

# Plastic waste and its Impact

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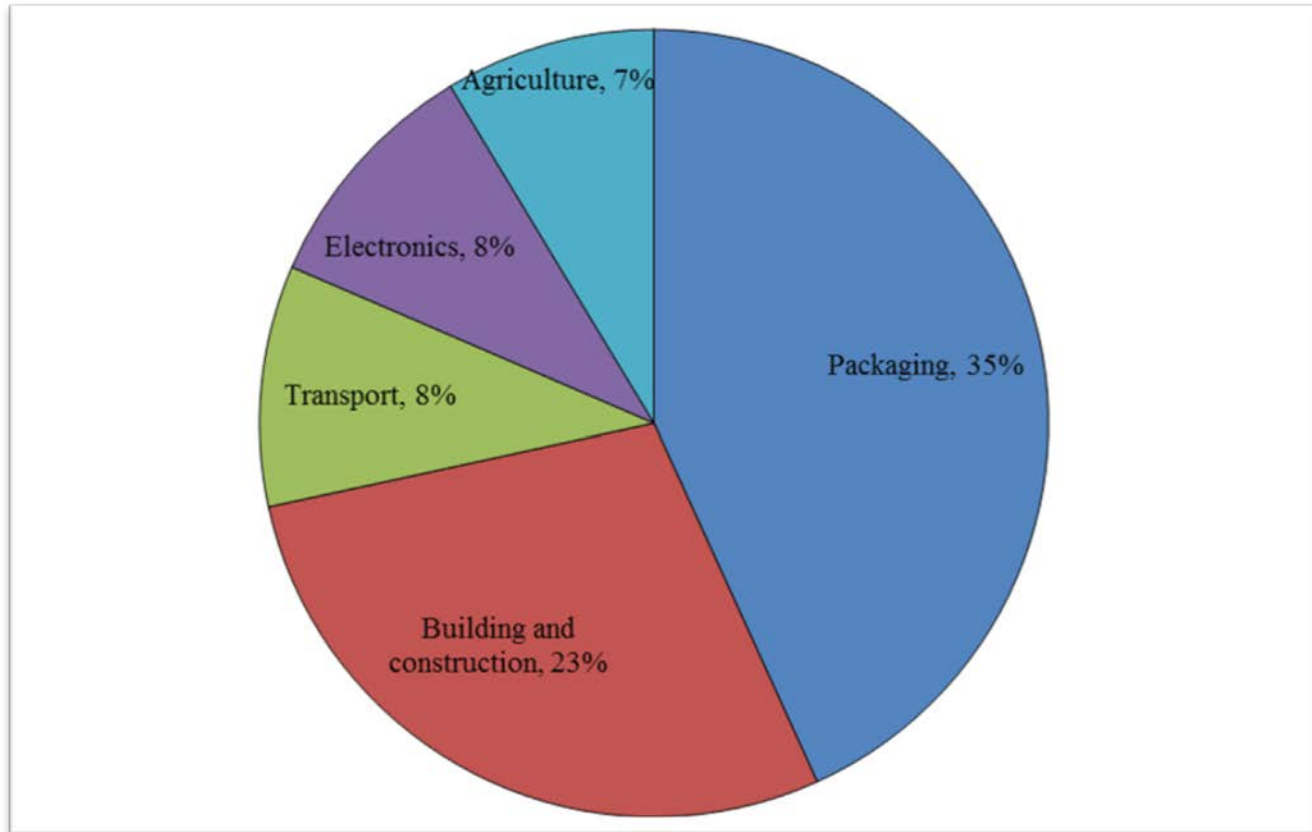


# Plastic Market

Parameter	Value
Estimated size of plastic processing in value (FY15)	~INR 1 lakh crore
Market size in volume (FY15)	13.4 MMTPA
Processing Units	> 30,000
Technical manpower ( as per CIPET)	11 lakh employees
Growth Rate	10-11%
Per Capita Plastic Consumption	11 kg (World: 28kg)

Source: FICCI, 2017

# Sector wise plastic consumption



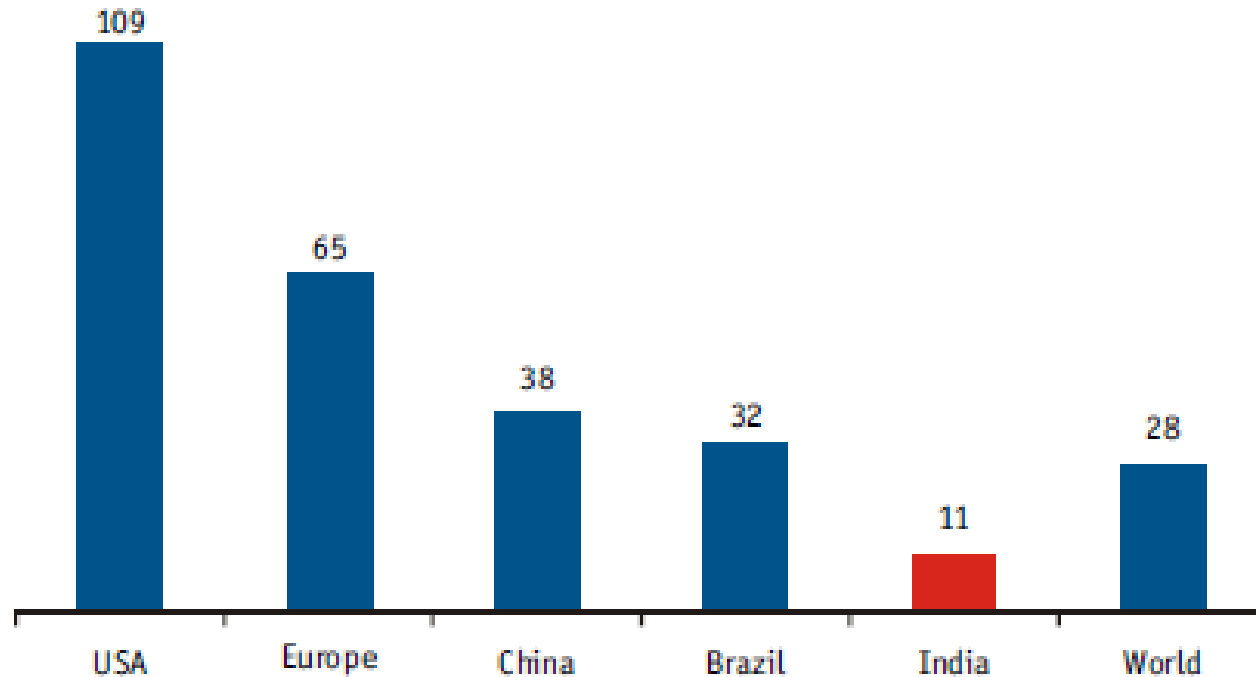
(Swachh Bharat Mission, 2018)

