



The Institution of Engineers (India)

U.P. State Centre



cordially invite you for the celebrations of

World Environment Day-2025

Theme: "Beat Plastic Pollution"

Dr. Pradeep Kumar

Assistant professor

Chemical Engineering Department,

Associate Dean PG IET

will be the Keynote Speakers

on Thursday, June 05, 2025 at 4:30 PM

Venue: Engineers' Bhawan, IEI, River Bank Colony, Lucknow



Er. V P Singh, FIE
Hony. Secretary



Prof.(Dr.) Neelam Srivastava, FIE
SCC Member &
Convener



Dr. Pradeep Kumar
Keynote Speaker



Er. Masarrat Noor Khan, FIE
IP Chairman &
Council Member



Er. Satya Prakash, FIE
Chairman



PLASTIC WASTE MANAGEMENT



Dr Pradeep Kumar

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INTRODUCTION

- The term “Plastic” means material which contains as an essential ingredient a high polymer such as polyethylene terephthalate, high density polyethylene, Vinyl, low density polyethylene, polypropylene, polystyrene resins, multi-materials like acrylonitrile butadiene styrene, poly-phenylene oxide, polycarbonate, Polybutylene terephthalate;.
- Polyethylene, polyvinyl chloride & polystyrene are largely used in the manufacturing of plastics.

TYPES OF PLASTIC

- Based on Chemical Properties & BIS Classification (Notified under PWM Rules, 2016), there are seven categories of plastics) :-

Symbol	Polymer Name	Product Examples		Recyclable Curbside?
	Polyethylene Terephthalate (PETE or PET)	- Soft drink bottles - Water bottles - Sports drink bottles - Salad dressing bottles - Vegetable oil bottles	- Peanut butter jars - Pickle jars - Jelly jars - Prepared food trays - Mouthwash bottles 	Yes
	High-density Polyethylene (HDPE)	- Milk jugs - Juice bottles - Yogurt tubs - Butter tubs - Cereal box liners	- Shampoo bottles - Motor oil bottles - Bleach/detergent bottles - Household cleaner bottles - Grocery bags 	Yes <i>*Plastic grocery bags not accepted</i>
	Polyvinyl Chloride (PVC or V)	- Clear food packaging - Wire/cable insulation - Pipes/fittings - Siding - Flooring	- Fencing - Window frames - Shower curtains - Lawn chairs - Children's toys 	Not accepted through most curbside recycling programs.

TYPES OF PLASTIC

 4 LDPE	Low-density Polyethylene (LDPE)	• Dry cleaning bags • Bread bags • Frozen food bags • Squeezable bottles • Wash bottles	• Dispensing bottles • 6 pack rings • Various molded laboratory equipment 	Yes
 5 PP	Polypropylene (PP)	• Ketchup bottles • Most yogurt tubs • Syrup bottles • Bottle caps • Straws	• Dishware • Medicine bottles • Some auto parts • Pails • Packing tape 	Yes
 6 PS	Polystyrene (PS)	• Disposable plates • Disposable cutlery • Cafeteria trays • Meat trays • Egg cartons	• Carry out containers • Aspirin bottles • CD/video cases • Packaging peanuts • Other Styrofoam products 	Not accepted through most curbside recycling programs.
 7 OTHER	Other Plastics (OTHER or O)	• 3/5 gallon water jugs • Citrus juice bottles • Plastic lumber • Headlight lenses • Safety glasses	• Gas containers • Bullet proof materials • Acrylic, nylon, polycarbonate • Polylactic acid (a bioplastic) • Combinations of different plastics 	Yes



Plastic processing industry classification: On the basis of end user/downstream industry

Packaging,
Automotive & Transportation,
Infrastructure & Construction
Consumer Goods/Lifestyle,
Healthcare & Pharmaceuticals,
Electrical & Electronics,
Agriculture and,
Textile.

USES OF PLASTIC IN DAILY LIFE



Some important facts about Plastic

Plastics are made from oil with a highly polluting production process. Plastics just do not dissolve; they break down into micro particles that circulate in the environment. A single water bottle can take up to 1000 years to break down.

Asia is the world leader in plastic pollution. The Philippines alone dumped over 1 billion pounds of plastics into our oceans. That is over 118,000 trucks worth. In 30 Years, there is likely to be more plastic in our oceans than fish.

83% of our drinking water contains plastic. Studies show that consuming plastic could lead to cancer, effects on hormone levels, and heart damage. Plastics have been found in the blood of even newborn babies

Over 600 marine species are affected by plastics. Nearly 45000 marine animals have ingested plastics and 80% were injured or killed. Plastics can pierce animals from inside or cause starvation, entanglement, loss of body parts and suffocation.

As plastics travel with ocean currents, an island of trash called the "Great pacific Garbage Patch" has been created. There are now many islands of trash in our seas.



