



# Eco-Friendly Substitutes for Plastics

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## Abstract

This paper discusses about the menace caused by the use of Plastics with reference to the Indian context. It also discusses the green alternates to plastics, the problems in implementation of a ban on Plastics and a solution for smooth transition from Plastics to green alternates.

**Keywords:** Alternate materials; environment; green; plastics

## Introduction

Plastic is a semi-synthetic or synthetic organic polymer. It can be made from different organic feed stocks, but the majority of industrial plastic is manufactured from petrochemicals. There are two types of plastic, thermosets which harden into an enduring shape, whereas thermoplastics they can be heated and remolded many, many times. Lot of additives like colorants, plasticizers, fillers, stabilizers, and reinforcements are used while making these plastics. The specific properties of any plastic depend on these additives. Examples of plastic, PET - polyethylene terephthalate, HDPE - high-density polyethylene, PVC - polyvinyl chloride and PS - polystyrene, these are among the different plastics that are used. Leo Baekeland was the first person who made plastic, and it is named as Bakelite in the year 1907. Since that time lot of work has been done and lot of plastics have been introduced [1].

Out of 62 million tons of waste that is generated in India from the cities per year, plastic accounts for 5 million tons. Delhi produces 689 tons of plastic per day; Chennai produces 429 tons per day, and Mumbai 408 tons per day. As far as the states are concerned, the state of Maharashtra produces 0.46 million tons per year, Gujarat comes second, it produces 0.26 million tons per year, and Tamil Nadu 0.15 million tons per year. Plastic is found everywhere. We use the plastic items, and we throw them around. In any vacant land, we find this plastic lying. Although we may have dumpsters, the capacity is not sufficient, and then many times they are overflowing dumpsters with a lot of plastic around. Lot of this plastic also has food particles sticking to it, so the animals try to eat that food and along with the food these animals are also taking plastic into their stomachs. After some post-mortems in certain places it is found

that many animals like deer, elephants have a lot of plastic inside their stomachs, which may be the cause for their death. We also find plastics lying on the beaches, especially the beaches in the South India on the Eastern Coast. Some of these plastics actually it is not just thrown by the people, it actually washed ashore from the sea. Plastic is ubiquitously found in every shop. This plastic, which is choking these drains, will not let flood waters flow very easily and then many times even a small amount of rain can cause local flooding because of this plastic in the drains [2]. Plastic is also present in the oceans. A typical or famous example is large amounts of plastic found in the Pacific Ocean. Oceans have become garbage dump yards. In between the United States and Japan, in the northern Pacific Ocean there is a patch of plastic. Plastic finds its way into the oceans [3,4]. First, it gets thrown and then from small, small drains it goes into the rivers. There is an example of Adyar River in the city of Chennai, where there is a lot of plastic in the river itself. So, from the drains, it goes into the rivers, from the rivers it goes to the sea, and then again from the sea it comes back to the beaches.

## Environmental Concerns with Plastic

First, there are emissions during manufacturing. Then there is a dumping of this plastic on land making it very infertile. This plastic reduces the porosity of the soil medium and then will not let water flow very easily in sub surface and can lead to infertility of the soil. In many developing and underdeveloped countries plastic is burnt. This burning generates toxic emissions such as carbon-monoxide, dioxins, etc among other toxic gases. We also add a lot of additives while making this plastic and these additives are toxic, and many times they are also can leach out. There are severe disposal

problems for this plastic; many times we do not have enough places where we can dispose plastic in a scientific way. Then there is a problem of sub-standard plastic, the sub-standard plastics are very thin plastic, there is a problem in collection, and there is a problem in recycling. So because of this some plastic maybe left with other garbage or sometimes this plastic is also found along with the biodegradable waste, which one would like to, use it for making compost. So, it is interfering with our waste processing facilities. And these waste in some places where proper monitoring is not present, it is encouraging unsound recycling processes [5,6]. So, in many countries, there is a need for banning the use of use & throw plastics. For example, Bangladesh, China, Denmark, Kenya, Rwanda, and many states in the USA have already banned the use of the use and throw plastics. Both developed countries and developing countries across the world are finding the need to ban the use of this plastic. In India more than 18 states have banned one time use of plastics and particularly the use and throw plastic items such as plates, cups, spoons, and other cutlery, carry bags, banners made of plastic, and material used for making packaging for food which is take away food from the restaurants, water sachets. Now, before we ban these daily use items made of plastic, we need to find alternative materials. Otherwise, implementation of the ban on plastics would not be effective. So, there are many alternative materials which are available.

### Alternate Materials

Carry bags made of jute, which is a biodegradable material can be used and we also have cutlery these days being made out of biodegradable material. We have spoons, forks, knives etc., we can make out of biodegradable material, we don't have to use plastic spoons and plastic knives. Lot of people are now using the plastic carry bags. So, there many alternative materials like paper, leaf products like banana leaf and leaves of many other trees can be used making, can be used for making plates, cups, etc. Then we have biodegradable bags which are made of starch, one can use cloth bags and jute bags for carrying the material instead of using plastic carry bags. In edible cutlery we can use the spoon and then we can eat the spoon too, this edible cutlery is being made from dough, coconut shells, kora grass etc. can be used for making many items. Then we can use earthen ware in many parts of the northern part of India, in fact, the earthen cups are used for serving tea and coffee. Other materials like glass, stainless steel are always there for making the items or products. Bamboo also can be used for making many products which are right now made using plastic.