# Packaging Industry-Growth Scenario

- With rising nos. of middle class consumers Indian packaging industry will grow at a CAGR of 9.2% in 2016-2021, as compared to 6.2% during 2011-2016
- Flexible Packaging leads - growing at a CAGR of 8.9% during 2016-2021 with major contributions from the Food, Household Care, and Cosmetics & Toiletries industries
- During this period, the Soft Drinks and Food industries will be the highest packaging market share gainers with share growth of 3.4% and 1.3% respectively.

*Source: Trends and Opportunities in the Indian Packaging Industry: Analysis of changing packaging trends in the Food, Cosmetics and Toiletries, Beverages and Other Industries, Research and Markets, April 2017.*

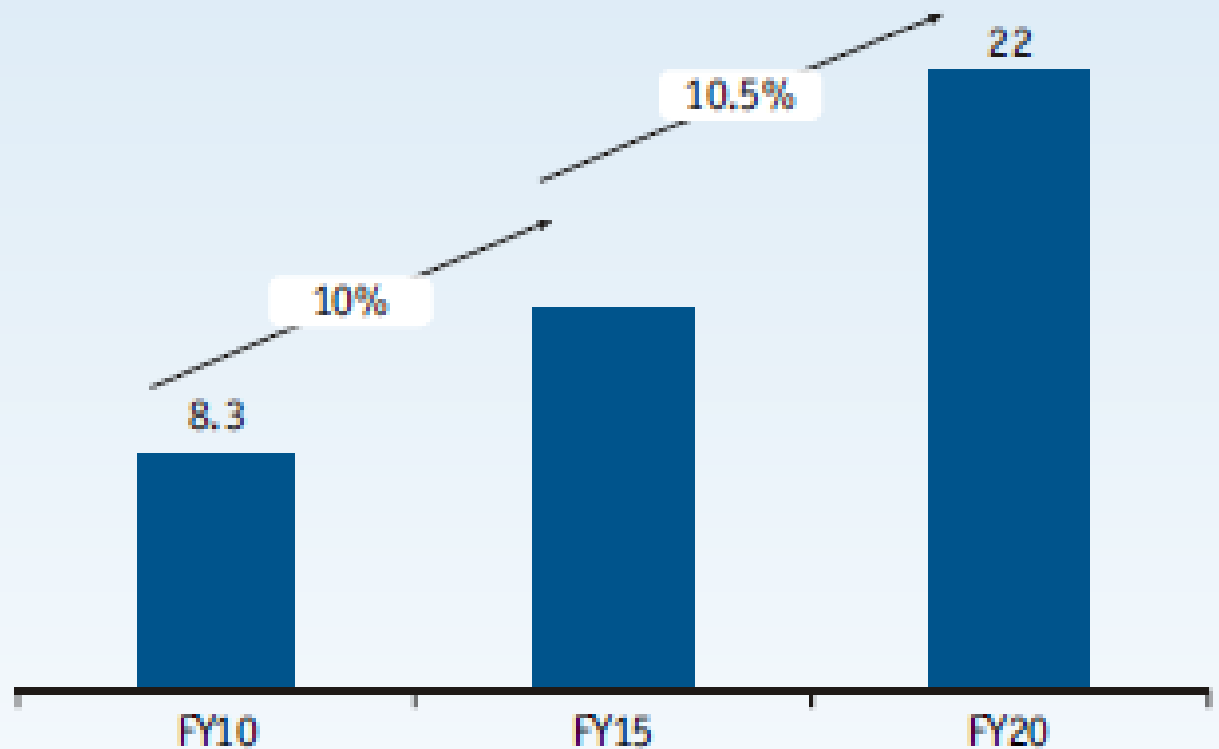
# Annual Plastic Products Consumption(kg/c/yr)