Figure: Whale killed by plastic waste



Figure: Plastics recovered inside the whale



BACK-GROUND

Country (Waste Mismanagement Rate)	Plastic Waste Imports from U.S. (2010 – 2018)	Number of TEU Shipping Containers*
China & Hong Kong (74%)	12.3 million metric tonnes	2,310,701
India (85%)	0.9 million metric tonnes	167,834
Indonesia (81%)	0.4 million metric tonnes	69,594
Malaysia (55%)	0.5 million metric tonnes	100,618
Thailand (73%)	0.2 million metric tonnes	33,540
Vietnam (86%)	0.4 million metric tonnes	84,200
Total to Countries with High Mismanagement Rates (>5%)	15.2 million metric tonnes	2,865,408

BACK-GROUND

India: Plastic Facts

Size of plastics industry
₹110,000 cr

No. of companies/units
Over 30,000

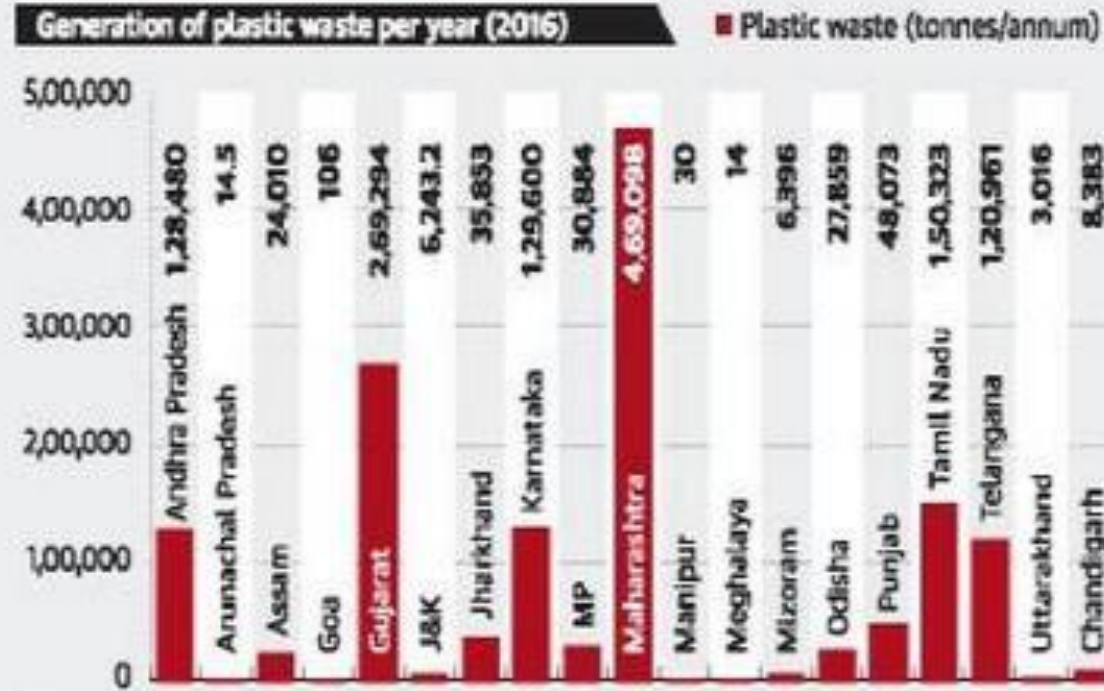
Plastics consumption
13 mn tonnes per year

Waste generated
9 mn tonnes per year

Amount recycled
60%

All things plastic

Among States from where data on plastic waste generation is available for 2016, Maharashtra tops the list



SOURCE: CPCB

Nature of ban

Partial ban

Andhra Pradesh, Goa, Gujarat, Jharkhand, M.P., Maharashtra, Meghalaya, Tamil Nadu, West Bengal

Total ban

Chhattisgarh, J&K, Mizoram, Nagaland, Odisha, Punjab, Uttarakhand, Chandigarh

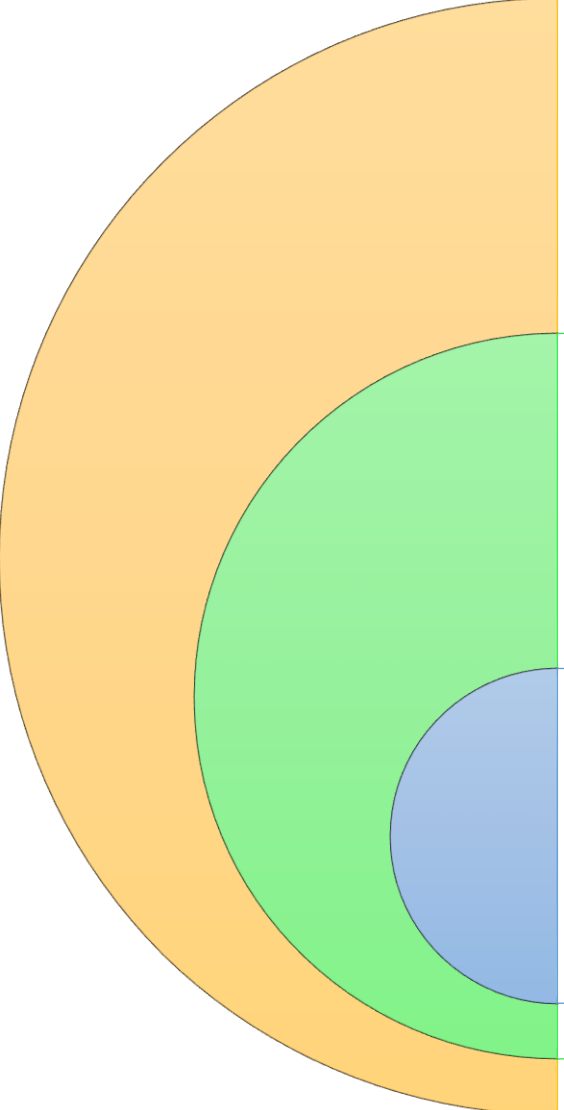
No ban

Manipur

* States where no data is available on the nature of the ban

Arunachal Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Kerala, Rajasthan, Sikkim, Telangana, Tripura, Lakshadweep, Delhi NCR and Puducherry

BACK-GROUND



The growth rate of the Indian plastics industry is one of the highest in the world: plastics consumption is growing at 16 per cent per annum in the country (compared to 10 per cent annually in China and around 2.5 per cent annually in the UK)..

