Plastic Pollution

Case Study- 4

- Check out the top picture: Clean, serene seashore with a large ship.
- Fast Forward: Dirty disposal of plastic into Seashore which is polluting the ocean.
- Compare the contrasting views of the seashore
- Reference:

- 1. Plastics Europe, Plastics—the Facts 2014/2015: an analysis of European plastics production, demand and waste data. (Retrieved from) http://issuu.com/plasticseuropeebook/docs/final_plastics_the_facts_2014_19122/1?e=5245759/13757977, 2014
- 2. Subhankar Chatterjee and Shivika Sharma, “Microplastics in our oceans and marine health”, Field Actions Science Reports [Online], Special Issue 19 | 2019, Online since 01 March 2019, connection on 21 September 2021. URL: http://journals.openedition.org/factsreports/5257
- 3. Vaid, M., Mehra, K. & Gupta, A. Microplastics as contaminants in Indian environment: a review. *Environ Sci Pollut Res* **28**, 68025–68052 (2021). https://doi.org/10.1007/s11356-021-16827-6
- 4. https://timesofindia.indiatimes.com/city/goa/microplastic-hits-marine-life-enters-human-foodmicroplastics-in-fish-at-keri-galgibaga-experts/articleshow/65329255.cms
- 5. https://www.statista.com/chart/18299/how-we-eat-drink-and-breathe-microplastics/

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?
1 PETE	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
2 HDPE	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 *Plastic grocery bags not accepted*
3 V	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

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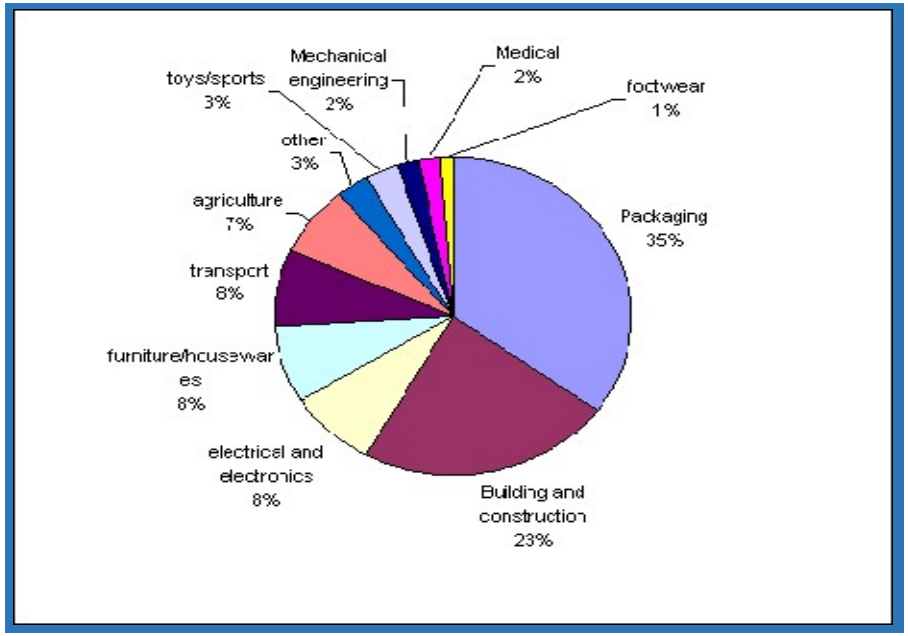
4 LDPE	Low-density Polyethylene (LDPE)	• Dry cleaning bags • Bread bags • Frozen food bags • Squeezable bottles • Wash bottles	• Dispensing bottles • 6 pack rings • Various molded laboratory equipment		Yes
5 PP	Polypropylene (PP)	• Ketchup bottles • Most yogurt tubs • Syrup bottles • Bottle caps • Straws	• 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 Waste Generation and Issues in India