Source: AIPMA and Plastindia, TATA Strategic Analysis

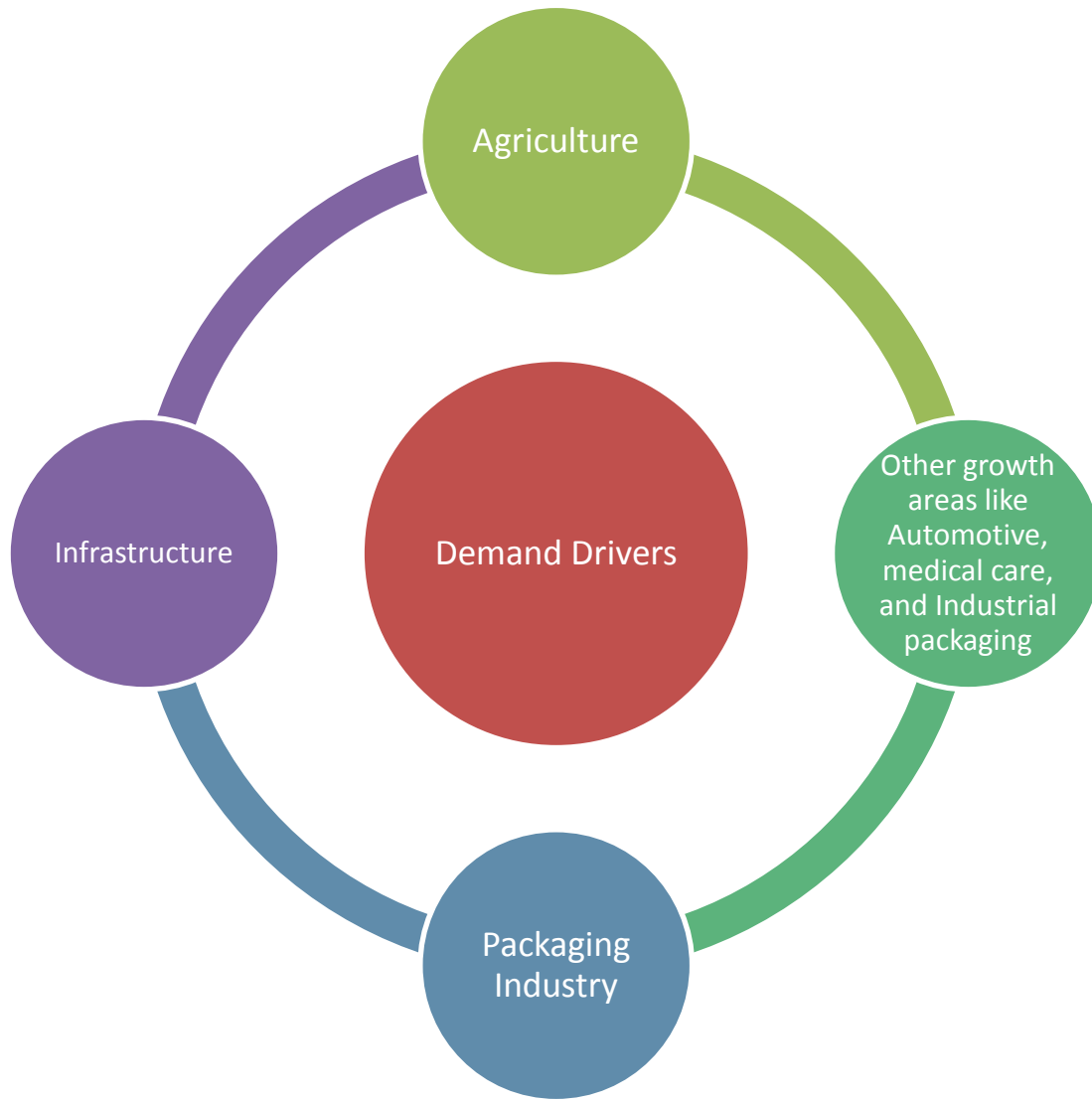
# Growth of Plastic Consumption

- 2015- 13.4MMTPA
- 2020- 22.0MMTPA

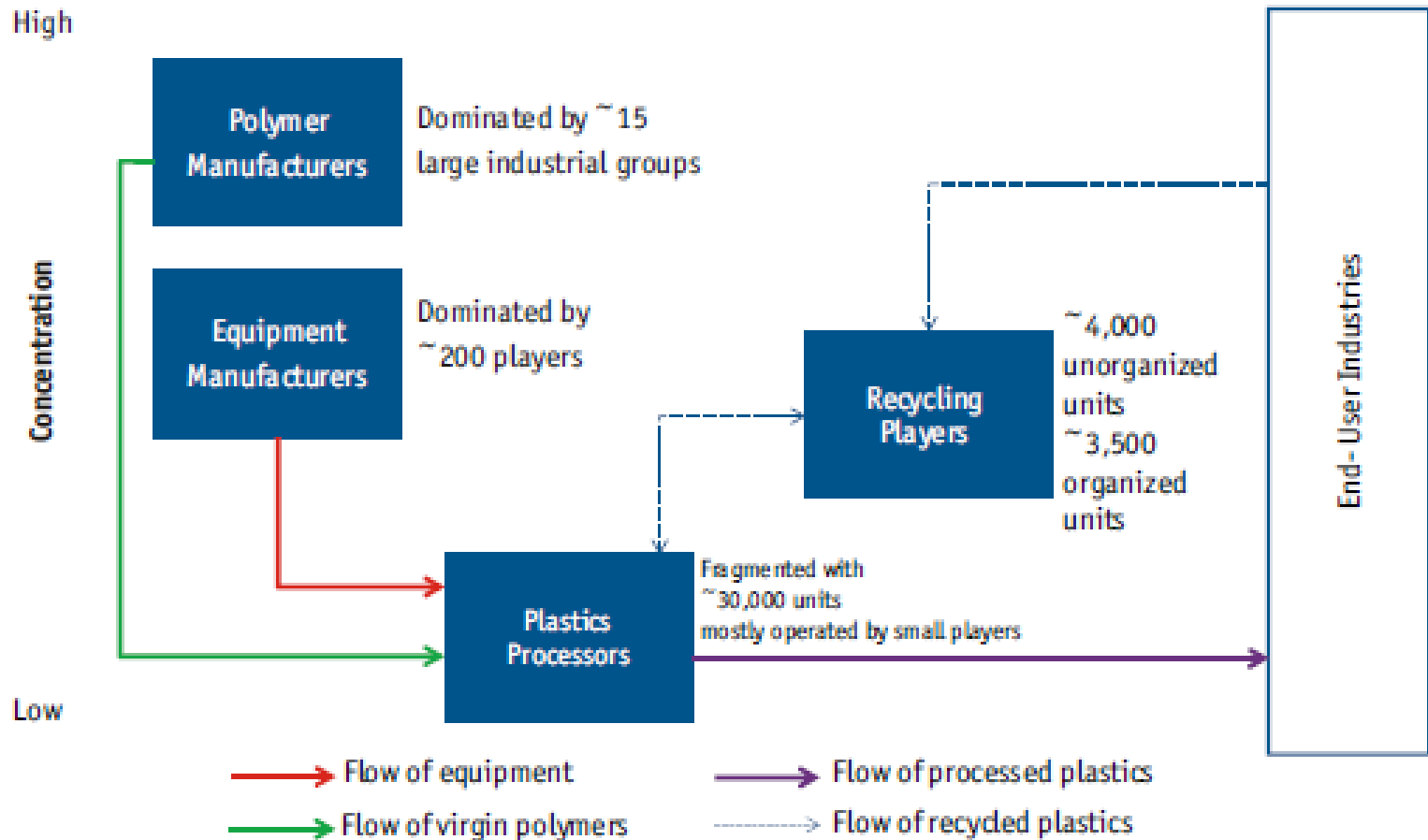


Source: Industry reports, TATA Strategic Analysis

