

# Introduction to Plastic Pollution



**Compiled by**

**The Energy and Resources Institute (TERI)**

**Sponsored by**

**United Nations Environment Programme (UNEP)**

© The Energy and Resources Institute 2019-2020

All rights reserved. No part of this publication may be reproduced in any form or by any means without prior permission of the publishers.

**Published by:**

The Energy and Resources Institute (TERI)  
(Registered Office at Mumbai)  
318, Raheja Arcade, Sector 11,  
CBD Belapur,  
Navi Mumbai – 400614  
India

**Conceptualized By:**

*Dr. Anjali Parasnis*

**Team Members**

*Ms. Vaishnavi Barthwal*  
*Mr. Manish Asodekar*  
*Ms. Pranali Chavan*  
*Mr. Prakash Joshi*

**Printed by:**

National Association For The Blind, India  
11, Khan Abdul Gaffar Khan Road,  
Worli Seaface,  
Mumbai- 400 030 India

## Table of Contents

Introduction to Plastic Pollution .....	1
1. Introduction to Plastic .....	1
1.1 Uses of Plastic.....	1
1.2 Plastic as a material is not a problem; but how we manage it is an issue.....	1
2. How Can We Help To Manage The Plastic Pollution? .....	3
3. The ‘Rethink Plastic’ Campaign.....	4
3.1 Demonstrating Reuse of Waste Plastic Bottles.....	4
3.2 Other activities under the campaign: .....	5
4. About TERI.....	5
5. About UNEP.....	6

## List of Touch and Feel Kits

Touch and feel Kit 1 – Entry of Micro plastics in Food chain and Bio-magnification

Touch and feel Kit 2 – Alternatives to Plastic Products

## Introduction to Plastic Pollution

### 1. Introduction to Plastic

Do you know what your toothbrush, your toothpaste tube, your drinking water bottle or the container of your hand wash and shampoos are made up of? They are all made up of plastic. Can you think of some more examples of plastic products and their uses?

Today, plastic is a very useful material and is used everywhere at homes, industries, hospitals, schools and markets in some form or the other. It is a petrochemical derivative that was first introduced in 1907. It has proved to have a huge advantage over other materials such as wood, natural fibers like cotton and wool, rubber and paper in terms of weight, durability, flexibility, variety and most importantly the cost. It is the cheapest material available in the market when we think of day to day used products made on large scale like plastic buckets and tooth brushes.

On reading further, you shall learn about the usability of plastics and the reasons why this exceptionally useful material has turned into a threat for our environment.

#### 1.1 Uses of Plastic

Today, plastic has become an integral part of our daily lives. We begin our day using mugs and buckets made of plastic for bathing. Further, as we trace back our activities throughout the day, we use plastic in the form of water bottles, combs, food packaging, milk pouches, straws, disposable cutlery, carry bags, gift wrappers, and toys. Finally as we end the day and switch the fans on before going to bed, even the switch boards are made of plastic. Different kinds of plastics are used to make these products, depending on their properties. Thus, plastic articles make our day to day activities more convenient and act as a blessing; and one cannot imagine a life without the intervention of plastic in some way in the 21<sup>st</sup> century. More specifically, because of large population size, the requirement of articles has also increased multifold and natural materials like paper, bamboo; metals, silk, wool and cotton would not be able to meet this demand. Hence synthetic materials like plastic become more and more important. Moreover, the revolution in several new and emerging fields like telecom industry, automobiles, space crafts, mechanization like use of washing machines has become possible due to lighter, cheaper and durable plastic material.

#### 1.2 Plastic as a material is not a problem; but how we manage it is an issue

The wide use of plastic by all of us, results in a large amount of waste being generated. This waste needs to be disposed of responsibly. That means the plastic waste items such as carry bags, straws, chocolate wrappers, water bottles need to be collected in separate waste bins,

segregated as synthetic waste and handled very carefully by Urban Local Bodies or Municipal Corporation. However, the waste is often carelessly thrown away on roads or into rivers and streams rather than getting collected at single location like dumping ground of the city. Further, many people also burn plastic waste which releases toxic gases like dioxins that severely impact human health. Thus, careless disposal and mismanagement of plastic waste negatively affects the health and lives of not only humans but also other living organisms on land and water.

Another problem with plastic is that it is synthetic in nature and takes many years to get decomposed or degraded using in soil or water. This means, that a piece of plastic thrown somewhere will not breakdown into simpler chemical substances that can be used in the nature’s cycles. However, if a banana peel is thrown in the garden it would break down into simpler products just in few days that mix with the soil and also provide nutrition to the plants. This is because it is natural and completely biodegradable. But this is not the case with plastic and hence it stays in the environment for over hundred years (Table No. 1) severely impacting the environment.