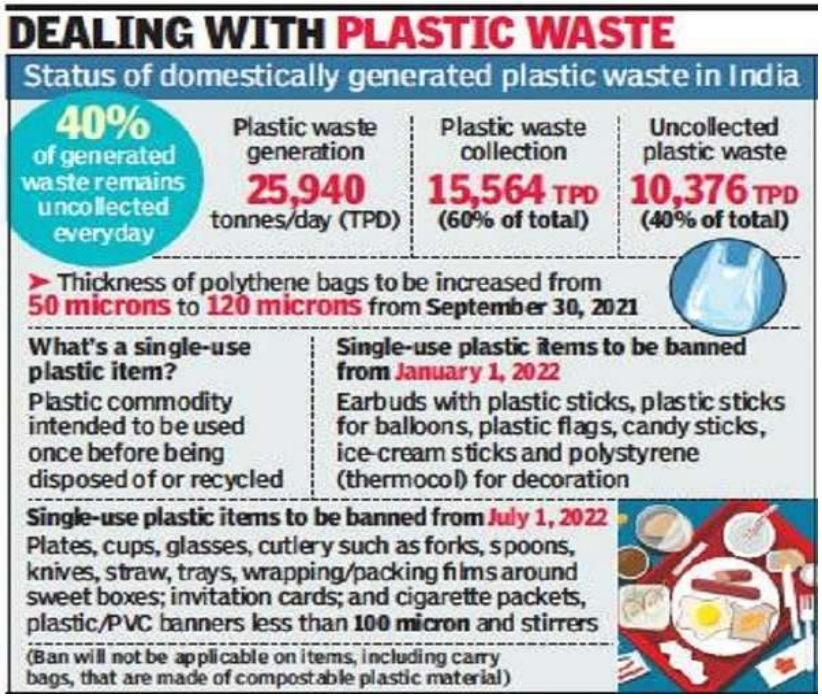
- As per the 2015 study conducted by Central Pollution Control Board (CPCB) in 60 major cities of India: 4,059 tonnes per day of plastic waste was generated by these cities.
- Extrapolating the data from these 60 cities, an estimated 25,940 tonnes per day of plastic waste is generated in India
- Out of the plastic waste generated , 94% comprises of thermoplastic content which is recyclable.



- Urban India fares worse than its rural counterpart in generating plastic waste. Of India's annual waste generation of 62 million tonnes, 5 million is plastic waste generated by India's cities. The national capital Delhi generates over 689 tonnes of plastic waste in a day, followed by Chennai at 429.30 tonnes and Mumbai at 408 tonnes. Among states, Maharashtra tops the list of plastic waste producers, with 4.6 lakh (4,69,098) tonnes per year, followed by Gujarat at 2.6 lakh (2,69,000) and Tamil Nadu at 1.5 lakh (1,50,323) tonnes.
- Maharashtra tops the list of India's largest plastic waste producing state, followed by Gujarat and Tamil Nadu
- https://swachhindia.ndtv.com/world-environment-day-plastic-ban-india-20774/