# Growth Drivers



# Structure of Plastic Industry in India

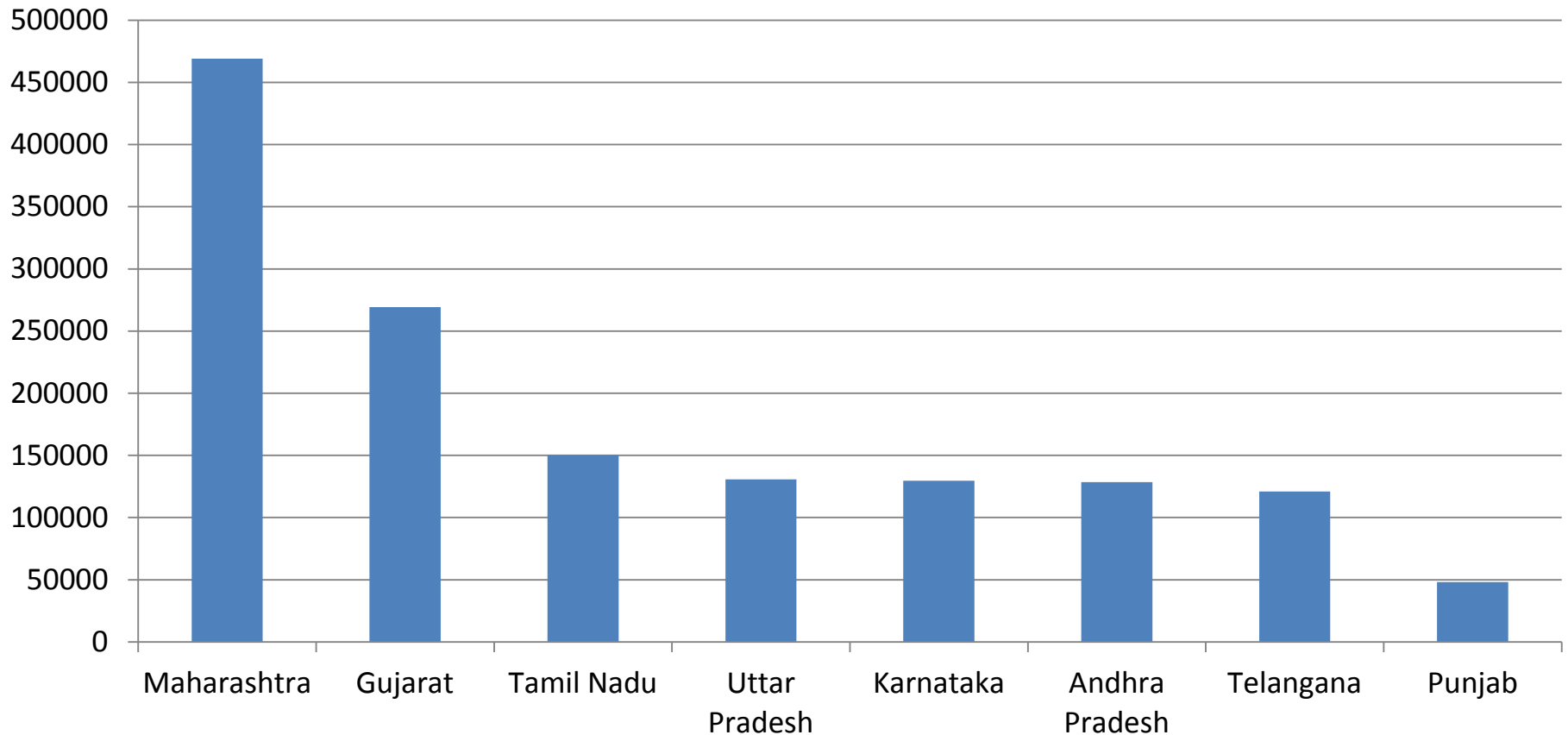


Source: CRISIL, Plastindia Foundation, Kanvic, TSMG Analysis



# Plastic Waste Status in India

Plastic Waste generation from Indian states (MT/yr)