When we introduce alternatives, we have to see the advantages and disadvantages. Like paper products, are suitable for making plastic bags, for replacement for plastic bags, plastic plates, and plastic cups. The small vendors can sell these items because they are not very costly. Consumers while carrying things from home they can be used for carrying lighter and dry things. Advantageous are they are recyclable, they are compostable, they are easily made, easy to carry, easily available, and the cost is not very much. But if we have to make many, many products out of paper, then will be cutting a lot of trees. And the process of recycling consumes a lot of

energy and paper bags do not have that much of strength, and they cannot carry liquids [7].

Similarly, leaf products can be used for making items which are replacement for plastic plates, plastic cups, and plastic bags from consumers end. And again, they can be used by small vendors and consumers while carrying things from home. They are also recyclable, compostable, they are easily made, easy to carry, easily available, they are sometimes costly, and they also cannot carry hot items and liquids. So, like this when we introduce alternative materials for items made of plastic, we have to weigh the advantages and disadvantages. Cost is one of the main factors and where we can use them is another important factor. Earthen products can be used as a replacement for plastic plates and plastic cups. But they are relatively costly, they are recyclable, reusable and compostable, but they are relatively costly, approximately a teacup cost around 3 rupees per piece as of now. We can also use bamboo products, again they are recyclable, reusable and compostable, but they are also relatively costly. A bamboo plate cost anywhere from 4 to 8 rupees per plate depending on the size and the bamboo basket costs around rupees 50 for a medium sized basket. So, when we introduce these new materials as an alternative to plastic we have to think about the cost of it, whether the small vendors will be able to stock them up and then sell them, whether the users are willing to pay that extra cost, if we banned the plastic and then introduce these items. These are some of the issues that one has to think seriously while implementing the ban on the plastic items [8].

### Conclusion

So, there are many worries for the governments planning to implement this ban on the plastics. First thing is people should change their life styles and that is a very big issue. If the people are not willing to change then it becomes very difficult to implement the ban. Alternatives are costly, definitely costlier than the plastic items, and so vendors especially small vendors or marginal vendors are afraid of losing their business. Because if the ban is not implemented uniformly then they are afraid that other shopkeepers who are carrying plastic bags or plastic items would be having all the business. Another important issue is at each locality we may not be able to find out appropriate alternatives based on the locally available material. Coordination between many stakeholders is needed when implementing ban on plastics. Particularly in some of the countries, this could be an issue, coordination between many stakeholders between the implementing agencies like government or monitoring agencies or manufacturers, the vendors, the users, coordination between all these different stakeholders could be a problem.

Manufacturers of alternative products, they are coming new into the market, so they expect some sort of support, financial support either in terms of low interest rate, loans, or subsidies etc. They expect some sort of support from the government. When we implement this ban, initially there will be protest from manufacturers and vendors, and there will be lobbies of manufacturers, would, who would lobby with the government for delaying this ban or diluting the rules for the ban, then

implementation of the ban by the government itself could be difficult because of availability of manpower for implementation [9]. They may not have enough people who can go and then implement this ban, in terms of, know, monitoring, in terms of finding the people who are violating the ban. Then the availability of manpower for implementation and there is also the government has to think very carefully regarding delegation of authority for implementation. We have to create new manufacturers because current levels of productivity are not sufficient to meet the demand that would be there for the alternative materials once there is an implementation of the ban. The, as mentioned earlier, the biggest hurdle would be changing the mind-set of people who got used to using these plastic items [10]. So, one has to design an effective information campaign, information, education and communication programs, they have to be innovative, and they have to be effective.

## References

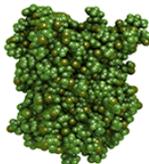
1. He d, Luo Y, Lu S, Liu M, Song Y, et al. (2018) "Microplastics in soils: Analytical methods, pollution characteristics and ecological risks". *TrAC Trends Anal Chem* 109: 163-172.
2. Karthik R, Robin RS, Purvaja R, Ganguly D, Anandavelu I, et al. (2018) "Microplastics along the beaches of southeast coast of India". *Sci Total Environ* 645: 1388-1399.
3. Lebreton L, Slat B, Ferrari F, Sainterose B, Aitken J, et al. (2018) "Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic". *Sci Rep* 8: 1-15.
4. Lorenz C, Roscher L, Meyer MS, Hidebrandt L, Prume J, et al. (2019) "Spatial distribution of microplastics in sediments and surface waters of the southern North Sea". *Environ Pollut* 252: 1719-1729.
5. Abbasi S, Soltani N, Keshavarzi B, Moore F, Turner A, et al. (2018) "Microplastics in different tissues of fish and prawn from the Musa Estuary" *Persian Gulf. Chemosphere* 205: 80-87.
6. Agm C, Thomas CR, Kle B, Motti CA, Arieil E, et al. (2018) "Ingestion of microplastic debris by green sea turtles (*Chelonia mydas*) in the Great Barrier Reef: Validation of a sequential extraction protocol". *Pollut Bull* 127: 743-751.
7. Alimi OS, Farner BJ, Hernandez LM, Tufenkji N (2018) "Microplastics and nanoplastics in aquatic environments: Aggregation, deposition, and enhanced contaminant transport". *Environ Sci Technol* 52(4): 1704-1724.
8. Sastry SVAR, Murthy ChVR (2013) "Sustainable Energy for Eco-Friendly Development". *i-manager's Journal on Future Engineering and Technology* 8: 1-8.
9. Sastry SVAR, Rao KV (2018) "Perspectives on the Drop in Carbon Intensity through Industrial Green Transformations ". *Austin Journal of Biotechnology & Bioengineering* 5(1): 1092.
10. Sastry SVAR, Murthy ChVR (2012) "Management of e-Waste in the Present Scenario". *IACSIT International Journal of Engineering and Technology* 4(5): 543-547.

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