open spaces thereby causing health hazards as well as environmental pollution in a vast area.

### RECYCLING

Plastic recycling is the process of recovering scrap or waste plastic and reprocessing the material into useful products. Since the vast majority of plastic is non-biodegradable, recycling is a part of global efforts to reduce plastic in the waste stream, especially the approximately eight million tonnes of waste plastic that enter the Earth's ocean every year. This helps to reduce the high rates of plastic pollution.

Compared to other materials like glass and metal, recycling of plastic is expensive and complex. This is due to the high molecular weight of the large polymer chains that build the plastic material. Heating plastic doesn't dissolve the polymer chains and hence a tedious and complex process is essential. Different types of plastic cannot be mixed together because they phase separate. Such a resulting melting product cannot be recycled to make another plastic product. While making plastic products many fillers like dyes and other additives are used. These fillers cannot be separated from the plastic using inexpensive techniques.

### ADVANTAGES OF RECYCLING:

1. **Recycling minimizes pollution-** All forms of pollution in the modern world emanate from industrial waste. Recycling of these industrial wastes such as plastics, cans, and chemicals go a long way towards considerably cutting back on levels of pollution because these waste products are reused rather than just being thrown away recklessly.
2. **Protects the environment-** The great benefit of recycling waste material is that it plays a big part in protecting Mother Nature in the most balanced way. While many trees are felled every day, recycled paper manufactured from specific trees is continually utilized to reduce deforestation. This classical example demonstrates that other natural resources can be recycled and made useful this way to conserve the environment.
3. **Recycling minimizes global warming-** It is perfectly true that recycling minimizes global warming and its grave impacts. During waste disposal, huge amounts of waste are combusted that lead to emission of vast greenhouse gases such as carbon dioxide, sulfur, and nitrogen, which contribute to climate change and global warming. Recycling

process involves minimal combustion and waste is transformed into reusable materials with zero or minimal harmful impact on the environment. The whole process of processing and manufacturing products from waste materials emits few greenhouse gases because the very waste recycling industries burn little fossil fuels.

4. **Conserves natural resources-** If the process of recycling used and old materials was not there, it means new products will be manufactured by extraction of fresh raw materials underneath the earth through the process of mining and extraction. Recycling is a surefire way of conserving existing raw materials and protecting them for future use. Taking steps to conserve natural resources like minerals, water and wood ensures sustainable and optimal use.
5. **Recycling cuts down amount of waste in landfill sites-** Recycling old and used materials into reusable products enormously reduces the possibility of choking of landfill sites. This is beneficial because it helps minimize land and water pollution since landfills contribute mightily to environmental degradation.
6. **Recycling ensures sustainable use of resources-** Recycling guarantees that existing resources will be used sensibly and sustainably. The recycling process alleviates the possibility of discriminate use of raw materials when they are obtainable in huge supply. Governments these days have stepped in to encourage recycling from lower levels, for instance, schools, small-sized organizations and also at global levels. This means that manufacturing industries can leave existing natural resources for exploitation by our children in the future without affecting current production.
7. **Recycling contributes to creation of employments-**the benefits it brings to the environment; recycling opens up job opportunities. Recycling means many recycling plants will be set up, thus, leading to a long chain of collection and delivery. All these activities are performed by humans, so this will trigger an explosion of opportunities.
8. **Reduces energy consumption** - A lot of energy is used to process raw materials in the course of manufacture. Recycling plays a big role in reducing energy consumption, which is vital for large-scale production, for instance, mining and refining. Recycling also renders the whole process of production less expensive, which is a great victory for manufacturers.

### **CONCLUSION:**

Today India and world facing a problem with the plastic pollution. control the plastic pollution Effective policy requires effective monitoring and the current state of plastic waste monitoring needs harmonization, which is being put into place by various guidelines on plastic debris in general. To raise public awareness, the regional and national different levels of educational curriculums must include the waste management systems. There is also a need for better education and awareness around plastic waste. Plastic footprints and labeling on products are possible but need the appropriate education to make them meaningful. Alongside this there could be labelling of products that contain known harmful additives. Banning of some harmful chemicals contained in plastic, such as Bisphenol A and some phthalates, has already occurred, but for others restriction may have to be voluntary. A harmonised industry-wide effort is needed to communicate information about chemicals used in plastic, alongside public education about the chemicals. In terms of addressing existing problems with plastic waste the identification of plastic waste 'hotspots' may prove useful. This can be done by monitoring or by some forms of modeling.

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