

Plastic Bags: A Menace, Addressing the Socio-Economic and Environmental Concerns Due to Plastic Bag Pollution

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ABSTRACT: Use of plastic bags to carry grocery items has increased rapidly over the past two decades. It increases the ease of shopping, however since the bags are generally littered off after use they cause severe havoc to the environment. These used plastic bags fly all around and block the drains, find their way into the rivers, oceans and seas thereby polluting the water, land and soil. The blockage of drains and other water channels leads to flooding. This paper seeks to analyse the extent of usage of plastic bags, their environmental impact and also suggests ways and methods to mitigate this problem.

I. INTRODUCTION

The usage of plastic bags to carry groceries and other goods is believed to have started as early as 1970s (Clapp & Swanton, 2009), however these bags gained popularity in the last quarter of 20th century (Sugii, 2008). Although accurate statistics regarding the production of plastic bags is not available but, over trillions of plastic bags are being used worldwide every year (Miller, R.M., 2012). As these bags are very cheap, strong, lightweight hence they have gained great popularity among shopkeepers and consumers as modern means of carrying goods.

With increase in population, the numbers of shops, markets, malls and vegetable vendors in pavement areas in big cities are also increasing in a galloping speed. Thus while returning home from offices, business places-people prefer to purchase daily requirement products and vegetable in single used plastic carry bags. Thus the consumption as well as the disposal of plastic related products are increasing day by day. However these modern sources of convenience are causing great environmental degradation. (Sugii, 2008).

These plastics bags are disposed off after usage and they find their way everywhere, into the water bodies, the rivers, oceans and seas, They even reach upto the ocean beds, into the land, into the landfills, agricultural lands thereby posing threat to aquatic life and contaminating the land and underground water sources through leaching. These plastics bags are swallowed by animals like cows, sheep, goats and in oceans and seas by turtles and other aquatic species leading to their suffocation and death. (Thiel et al, 2003; UNEP, 2005).

II. ENVIRONMENTAL IMPACT OF PLASTIC BAGS

There are some serious effects of plastic bags on the environment as they take many years to decompose. Some major adverse impacts of plastic bags on the environment are as follows:

1. Plastic bags are non biodegradable: Plastic bags take thousands of years to decompose in a landfill. Their decomposition under the effect of sunlight leads to the release of toxic chemicals into the soil
2. Death of animals : Plastic bags are believed to kill nearly 100,000 animals annually. These animals mistake these plastic bags for food and ingest them. Plastic then accumulates in the body of the animal and causes its death and sometimes also leads to death due to choking .
3. Harms wildlife and plant life: The animals die not only due to ingestion of plastic waste but plastic bags being light fly everywhere with the wind and finds its ways into the forests as well. Small animals like squirrels get entangled in these bags and die. Moreover plastic bags also entangle in the trees and cover the leaves and branches interfering with their photosynthetic process.

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4. Plastic bags are made of petroleum products: Plastic products including plastic bags cause the depletion of valuable resources of the earth as their production requires 60-100 barrels of oil from the world's petroleum reserves.
5. Release of toxic chemicals: Plastic bags on decomposition in sunlight lead to the release of plethora of toxic chemicals into the soil and if burnt they release toxic substances into the air thereby polluting the ambient air. Plastic bags in landfills also release carcinogenic substances (Simons 2008).
6. Pollution of groundwater: The plastic bags in landfills and other water bodies release toxic chemicals that leach into the ground and pollute the groundwater. These chemicals then reach our body through the plants which absorb this groundwater. Groundwater generally considered to be safe for drinking on being contaminated with toxic substances affect humans adversely.
7. Release of toxic chemicals during plastic manufacturing: Many neurotoxic, carcinogenic and hormone disruptive chemicals are released during the manufacturing process of plastics and sometimes they are released as by products.
8. Blockage of drainage system: Plastic bags get accumulated in the drains and block the drainage system. This leads to disruption of water drainage and also leads to floods. If during rainy season the drains and water exit channels are blocked due to plastic bags then water will not be able to flow to its final destination leading to flooding of the city areas. Blockage of drainage system by plastics was the primary cause for the Mumbai 2005 floods which killed thousands. Floods due to clogging of drainage system also affected countries like Bangladesh , Manila and several other countries..
9. Plastic bags are the main cause of ocean and sea pollution: Plastic bags are responsible for the pile of massive plastic debris in the oceans. This pollutes the ocean water, kills aquatic life and disturbs the aquatic ecosystem. A report of the Ellen MacArthur Foundation's The New Plastic Economy report points out that over 8 m tonnes of plastic finds its way into the oceans and this is equivalent to throwing one truck garbage every minute into the sea.
10. Plastic bags expose children to lung complications: Bisphenol-A is a chemical compound used in the manufacture of plastic bags, the usage of plastic bags for food articles contaminates it. According to World Health organization, when pregnant women are exposed to high concentrations of phthalates and BPA, they may give birth to children with lung complications. It has been found that such children have a high risk of developing asthma and also have increased insulin resistance and high blood pressure. Studies conducted at the New York school of medicine have shown the outbreak of obesity , diabetes, kidney and heart complications.
11. Can affect reproduction in women: BPA and few other chemicals used in manufacturing plastic bags act in the same way as oestrogen. Therefore in the long run they may affect the hormonal balance in women leading to disturbance in the reproduction cycle.
12. Risk of prostate cancer in men: BPA and phthalates are also associated with development of prostate cancer in men.
13. Disruption of food chain: Animals and plants at different stages of the food chain get affected adversely by plastic bags , some are even killed due to plastic bag pollution , this leads to the disruption of the natural food chain.
14. Microplastics- the invisible threat: Plastic on breakdown produces small particles of plastic called microplastics which find their way into soil, waterways, wildlife habitats, etc. less than 1% of the plastic bags are collected and recycled.
15. Decomposing plastics causes greenhouse gas emission: Plastic bags on decomposition produces greenhouse gases like sulfur dioxide, carbon monoxide and poisonous gases like toluene, benzene, xylene and hydrogen sulphide and all these once again harm the environment.
16. Hidden cost of plastic clean up: Plastic bags have gained popularity as they are cheap, easily available and relieves the consumer of carrying jute or cloth bags however the cost of cleaning plastic bags from the environment is very high and the taxpayers money goes into it.