Plastic Waste Generation and Issues in India

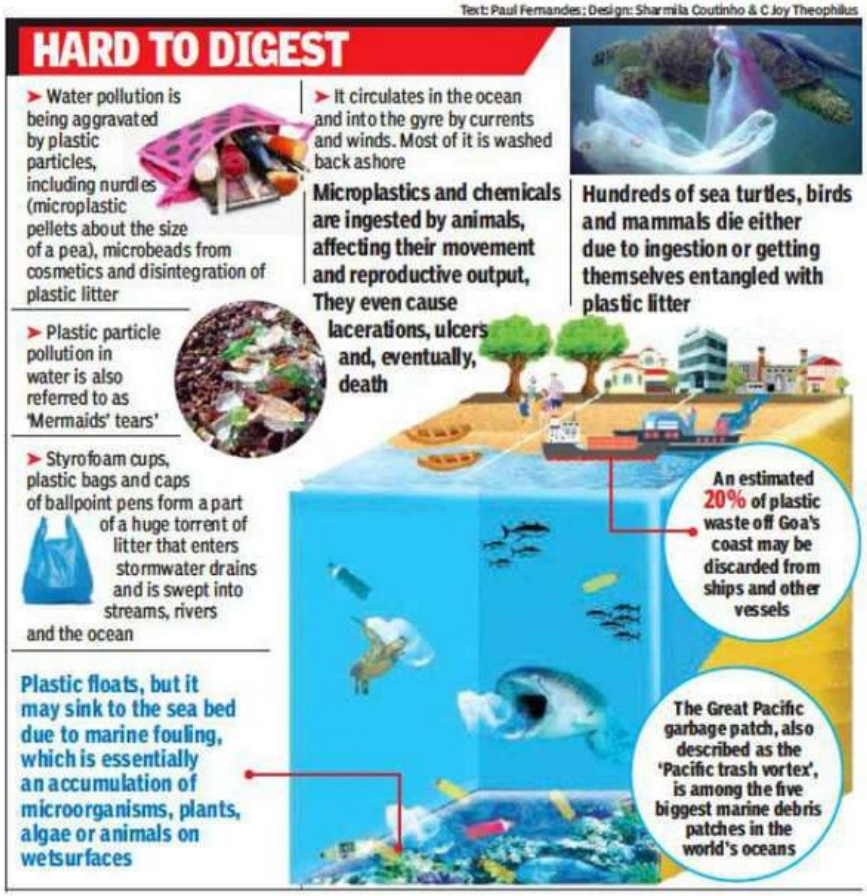
- According to world bank, current per capita per day global waste production is 0.74 kg and there will be increase of 70% by 2050.
- Various factors on which the characteristics of waste depends are food habits, economy, lifestyle, climate, urbanisation etc.
- India's plastic consumption set to cross 20 million metric tonnes by 2020