What is alarming is that per capita consumption of plastic products in India is rising – it is expected to go up to 16-20 kg per annum by 2025.

India's plastic consumption set to cross 20 million metric tonnes by 2022

PLASTIC WASTE GENERATION IN INDIA

According to the reports for year 2017-18, Central Pollution Control Board (CPCB) has estimated that India generates approximately 9.4 Million tonnes per annum plastic waste, (which amounts to 26,000 tonnes of waste per day), and out of this approximately 5.6 Million tonnes per annum plastic waste is recycled (i.e., 15,600 tonnes of waste per day) and 3.8 Million tonnes per annum plastic waste is left uncollected or littered (9,400 tonnes of waste per day).

Out of the 60% of recycled plastic:

- 70% is recycled at registered facilities
- 20% is recycled by Unorganized Sector
- 10% of the plastic is recycled at home

While these stats are 38% higher than the global average of 20%, there is no comprehensive methods in place for plastic waste management.

Additionally, there is a constant increase in plastics waste generation. One of the major reasons for this is that 50% of plastic is discarded as waste after single use.

Per Capita Plastic Consumption
in 2014-2015 (in kg)

109

65

38

32

11

US

Europe

China

Brazil

India

Global Average: **28**

Global Plastic Production

Million metric tons 2018

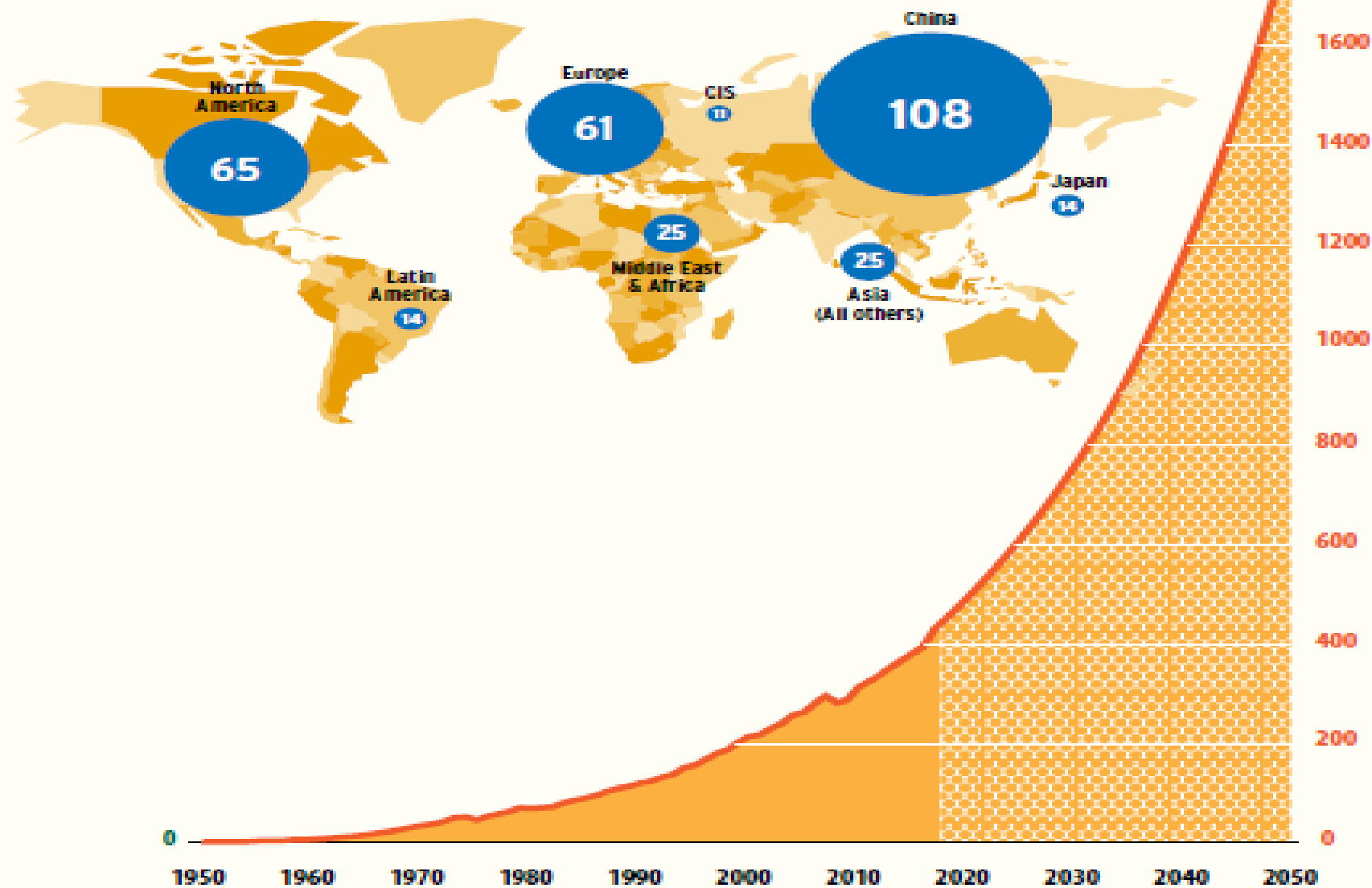
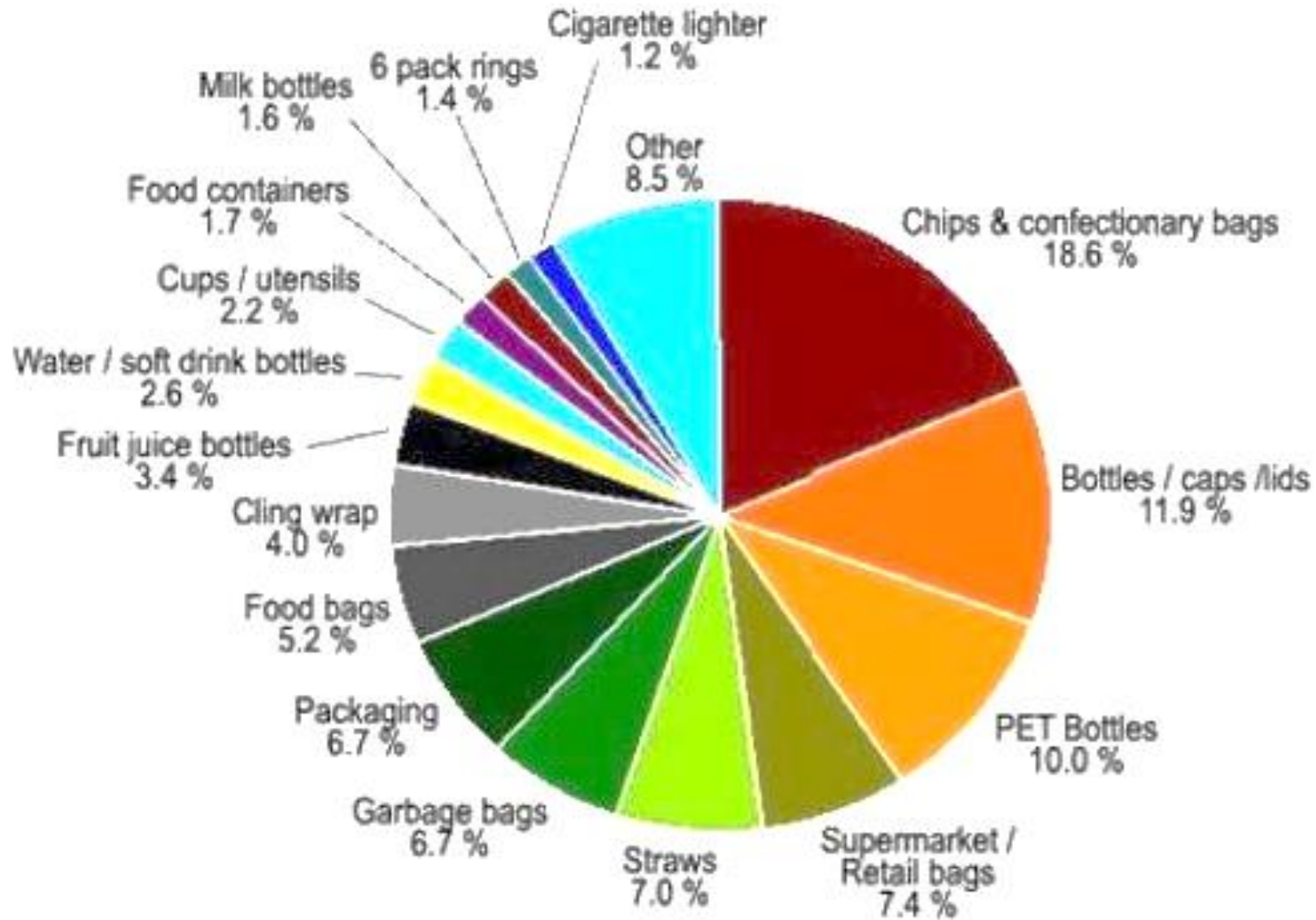
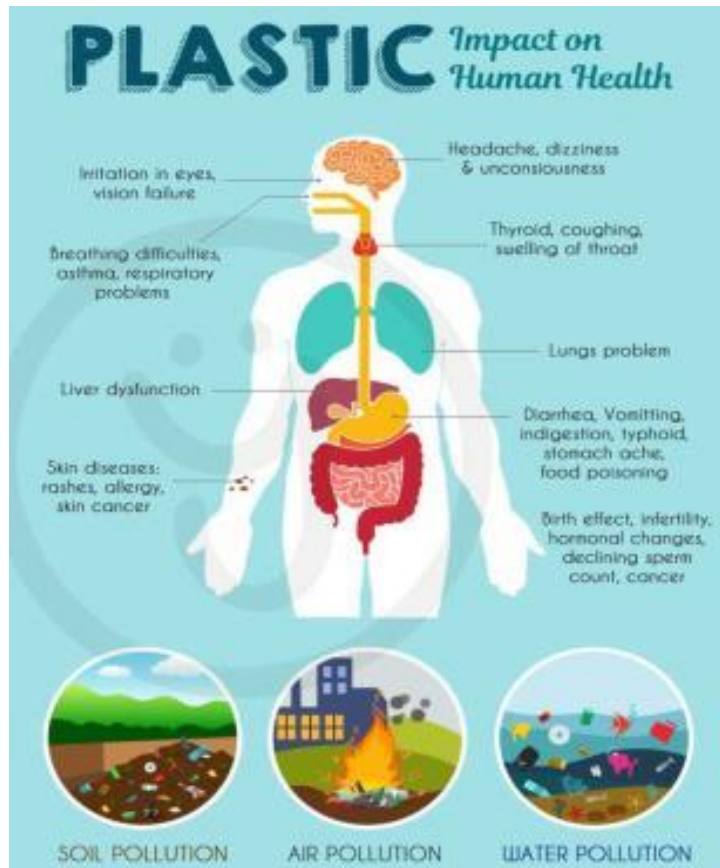