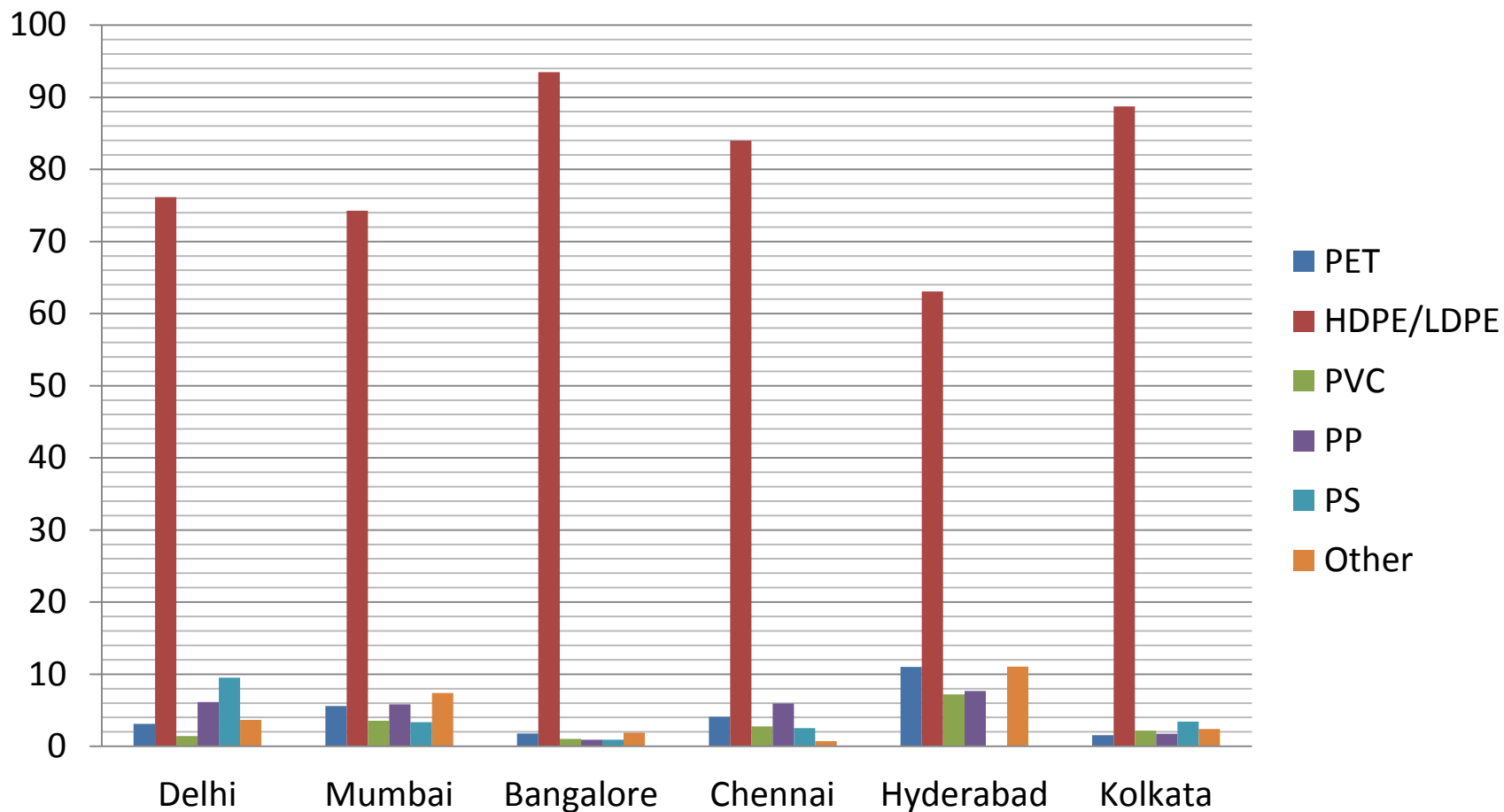
As of 2017, India's total plastic waste generation- 15722 TPD (P. Singh, 2016)

On an average, about 60% i.e. 9205 tonnes plastic is recycled. This recycle rate is very large in comparison to developed countries (10-15%).

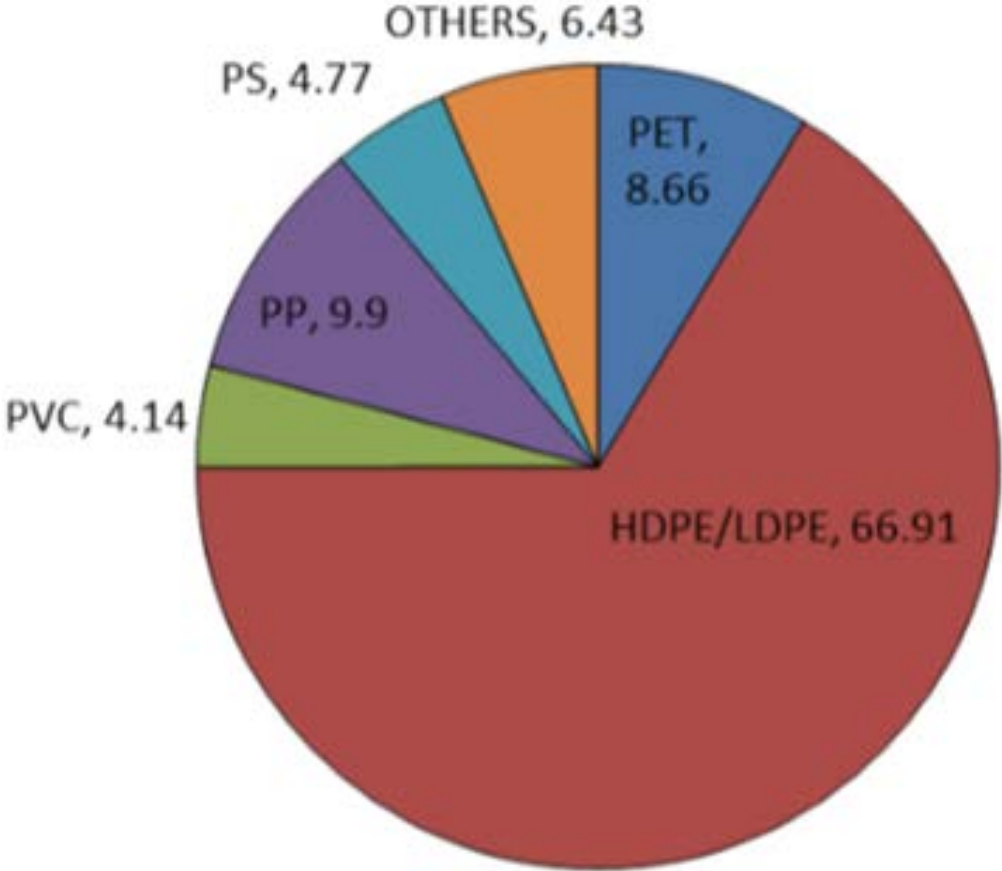
# Largest Plastic Waste Generating Cities

