

Chapter 1

Plastic Pollution and Its Effect on the Environment

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ABSTRACT

Chlorinated plastics releases harmful chemicals and toxic substances into the surrounding soil, which can then seep into ground water or other surrounding surface water bodies in the form of a black thick liquid known as leachate causing sever water pollution. This water, if used as drinking water, causes serious harm to both plants and animals. Many advanced polymer composites used in various fields can leach into water forming hurdles. Plastic pollution is potentially poisonous to animals, which can then affect human food supplies. Plastic materials contain a number and variety of chemicals that are carcinogenic and mutagenic in nature. The five R's (recycle, reuse, reduce, remove, and refuse) can control the plastic pollution in our environment. This chapter explores plastic pollution and its effect on the environment.

INTRODUCTION

Plastic pollution may be defined as gathering of the various kinds of plastic materials, composites and Nano-composites of polymer on the surface of the earth, as well as in different surface water bodies such as rivers, sea and oceans, canals, some usable lakes, water reservoirs, dams, ponds etc. Now a day's plastic materials are utilized in different sectors on a large scale in different forms all over the world (Pavani et. al., 2014). The use of plastic materials are basically synthetic polymer or polymer composites and mostly the composition of some organic materials and some plastic materials may contain inorganic compounds and known as inorganic polymers. These are mainly derived from petrochemicals like alkenes and alkanes. While we discuss about the polymer or polymeric materials generally it means organic polymers because it is large in number and the number of inorganic polymers are quite less in number. Plastic materials are mainly classified as thermoplastics (polystyrene and polyvinyl chloride) and thermosetting polymers (poly-isoprene, Bakelite) on the basis of heat treatment. Apart from these

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again polymeric materials are classified as biodegradable or non-biodegradable, engineering plastic materials, elastomers, fibers and plastics. Besides these there are several classifications of plastic materials. Plastic materials takes about 500-1000 years for its degradation but the actual time of degradation is not known to anyone. The monomer, initiators, catalyst, fillers, plasticizers, colouring materials used for the manufacture of plastic are highly poisonous and cause many dreadful diseases both in animals and human beings. If these waste plastic materials are not properly removed from the environment it may causes hazardous effect to our biological system.

Many vinyl monomers are carcinogenic in nature and its exposure for a long time causes cancer. (Elena - Diana et. al.2016, Plastic pollution Wikipedia) Plastic materials are light weight, durable, low cost and good looking, which is the cause of overuse of plastic materials in different sectors. The waste plastic materials such as bags, bottles, rejected electronic and electrical devices, toys, balls, packaging materials, home utensils, decorative materials etc., are used extensively in urban areas and therefore cause of clogging the water bodies mostly like canals, rivers, lakes and water pipelines particularly in the urban areas and this trend is increasing day by day (*Annual Review of Marine Science*, 9, 2017).

Many people throw their plastic bottles and polythene bags after limited use or even after a single use as this less expensive method of disposal. But these waste plastic materials finally reach in landfill sites, and are deposited in the form of layer over the land surface or soil in the surrounding area. Most of these are non-biodegradable in nature. Waste plastic materials are also dumped in landfill sites. The waste materials of plastic may interact with the water and soil and degraded partially into toxic chemical substances. If these toxic degraded polymeric materials infiltrated inside the surface of the earth and mixed with the groundwater aquifers, then it causes the change in quality if the ground water resulting ground water pollution.

It is estimated that globally about 70,000 tons of plastic waste materials finally reach sea or ocean (Moharam et. al., 2014). Sometimes the rejected unused fishing nets and some other synthetic plastic materials are eaten by both terrestrial and aquatic animals by mistake as food, and cause bioaccumulation inside their bodies. Ultimately this is the cause of death of these animals Due to accumulation of plastic waste it may causes breeding of mosquitoes and other harmful dangerous insects and it might cause several diseases to human beings and domestic animals. Not only terrestrial environment but the accumulation of plastic waste in ocean cause harm to marine biota along with marine plants (Grantham Institute Briefing Paper No. 19).

Large use of plastic materials also deteriorates the quality of the drinking water day by day because the plastic materials are made of toxic chemicals like vinyl chloride, Bisphenol-A, Styrene, Acrylonitrile, Methyl methacrylate etc. and these are undergoing partial degradation after many years. The Bisphenol-A sometimes damages our respiratory and reproductive system.

One of the methods to reduce plastic waste is controlled incineration, which is nothing but the combustion of plastic waste materials which releases huge amounts of toxic gases to the atmosphere. This leads to air pollution.

Many vagrant animals sometimes eat waste plastic materials because of inadequate disposal systems and improper management and carelessly thrown nearby the locality area leading to death of these animals (G. Scott, et. al.2007).

The deposited waste plastic materials are transferred from one place to another due to wind causing increase in the land littering. These waste plastic materials also get trapped by railings, plants and trees, long towers, huge buildings, etc. and any animal who comes nearby it might even get twisted and suffocated by it and ultimately resulting in death.

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