Figure 1. Projected plastic production to 2050.

- **Only 60% of the plastic produced is recycled, balance 9400 Tonnes of plastic is left unattended in environment causing land, air and water pollution.**
- **70% of Plastics packaging products are converted into plastic waste in a short span.**
- **The recycling of a virgin plastic material can be done 2-3 times only, because after every recycling, the plastic material deteriorates due to thermal pressure and its life span is reduced. Hence recycling is not a safe and permanent solution for plastic waste disposal.**
- **It has been observed that disposal of plastic waste is a serious concern due to improper collection and segregation system.**

SOURCES OF PLASTIC WASTE





Environmental impacts

Harmful Effects of Plastics

- **Groundwater and soil pollution:** Plastic is a material made to last forever, and due to the same chemical composition, plastic cannot biodegrade; it breaks down into smaller and smaller pieces. When buried in a landfill, plastic lies untreated for years. In the process, toxic chemicals from plastics drain out and seep into groundwater, flowing downstream into lakes and rivers. The seeping of plastic also causes soil pollution and have now started resulting in presence of micro plastics in soil.
- **Pollution in Oceans:** The increased presence of plastic on the ocean surface has resulted in more serious problems. Since most of the plastic debris that reaches the ocean remains floating for years as it does not decompose quickly, it leads to the dropping of oxygen level in the water, severely affecting the survival of marine species. Materials like plastic are non-degradable which means they will not be absorbed and recycled. When oceanic creatures and even birds consume plastic inadvertently, they choke on it which causes a steady decline in their population.
- **Dangerous for human life** Burning of plastic results into formation of a class of flame retardants called as Halogens. Collectively, these harmful chemicals are known to cause the following severe health problems: cancer, endometriosis, neurological damage, endocrine disruption, birth defects and child developmental disorders, reproductive damage, immune damage, asthma, and multiple organ damage.



PLASTIC WASTE POSES A HUGE THREAT TO MARINE ECOLOGY

There are
8 million
tonnes of
plastic waste
entering the
ocean every
year

The total plastic
in the ocean
amounts to
**150
million
tonnes**

Plastic packaging
accounts for
62% of all
items recovered
in coastal clean-
up efforts

In 2014, there was
**1 kg of plastic in the
ocean for every
5 kg of fish, and by
2050 there will
be more plastic
than fish**



Salient features of Plastic Waste Management (PWM Rules), 2016

These rules shall apply to every Waste Generator, Local Body, Gram Panchayat, Manufacturer, Importer, Producer and Brand Owner.

Carry bags made of virgin or recycled plastic, shall not be less than fifty microns in thickness. The provision of thickness shall not be applicable to carry bags made up of Compostable plastic, complying IS/ISO: 17088.

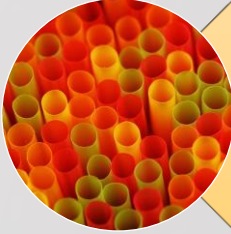
Waste Generators including institutional generators, event organizers shall not litter the plastic waste, shall segregate waste and handover to authorized agency and shall pay user fee as prescribed by ULB and spot fine in case of violation.

Local Bodies shall encourage use of plastic waste for road construction or energy recovery or waste to oil or co-processing in cement kilns etc.

It shall be responsible for development and setting up of infrastructure for segregation, collection, storage, transportation, processing and disposal of the plastic waste either on its own or by engaging agencies or producers.

Gram Panchayat either on its own or by engaging an agency shall set up, operationalize and coordinate for waste management in the rural area under their control and for performing the associated functions.

Salient features of Plastic Waste Management (PWM Rules), 2016



Producer, Importers and Brand Owners need to work out modalities for waste collection system for collecting back the plastic waste within a period of six months in consultation with local authority/State Urban Development Department and implement with two years thereafter.



State Pollution Control Board (SPCB)/ Pollution Control Committee (PCC) shall be the authority for enforcement of the provisions of PWM Rules, 2016, relating to registration, manufacture of plastic products and multi-layered packaging, processing and disposal of plastic wastes.