City	Waste Generated TPD (2015)
Delhi	689
Chennai	429
Kolkata	426
Mumbai	408
Bangalore	314
Hyderabad	199

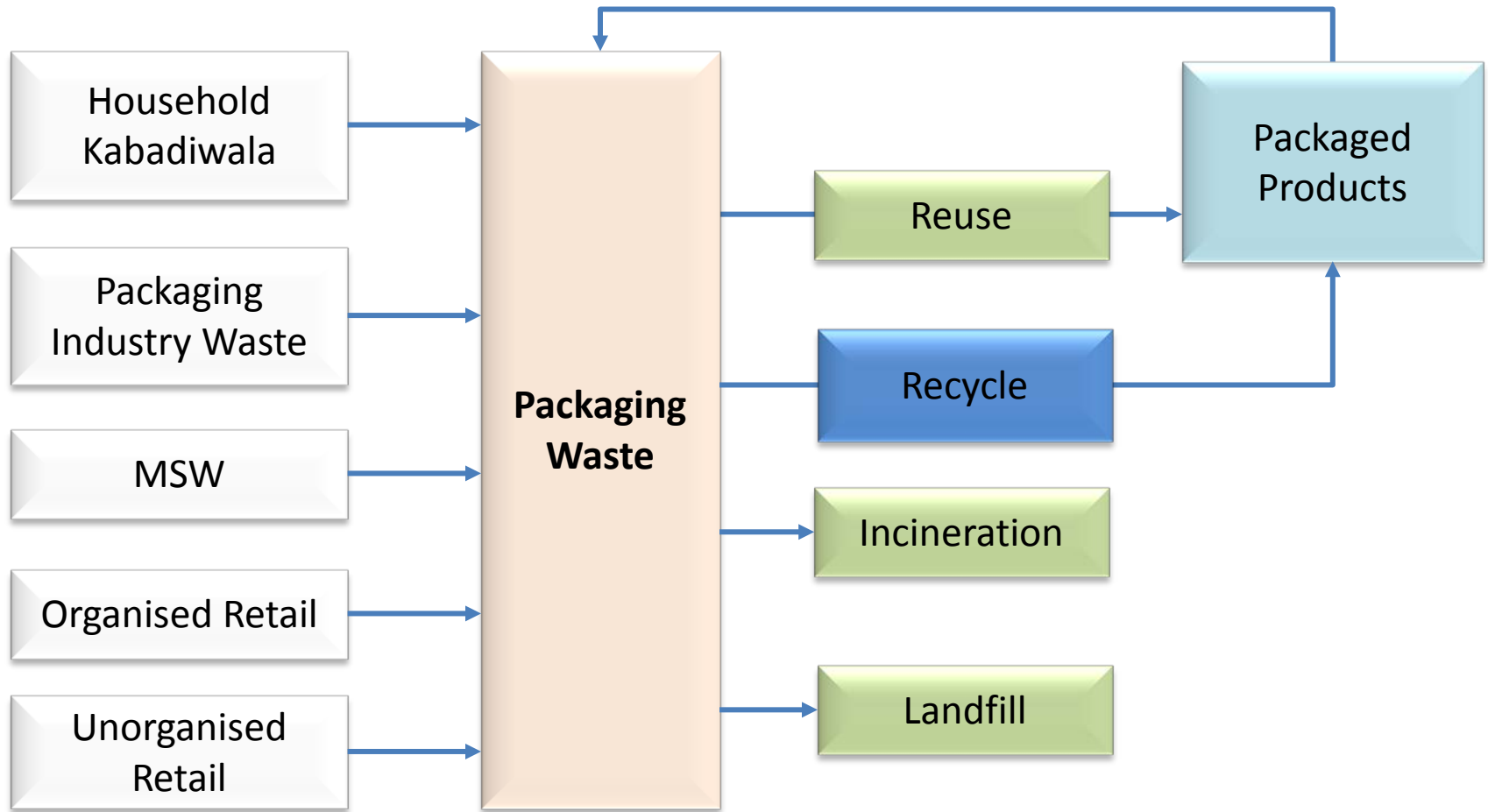
# Plastic Waste composition in some cities