**Table No. 1: Plastic items take very long to degrade**

Sr. No.	Plastic Item	Time taken to degrade (in years) <sup>1</sup>
1.	Plastic bag	20
2.	Straw	200
3.	Cup	450
4.	Water Bottle	450
5.	Toothbrush	500

Animals such as cows, goats, sheep, dogs, etc. that live close to the human settlements are directly exposed to the garbage thrown in and around the city which includes plastic wastes. These animals cannot differentiate between their food like leaves or grass and plastic waste. So, they tend to eat plastic wastes as well. But plastic cannot be digested by living beings and chokes their digestive systems leading to death. Similarly, the plastics that reach the oceans are also eaten by the fish, turtles, crabs and other creatures causing their death. Many a times things like broken fishing nets, sheets of plastic and small plastic fragments are ingested by sea animals. There are several cases where the underwater creatures get entangled into waste plastic like large nets. The chemicals used in manufacturing plastics also leak out and cause serious health issues like skin diseases, reproductive and endocrine (hormone related) disorders in humans<sup>2</sup>.

<sup>1</sup> <https://www.wwf.org.au/news/blogs/the-lifecycle-of-plastics#gs.q7wuki>

<sup>2</sup> [https://www.researchgate.net/publication/321906991\\_Toxic\\_effects\\_of\\_plastic\\_on\\_human\\_health\\_and\\_environment\\_A\\_consequences\\_of\\_health\\_risk\\_assessment\\_in\\_Bangladesh](https://www.researchgate.net/publication/321906991_Toxic_effects_of_plastic_on_human_health_and_environment_A_consequences_of_health_risk_assessment_in_Bangladesh)

### **1.2.1 Micro plastics in the food chain (Refer to Touch and Feel Kit 1- Entry of Micro plastics in Food chain and Bio-magnification)**

Micro plastics are very small sized plastics<sup>3</sup>. They get formed when larger pieces of plastic break down over time. The tiny bits of plastic enter the soil and water ecosystems. In the water bodies there are organisms like fish and crabs. They ingest micro plastics along with their food. As these micro plastics cannot be digested by them, they remain in their bodies. These fish and crabs are then eaten by humans and the plastic in their bodies now enters the human digestive system. Similarly, micro plastics present in the soil and water can be taken up by plants. When such plants are consumed by humans, micro plastics again enter the food chain and the tertiary users get more plastics in their body which is called as “Bio-magnification”. That means, for example, if a small fish consumes 10 micro-plastic particles in its life time and a human being consumes 10 such small fishes in a week, the human body is accumulating 100 small micro-plastic particles just in one week which would have serious health impacts.

### **1.2.2 Single use Plastics**

Single use plastic is used only once and then discarded. We rely on them for being cheap, light weight, safe and convenient for food transport and storage. Some examples of single use plastics are:

1. Plastic straws
2. Disposable cutlery (spoons, forks, plates and cups)
3. Polythene carry bags
4. Food packaging like wrappers of chips and chocolates, milk pouches and more.

Single use plastics are one of the biggest problem as their increasing usage, compounded by the lack of affordable and easily available alternatives is slowly choking the environment. For instance, these single use plastic products when dumped on roads, railway tracks and water bodies, also enter the drainage system. This causes the drains to clog, resulting in water logging, a major problem, especially during monsoons.

## **2. How Can We Help To Manage The Plastic Pollution?**

To save the environment from plastic waste, it is now very important to be aware and practice responsible use of plastic. Each one of us has a very important role to play in restricting plastic pollution. For this, the following R’s are to be kept in mind:

1. Refuse- say no to plastic, particularly single use plastic as much as possible
2. Reduce- limit or reduce the use of plastic in daily life

---

<sup>3</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6132564/>

3. Reuse- reuse plastic products as much as possible, before disposing them
4. Recycle- Plastic products should be recycled into other usable products. This reduces the demand for manufacturing virgin (raw) plastic required to make various plastic products

Note that not just plastic but metals such as cans of cold drink can also be recycled. You can segregate and collect all recyclable wastes and hand it over to recyclers. This would be a great way to reduce demands for raw materials in the plastic and metal industries, thus saving the resources of our planet.