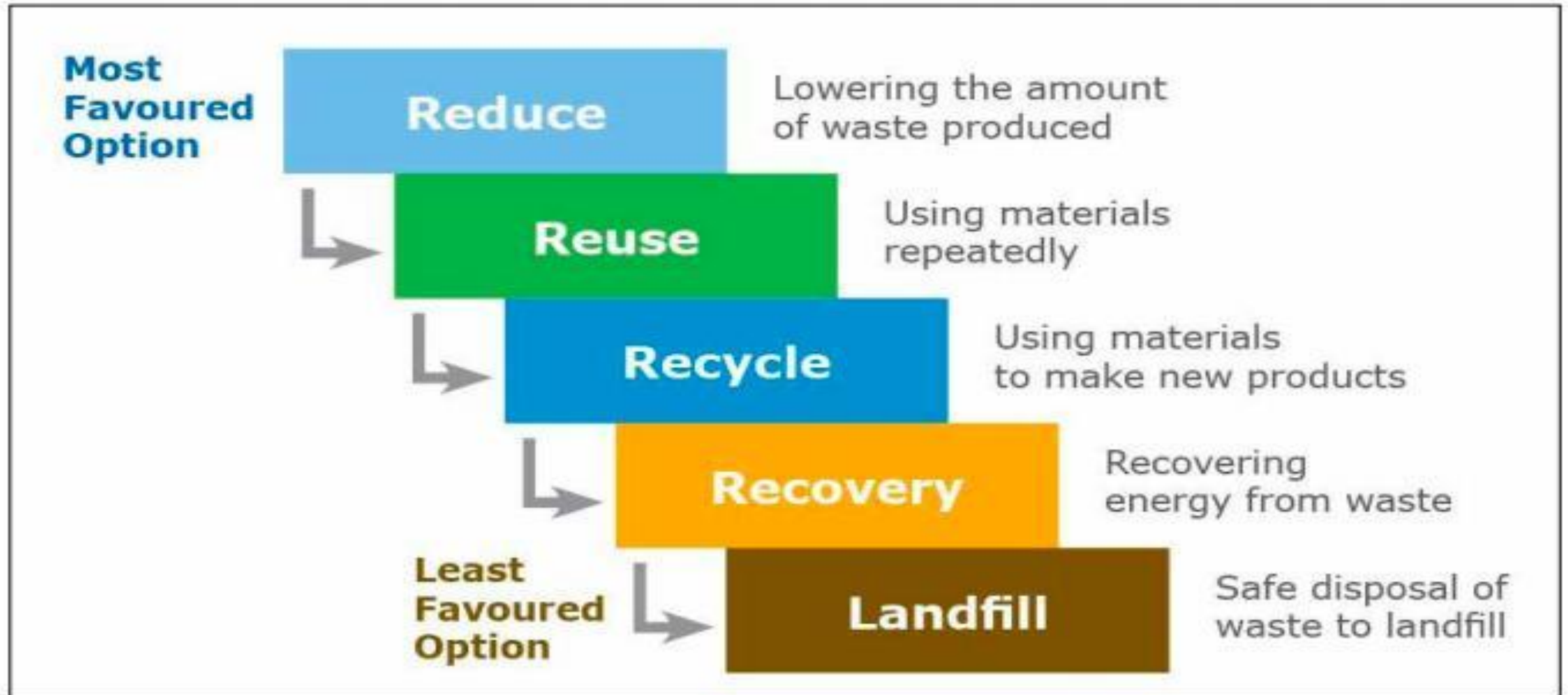


Concerned Secretary-in-charge of Urban Development of the State or a Union Territory and concerned Gram Panchayat in the rural area of the State or a Union Territory shall be the authority for enforcement of the provisions of PWM Rules, Rules relating to waste management by waste generator, use of plastic carry bags, plastic sheets or like, covers made of plastic sheets and multilayered packaging.



District Magistrate or Deputy Commissioner shall provide the assistance to SPCBs/PCCs, Secretary-in- Charge, Urban Development Department and Gram Panchayat under his jurisdiction, whenever required for enforcement of provisions of PWM Rules, 2016.

REDUCE, REUSE, RECYCLE & RECOVERY



Reduce

Plastic, of course, is uniquely problematic because it's non-biodegradable and therefore sticks around for a lot longer than the other forms of waste. Few small steps in day-to-day life would help to keep plastics a possible out of the waste stream. Some of these steps may include:

Discourage the use of disposal plastics
Ninety percent of the plastic items in our daily lives are used once and then abandoned: grocery bags, plastic wrap, disposable cutlery, straws, coffee-cup lids. Take note of how often we rely on these products and replace them with reusable versions. It only takes a few times of bringing our own bags to the store, silverware to the office, or travel mug to office tea areas before it becomes habit.

Minimize Buying Water
Each year, close to 20 billion plastic bottles are thrown in the trash. Making a habit of using reusable bottle in the bag, use of water from office, home and work areas where the quality of the water can be trusted

Minimize use of Plastics Cutlery
Making a habit of using metal utensils instead of plastic cutlery would help saving a lot of plastics that is thrown in trash every year.