# Average Plastic Waste Composition (2015)

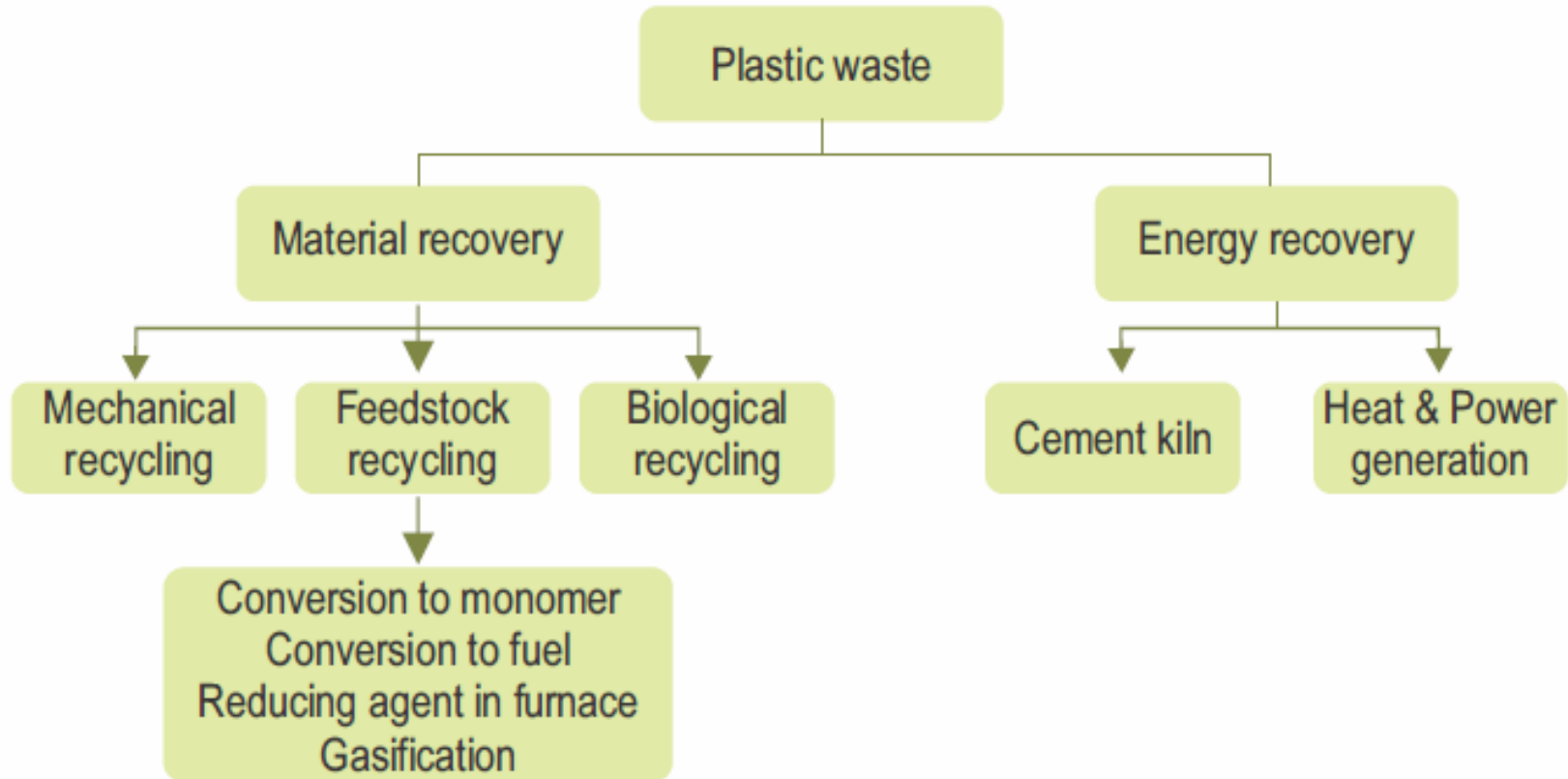


# Sources and fate of packaging waste



Source: IIP

# Plastic recovery flow diagram



# Impacts of Plastic Pollution

# Impact of unmanaged plastic waste

- These plastic items such as thermocol, Styrofoam, transparent and colored plastics, only tend to break down into smaller particles.
- On reaching to water bodies they continue to either stay suspended, or settle in the sediments, blocking transfer of oxygen and percolation of water through the soil.
- Through their continual existence these plastic articles also tend to be consumed by plankton consuming animals and hence enter the **food chain** as well.
- Presence of micro plastics as marine debris, often ingested by freshwater fauna, and thereby entering the food chain.
- River Yamuna in India faces discharge of industrial waste of which phthalic acid esters, hazardous compounds that are found in PVC (also blended in plastics to enhance their plasticity).
- These phthalates leach out in the vicinity- both land and water causing serious concerns to the biota of the river and indirectly to human health as well.



