# STRATEGIES FOR PLASTIC POLLUTION CONTROL

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## *Abstract*

*Plastic has revolutionised the human life in every way possible. It has become a go to material for everything from simple carry bag to large structures [1]. With various forms and types it had invaded our everyday life. With the great comfort also came an impending disaster which we were late to recognise giving its wide variety of advantages of affordability, quality, flexibility and durability. This paper examines the different causes and possible strategies for plastic pollution mitigation*

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## Introduction

Plastic is one of the most wonderful human inventions. It has the durability and flexibility which is desired for various uses. It is used in making of all sorts of things from television sets to mobile phones, from chocolate wrappers to large containers. The ingenuity of innovators has made it possible to make plastic alternatives for all the things once manufactured with other materials. Two examples of different scale are building piping systems and carry bags. This property of the plastics to replace most of the materials of everyday use, has improved convenience and led to the widespread adoption of plastics. But this enhanced convenience is not without problems. Though plastic is a wonderful material, overuse of it without understanding the consequences led to the problems we face today.

Lack of proper disposal mechanisms have led to a serious problem of widespread pollution caused directly and indirectly. Directly by interfering with animaland aquatic lifeand indirectly from the greenhouse gasesproduced during the unscientific burning of plastics.Improper disposal of polyvinyl chloride, or PVC releases toxic substances which pollute the environment.The burning of plastics releases chemicals such asphosgene and dioxides that are considered as a hazard to the ecosystem. The toxic debris that isreleased from the plastics, enters in the food chain and water bodies in the form of microplastics. Microplastic polluted foods and the presence of meagre amounts of phthalates in the childrentoys lead to serious health consequences such as congenital diseases and malignant cancers. Thedioxins released from the plastic polymers are lethal persistent organic pollutants which cause18 tumours and neurological damage to mankind.

With land being a limited resource, turning to landfills for discarding plastic waste is a no brainer for India. Incineration produces harmful gases and is not the best way to eliminate plastic waste.As 100% recycling of plastic waste seems to be an impossible feat in the near future, embracing a multi-pronged approach would help us to solve the menace of plastic pollution.

## Mitigation of plastic waste

The best way to tackle the problem of plastics is to follow the framework of Reduce, Reuse and Recycle. This framework builds on the following ideology. Whenever possible, reduce the use of plastics by not using it at all and by substituting with biodegradable alternatives.Whenever reduction is not an option, reuse the same plastics again and again, so that the need for new plastics comes down. And the last step in the framework is to recycle the plastics when its usable life is completed. The following are the different ways of mitigating plastic waste under the reduce-reuse-recycle framework

- **Bio based plastics**

Traditional plastics are synthesized from oil by catalytic processes. Evolving processes to produce plastics from non-edible biomass, which not only makes our society more sustainable, but also has super performance, is part of ongoing research across the world and is an emerging field [2]. These types of bio-based plastics can give the comfort of traditional plastics and still be biodegradable, there by solving the menace of plastic waste. More resources should be allocated by various funding agencies to fast track the research efforts and bring these innovations to daily use.

- **Recycling of plastics**

Plastic recycling is the process of recovering different types of plastic material in order to reprocess them into varied other products, unlike their original form. With vast amount of plastic waste generated on a day-to-day basis recycling plastic is an essential step to in effectively dealing with the waste. Recycling has the benefits of conserving the energy and natural resources required to make virgin plastics by forming a viable alternative. It also reduces the burden on the landfills in the country [3].

- **Use of plastic waste in infrastructure**

Good amount of research has been carried out on how to use plastic waste in the construction industry. The following are some of the ways evolved by researchers which would reduce the menace of plastic pollution by permanently embedding used plastics into them.

### 1) Construction of roads

Plastic waste can be used in construction of roads. Plastic waste is used as a partial replacement for bitumen. The roads constructed from the plastic waste were reported to be more durable against extreme weather conditions like floods and heat as compared to the conventional roads. Almost one lakh kilometres of road in India is constructed with plastic

waste [4]. Using plastic waste to construct roads seems to be one of the ways to reduce plastic pollution in the country.

### 2) Construction of bridges

A company in Europe recently led the construction of Europe's first 100 percent recycled plastic bridge. The roughly 90-foot bridge, which spans the River Tweed at Easter Dawyck in Peeblesshire, Scotland, was made out of 50 tons of waste plastic from end-of-life vehicle recycling and everyday plastic bottles. This way of using plastic waste can not only solve the problem of plastic pollution but also reduces the requirement for virgin construction materials [5].

### 3) Manufacturing railway sleeper composites

Railway sleepers are one of the most important elements of the railway track system. Traditionally timber is used for making the sleepers. Over a period of time concrete replaced timber as primary material for manufacture of railway sleepers given its strength and durability. Recently, attempts have been made to make these sleepers from composites of plastic polymer made from plastic wastes. These are found to be as durable as concrete sleepers. Given the vast network of railways and huge requirement of sleepers, using plastic waste polymers can reduce the pollution by a large extent [6].

### 4) Polyester concrete

Polymers in traditional concrete can be employed to enhance its mechanical properties. Electronic plastic wastes (e-wastes) have not been polluting nature but also threatening human health. So, many studies have recently started studying the effects of adding e-waste to concrete [7]. the results have been encouraging so far. Further studies would bring in the confidence to use this at a mass scale to tackle the problem of e-waste.

- **Substitution**

One of the major causes of plastic pollution is single use plastics used in the food packaging industry. One credible way to reduce pollution is by substituting the high volume and high frequency use plastics with alternative materials which are more environmentally friendly. For example, the disposable plastic culinary can be replace by plant-based products which are biodegradable [8]. This use of plant-based products encourages the industries to plant more trees and use them responsibly to make their businesses sustainable.

- **Effective legislation and implementation**

Effective legislation and favourable polices can be used to affect the problem of plastic pollution in two ways. First, by developing credible and affordable alternatives to the plastics which are frequently used in high quantity. Second, by implementing proper plastic waste disposal strategies. The recent move by the government of India to phase out single use plastics by 2022 is one such step which ensures that alternatives for single use plastics would be developed and sufficient time is given for everyone to adopt to the changed legislation [9]. Government should also attract entrepreneurs by providing incentives to develop business

models around sustainable plastic waste disposal. Bayan plastics is one such start up operating from Hyderabad. With government support, many such initiatives could succeed and there by solving the pollution menace [10,11].Developing companies such as the above which effectively close the value chain loop by providing a viable substitute to virgin plastic.

## Conclusions

Plastic pollution has become one of the greatest challenges to the humankind which are yet to be effectively tackled. The best way forward would be to reduce the usage of plastics wherever possible, reuse them to extend the life and recycle the major portion of what is consumed. This along with emerging technologies of biobased plastics would help to mitigate the problem of plastic pollution.

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