To Refuse and Reduce plastic, the best way is to switch over to alternatives, especially for single use plastics (*Refer to touch and feel Kit 2 - Alternatives to Plastic Products*). Examples of such alternatives are- paper or metal straws, cutlery made of steel, disposable plates and bowls made of leaves (Patravali/ Pattal), and carry bags made of cloth or paper. Each day we can take simple actions such as those mentioned below to reduce our dependence on plastic products:

1. Always carry a cloth bag for shopping
2. Use reusable/ biodegradable plates and cutlery
3. Use steel water bottles
4. Encourage peers and family members to use alternatives to plastic
5. Spread knowledge about plastic pollution and ways to tackle it.

Each small or large initiative against plastic pollution can make a significant difference. Each one of us can be a part of this Movement. Let us all pledge to our bit to reduce and remove single use plastics from the Earth.

### **3. The 'Rethink Plastic' Campaign**

The Energy and Resources Institute (TERI) is the outreach partner of United Nations Environment Programme (UNEP) for implementing the project 'Promotion of Countermeasures against Marine Plastic Litter in Southeast Asia and India' in Mumbai. Thus, in partnership with UNEP, TERI has launched a campaign in Mumbai titled 'Rethink Plastic' encompassing various action oriented activities and awareness programmes to mobilize youth and engage the local communities to reduce plastic pollution.

#### **3.1 Demonstrating Reuse of Waste Plastic Bottles**

With an objective to demonstrate effective reuse of waste plastic bottles, TERI aims to reuse 50,000 waste plastic bottles to raise saplings of native tree species like Mango, Neem, Peepal, Banyan and Fig. These native trees will be collected from roadsides and cracks of walls and buildings. This would help us save the treasure of native trees, which otherwise do not necessarily survive and mature in such places. These trees raised in waste plastic bottles will be nurtured by different organization / individuals and further used for afforestation.

**Benefits of using native trees for afforestation:**

1. They are sturdy and well acclimatized to the local conditions. Thus, they can survive very well
2. There is no threat of invasion to the local biodiversity from these species
3. They support the native biodiversity and provide ecological benefits like carbon sequestration

**Offset of Carbon foot print towards production of waste plastic bottles by the saplings**

Carbon footprint refers to the total amount of greenhouse gas emissions, primarily Carbon dioxide, resulting from the production, use and its management or life cycle of a product or service<sup>4</sup>. However, trees sequester carbon dioxide, which means they use carbon dioxide for photosynthesis while releasing oxygen. Thus, trees help fix and recycle the carbon dioxide offsetting the carbon footprint of various activities or goods.

It is estimated that for production of one Kg Plastic bottle the carbon footprint is 3.12kg CO<sub>2</sub>e/kg. Considering that 1 mature Neem tree sequesters CO<sub>2</sub> ~ 33.61 kg/day<sup>4</sup>. If we consider that, a single person is consuming water from 1000 plastic bottles/year then too, a person should plant and raise at least 5 mature Neem trees to offset the carbon footprint for using these bottles.

On the occasion of World Wetlands Day 2020, on 2<sup>nd</sup> February, Helen Keller Institute for Deaf and Deaf blind, Navi Mumbai has adopted 100 saplings of native tree species, raised in waste plastic bottles. These saplings will be nurtured by the students and later used for afforestation.

**3.2 Other activities under the campaign:**

1. Waste collection and characterization activities at Chimabai Beach, Bandra (127 kg waste was collected) and in mangroves at Sagar Vihar, Vashi (281 kg waste was collected).
2. Awareness programmes and workshops for industries (Thane Belapur Industries Association) and for students (National Service Scheme (NSS) and various colleges)
3. Perception survey: more than 800 responses have been received
4. Pledge against single use plastics: more than 1000 people have taken the pledge
5. World Wetlands Day 2020 Event at Sagar Vihar, Vashi.

**4. About TERI**

The Energy and Resources Institute (TERI) is an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation. It has pioneered conversations and action in the energy, environment, climate change, and sustainability space for over four decades. The institute's research and research-based solutions have had a transformative impact on industry and communities. Headquartered in New Delhi, it has regional centers and campuses in Gurugram, Bengaluru, Guwahati, Maharashtra (Mumbai),

<sup>4</sup> <https://neempedia.com/neem-safeguard-environment/>



Goa, and in Uttarakhand (Mukteshwar) which is supported by a multidisciplinary team of scientists, sociologists, economists and engineers, and state-of-the-art infrastructure.

## 5. About UNEP

United Nations Environment Programme is the leading environmental agency that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment. UN Environment Programme Regional Office of Asia and the Pacific (UNEPROAP) with the support from India Country Office helps to implement its global programmes in the region by initiating, coordinating and catalyzing regional and sub-regional cooperation and action in response to environmental problems.