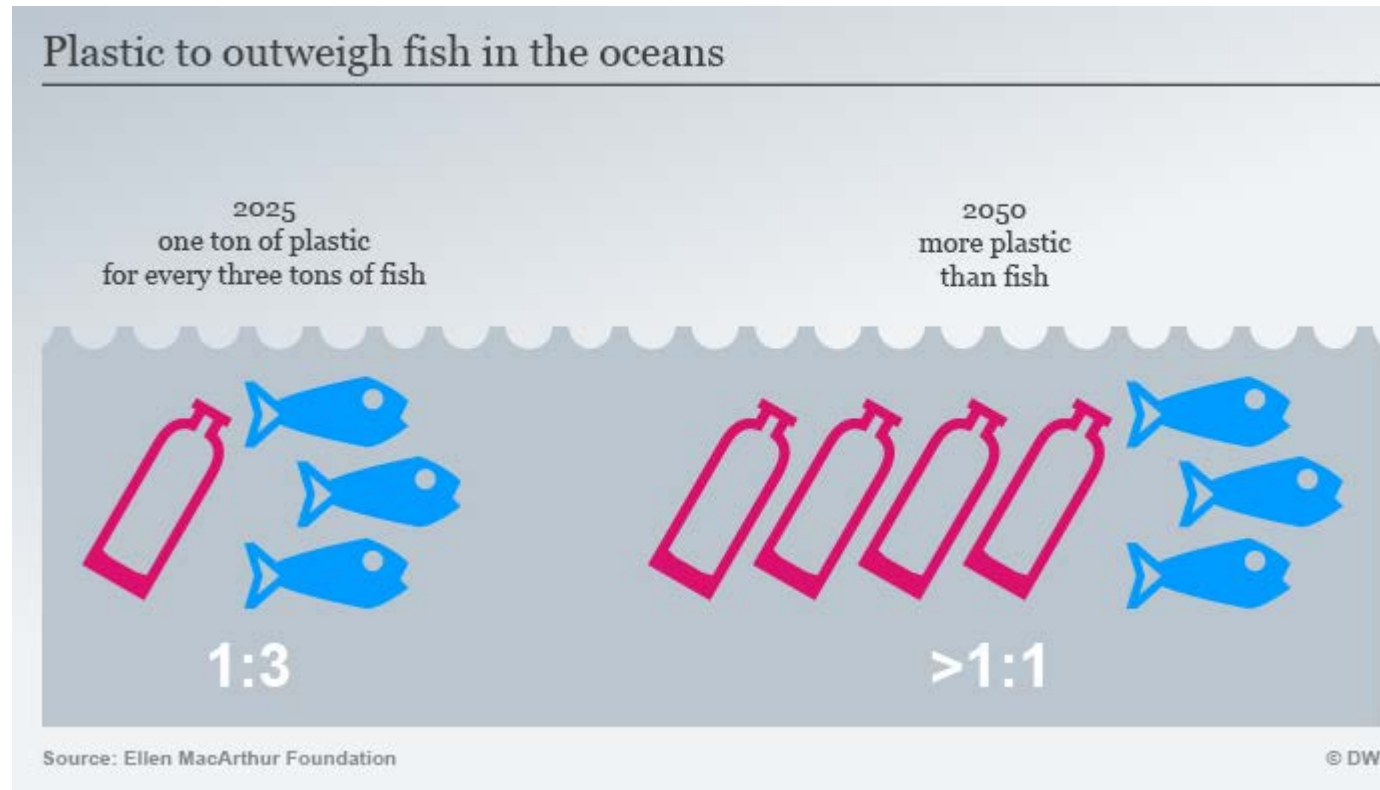
# Impact of unmanaged plastic waste

- Another common method of managing collected and non recyclable plastic waste in India is landfilling.
- Waste is dumped in low lying areas.
- Because these areas are prone to flooding, there is higher possibility of contamination of surface water during rains.
- Leachate from plastic waste is highly toxic and it deteriorates the ground water quality as it permeates through the soil, especially in the rainy season.



# Alarming Scenerio

- Plastic rubbish will outweigh fish in the oceans by 2050 unless drastic action is taken to recycle it.
- 95 percent of plastic packaging is thrown away after a single use.



# Is Plastic a Problem?

Accounts for 40% of  
Global packaging mix

PET is fast replacing glass  
and aluminum in  
packaging market

Glass and aluminum  
containers yield 230%  
and 175% more  
atmospheric emissions  
vis-à-vis PET

Contribute 68% and 18%  
less solid waste by  
weight vis-à-vis glass and  
aluminium containers

India has low per capital  
consumption of PET (0.3  
kg) as compared to  
global average of over 2  
kgs

Recycling each plastic  
bottle can conserve  
enough energy to light a  
60W light bulb for up to  
6 hours

Recycling 1 ton of PET  
containers saves 6 cubic  
meters of landfill space

Recycling 1 ton of PET  
saves 1.5 tons of Carbon  
Dioxide vs. land filling or  
incineration

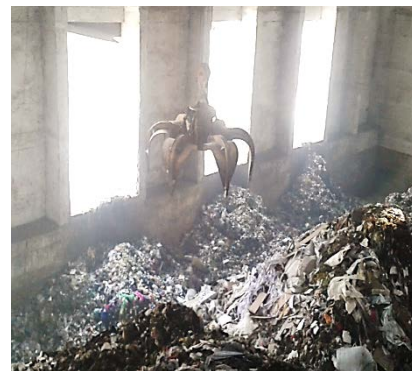
70 per cent PET is  
recycled in organised  
sector in India

# Is Plastic a Problem?

- Using resources already in the human economy consumes much less energy than virgin materials, up to 95% less energy in case of aluminum and 80% in case of plastics.
- Recycling is an essential part of responsible materials management and helps to shift from a 'linear' to 'circular' economy. It helps in generating more jobs, retrieving valuable products as sources of revenue, reduces waste transportation costs and emissions along with landfill expenses.
- Plastic has low energy requirements during production, hence considered to be energy efficient. It consumes about ~25% less energy in production compared to other alternatives.
- It results in lower emission of CO<sub>2</sub>. Thus when compared to glass or aluminum plastics results in lighter environmental footprint. However, plastic is sustainable choice only if recycled and disposed of properly.
- Segregation of waste at source, promotion of waste management infrastructure and increased bio-based plastic are the key's to manage plastic pollution.

# Requirement- Proper management of Waste

- Problem: rather organizational than technical
- Refuse disposal is non profit business  
-> looked as an unwanted side effect of development.
- Proper operation and monitoring is required at every functional element of MSW management.



# Suggested Actions

## PREVENTION/ REDUCE

- Create awareness
- Phase out single use plastics
- Source reduction (waste prevention)

## PREPARING FOR RE-USE

- Policies – globally and in India for “end-of-life” plastic management
- Set up reverse distribution systems
- “design-for-recycle/ disassembly” or “cradle-to-cradle” example - labels, easy disassembly etc. will go into recycling and re-manufacturing

## RECYCLING

- Mechanical recycling (recovery of materials from waste while maintaining molecular structure to reprocess materials into new products)
- Feedstock recycling (plastics turned into basic chemicals for difficult to recycle plastics)

## ENERGY RECOVERY

- Incineration - eg of plastic medical equipment
- Pyrolysis – Plastic to oil
- Efficient and selective degradation of polyethylenes into liquid fuels and waxes (Jia et al 2016)

## DISPOSAL

- Manufacturing alternatives like bioplastics (eg. Chitosan bioplastic)
- Plastic degrading bacteria (Yoshida S. et. al 2016)

# Suggested actions that can have a deep impact

- Minimize single-use plastic packaging and find sustainable alternative materials.
- Make brand-owners responsible for the environmentally sound management of the packaging at the end of its life.
- Introduce incentives for the collection and recycling of plastic packaging.
- Increase the value of plastics to incentivize plastic collection in countries where informal systems of waste picking and recycling prevail.
- Evolving and implementing the concept of Design for Recyclability (DfR) which would involve addressing the following issues:
  - Design and fabricating a product for easy dismantling after end of life (e.g. automobiles are required to be 90 % recyclable in Europe at the end-of-life)
  - Promoting products with modular designs with longer life where different components can be replaced/changed as the need may be so that the product's entry into the waste stream is delayed (e.g. Dell computers)
  - Controlling use of dyes and additives and look for non-hazardous substitutes



Thank you!

*"We Do Not Inherit the Earth from Our  
Ancestors;  
We Borrow It from Our Children"*

-By Moses Henry "Moss" Cass