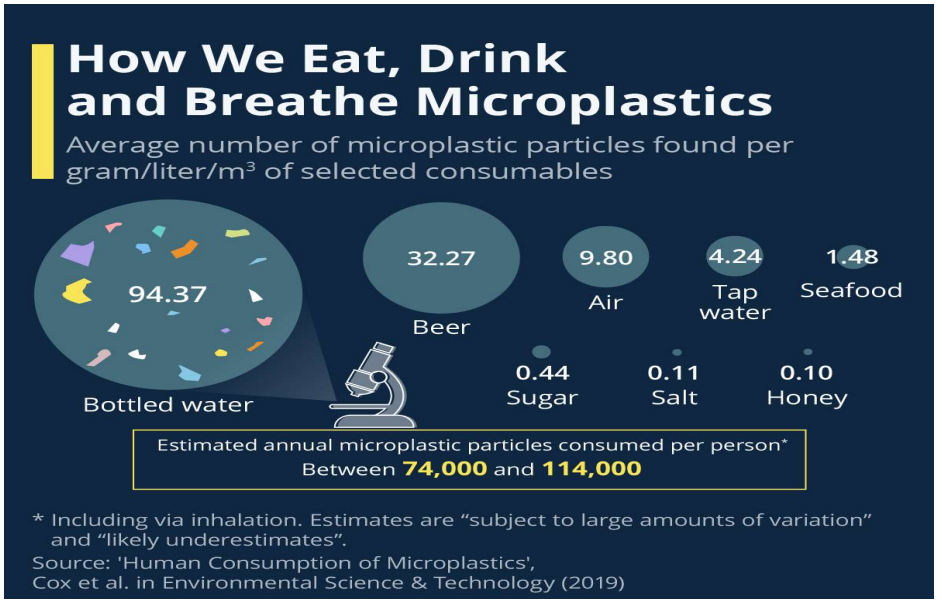


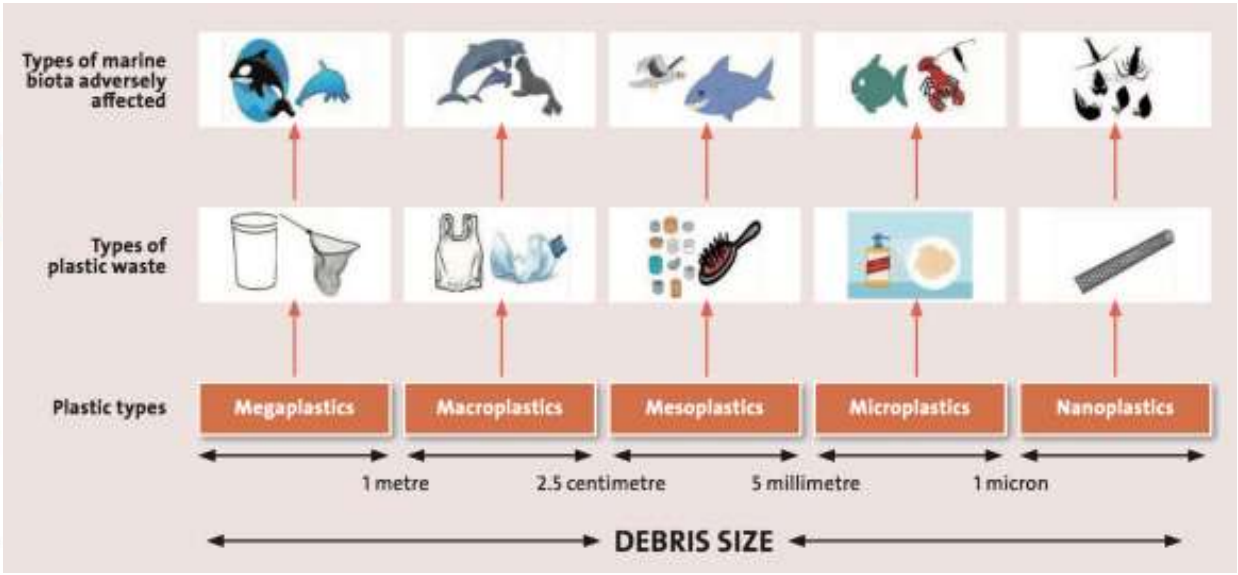
Indian Government has proposed a ban on use of single use plastic items in two phases beginning Jan 1 2022.
In order to deal with the menace of huge uncollected waste across the country, the Centre has also decided to increase thickness of polythene bags from 50 microns to 120 microns from September 30 2021. Currently, polythene bags of less than 50 microns are banned in the country. Manufacture, import, stocking, distribution, sale and use of all single-use plastic commodities will be prohibited under amended rules ahead of the celebration of 75 years of India's independence on August 15 2022.

Read more at:
http://timesofindia.indiatimes.com/articleshow/81475753.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

Generation of Microplastics







Microplastics, which are derived from the consequent breakdown of larger debris, are less than 5mm in length, facilitating their ingestion by marine species and, ultimately, by human beings at the end of the food chain. Studies conducted at Keri and Galgibaga near to Goa beach shows high concentrations of microplastics laced with chemical pollutants found in fish tissue.

Read more at:
http://timesofindia.indiatimes.com/articleshow/65329255.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

- Microplastic are also found in our everyday usable products, in air, water and food. The average person eats, drinks and breathes between 74,000 and 114,000 microplastic particles every year - and that is considered an underestimate.

- https://www.statista.com/chart/18299/how-we-eat-drink-and-breathe-microplastics/