Purchase item Secondhand
The newer items comes with lot of packaging materials instead try to use secondhand materials until it is very necessary

Support a bag Tax or Ban
Support legislations and by laws which put taxes on ban of single use plastics

Reuse



- Reuse is a step up from recycling. It diverts plastic and takes pressure off the recycling services. In fact, reuse is the middle-man between reduce and recycle, and some would be surprised at how many opportunities for reuse there really are.
- One can reuse plastic-produce bags for sandwiches, plastic grocery bags for small trash bags, and re-use plastic silverware. Most people skip this step and go directly to recycling, but reusing plastics can reduce the demand for new plastics to be created.
- For instance, since refillable plastic containers can be reused for many times, container reuse can lead to a substantial reduction in the demand for disposable plastic and reduced use of materials and energy, with the consequent reduced environmental impacts.

Recycle

Recycling and re-utilization of waste plastics have several advantages. It leads to a reduction of the use of virgin materials and of the use of energy, thus also a reduction of carbon dioxide emissions.

Benefits of Recycling:

- Reduces Environmental Pollution
- Energy savings : 40 - 100 MJ/kg (depends on the polymer)
- Economic Benefits
- Reduces demand for virgin polymer
- Preferred to Land Filling
- Generates Employment
- Reduces depletion of Fossil fuel reserves

Difficulties in Recycling:

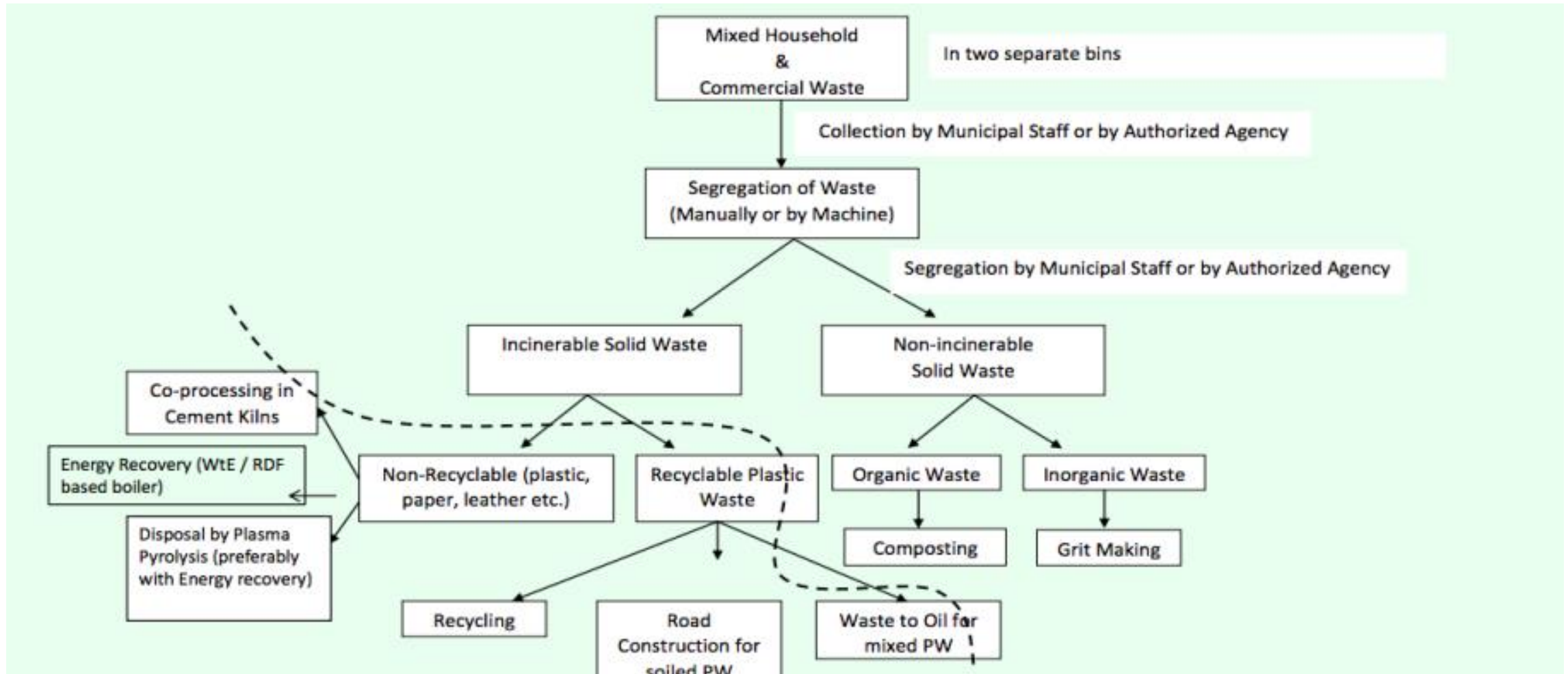
- Hard to separate from non-plastics (no 'magnet' equivalent)
- Differing composition of plastic resins means they are largely incompatible
- Degradation of polymer chains on recycling
- Recycled polymer is of lower quality than virgin polymer
- Most waste plastics films specially thin plastics films have limited market value, therefore effort is not spent in collecting them
- Identification of reuse and recycling opportunities
- Markets for Plastics; Lack of Infrastructure
- Low value of recovered Plastics
- Subsidies for recycling program

Recovery



Another alternative is recovering the energy stored in residual material. That means turning waste into fuel for manufacturing processes or equipment designed to produce energy. Various mechanical, biological and caloric systems and technologies can convert, reprocess or break up wastes into new materials or energy.