III. STEPS TO CURB PLASTIC BAG POLLUTION

Plastic bags are a menace to the environment not because the bags are a nuisance but because the major problem lies in the fact that the ragpickers or kabadiwallahs do not collect plastic bags as it is not economical for them to collect these bags as a result of which the bags litter all around. The Government has taken some strict steps to curb the menace of plastic bags. Various rules have been laid down from time to time .The Plastic Waste (Management and Handling) Rules 2011 specifies that the minimum thickness of plastic bags should be of 40 microns as opposed to the previous 20 microns specified by the plastic Manufacture, Sales and usage Rules 1999. This is primarily because the thickness of

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the bag determines the strength of the bag to break it to smaller pieces. The thinner the bag the higher is the probability of its breakdown and mixing with the soil which seriously deteriorates the soil and marine fauna.

These rules were further modified to curb the menace of plastic bags still further with the introduction of Plastic Waste Management Rules 2016(PWM 2016) where the government has banned the production and usage of plastic bags of less than 50 microns thickness. There are two primary reasons for increasing the thickness of plastic bags. First is that the cost of thick bags is more(A 40 micron bag costs around Rs 2 as opposed to 10 paise for a 10 micron bag) and this increased cost would reduce production and second is that thicker bags are easily collected by ragpickers and brought for recycling. It is also proposed that plastic bags should not be made available free of cost to the consumer.

IV. WASTE TO WEALTH

Plastic bags and other plastic products can be reused and recycled in a number of ways

1. Fuel from Plastics : Polythene bags are nothing but polymers of carbon and hydrogen. Technologies are available where these long chain polymers can be converted into liquid fuels by the process of pyrolysis [15].The hydrocarbon fuel is in the range of Light Diesel oil (LDO) and can be used in boilers, transformers, generators, etc. Gross calorific value of the fuel is around 10,500 cal/G
2. Reducing agent in Blast furnace for production of iron: Plastic waste can be used as a reducing agent in the manufacture of iron from its ore. A steel manufacturing facility with a production capacity of 3 million tons per annum, can consume 600,000 MTs of plastic waste. Japan is the world leader in implementing this process in various steel plants in their country.
2. Coprocessing in Cement Kilns: Plastics can also be used as an alternative fuel in cement kilns. Out of nearly 170 cement kilns in different zones nearly 150 can use plastics as fuel. Even if each cement kiln replaces 10% of coal with plastic waste more than half a million tons of the country plastic waste can be disposed off scientifically and also helps in saving close to one million ton of coal (for every ton of coal about 0.6MT of plastic waste is sufficient because of the high calorific value of plastic).
3. Incineration for energy recovery: Plastics can be incinerated to produce energy which can be used for electricity generation.
4. Use of plastics in construction of asphalt road: Plastic bags can be mixed with the road construction material .Such roads have been constructed in many parts of the country. Since plastics are polymers they bind these particles together and such road have greater strength and are more resistant to formation of potholes. For 1 km long and 7 feet wide road, 1MT of Plastic Waste is used with 9MTs of Bitumen in the bottom layer.

V. CONCLUSION

It is true that plastic bags are very convenient to use and that is the reason why their use has increased rapidly in current years .It is also true that plastic bags cause a lot of pollution and are very harmful for the environment but research also shows that as compared to paper bags or jute bags it requires lesser energy to produce plastic bags, the production and usage of paper bags results in unscrupulous felling of trees. The plastics bags can be used in a number of ways – to produce fuel, as fuel in cement industries, for construction of road, etc but the greatest challenge is the collection of plastic bags as the ragpickers are unable to collect plastic bags due to the fact that it is uneconomical to collect these bags. Government has introduced various rules from times to time banning the production and use of plastic bags of less than 40 micron thickness. Strict implementation of these rules will bring the plastic bag waste to recycle and it will be possible to curtail the menace due to plastic bag pollution.

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