PLASTIC WASTE MANAGEMENT - TECHNOLOGY



Way Forward

Target the most problematic single-use plastics by conducting a baseline assessment to identify the most problematic single-use plastics, as well as the current causes, extent and impacts of their mismanagement.

Assess the potential social, economic and environmental impacts (positive and negative) of the preferred short-listed instruments/actions, by considering how will the poor be affected, or what impact will the preferred course of action have on different sectors and industries.

Consider the best actions to tackle the problem (e.g. through regulatory, economic, awareness, voluntary actions), given the country's socio-economic standing and considering their appropriateness in addressing the specific problems identified.

Identify and engage key stakeholder groups – retailers, consumers, industry representatives, local government, manufacturers, civil society, environmental groups, and tourism associations – to ensure broad buy-in. Evidence-based studies are also necessary to defeat opposition from the plastics industry.

Way Forward

Raise public awareness about the harm caused by single-used plastics, by clearly explaining the decision and any punitive measures that will follow.

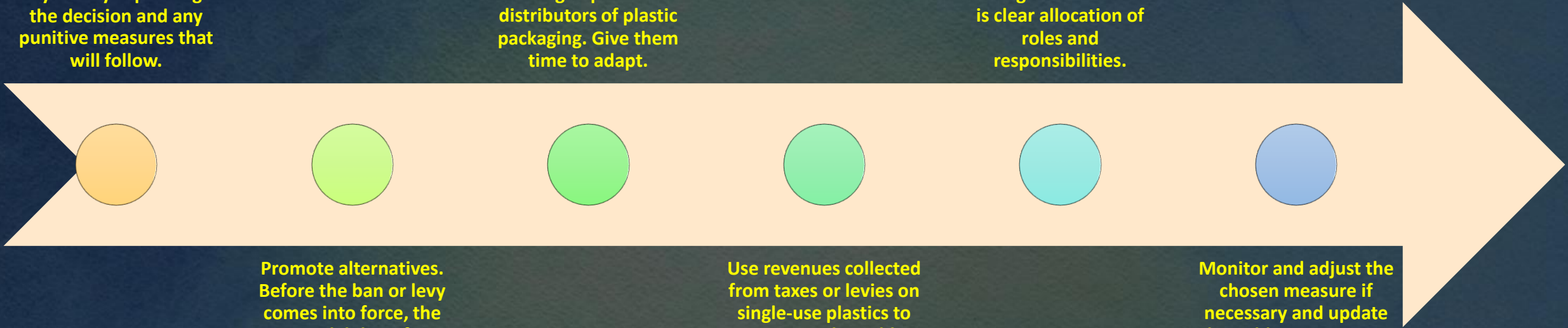
Provide incentives to industry by introducing tax rebates or other conditions to support its transition. Governments will face resistance from the plastics industry, including importers and distributors of plastic packaging. Give them time to adapt.

Enforce the measure chosen effectively, by making sure that there is clear allocation of roles and responsibilities.

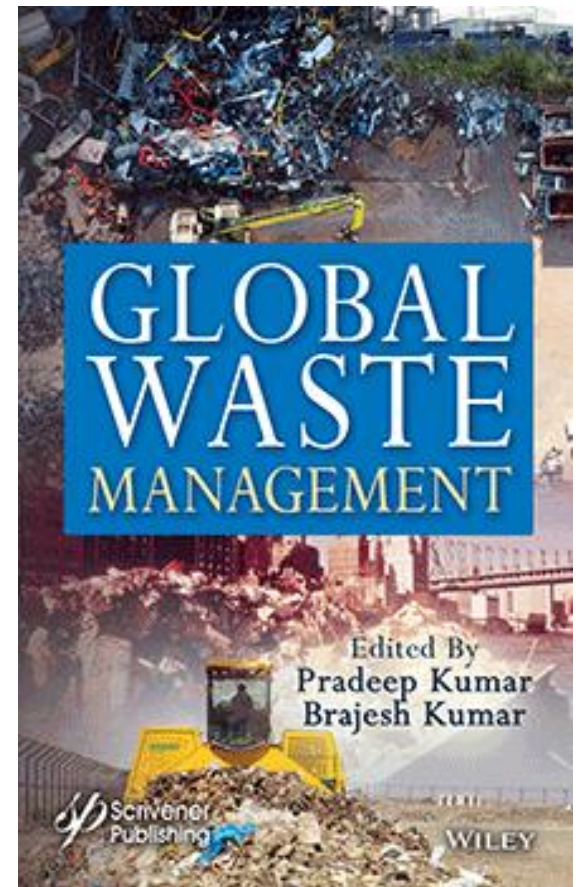
Promote alternatives. Before the ban or levy comes into force, the availability of alternatives need to be assessed.

Use revenues collected from taxes or levies on single-use plastics to maximize the public good, thereby supporting environmental projects or boosting local recycling with the funds and creating jobs in the plastic recycling sector with seed funding.

Monitor and adjust the chosen measure if necessary and update the public on progress.



This is the video
presented by
“Kargha Art”



**Section 5: Plastic
Waste and Its Severity**

NH constructed with Plastic waste - Morena Ambah Porsa road

NH-552 Porsa Ater Bhind on NH 552 in MP



MoRTH, <https://morth.nic.in/>

“Plastic pollution is a global issue: killing wildlife, contaminating our oceans and waters, and lasting far longer than it is used.”

– Leonardo DiCaprio