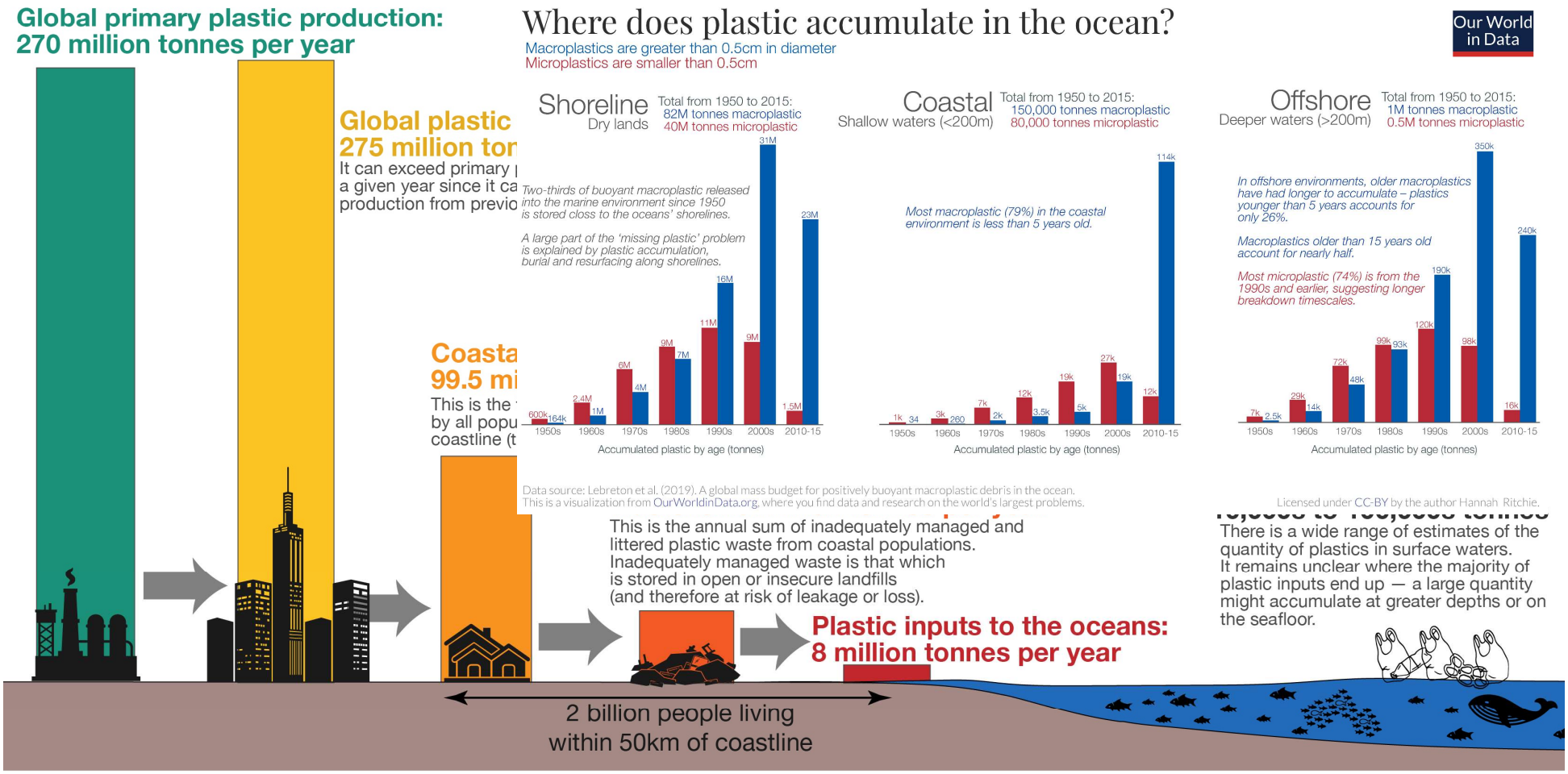
- Primary microplastics are micro-sized synthetic polymers and used as exfoliates of various processes such as chemical formulations, sandblasting media, maintenance of various plastic products and also in the manufacturing of synthetic clothes. Secondary microplastics are the fragmented product of macro or meso plastics and mostly generated under the effect of various environmental processes such as biodegradation, photodegradation, thermo-oxidative degradation, thermal degradation and hydrolysis. Further nanoplastics are plastic fragments with < 1 µm size, and all these microplastics and nanoplastics have potential implications for the bioamplification and bioaccumulation of various chemicals and pollutants.

- Reference: Subhankar Chatterjee and Shivika Sharma, “Microplastics in our oceans and marine health”, Field Actions Science Reports [Online], Special Issue 19 | 2019, Online since 01 March 2019, connection on 21 September 2021. URL: http://journals.openedition.org/factsreports/5257

The pathway by which plastic enters the world's oceans

Our World in Data

Estimates of global plastics entering the oceans from land-based sources in 2010 based on the pathway from primary production through to marine plastic inputs.



Source: based on Jambeck et al. (2015) and Eriksen et al. (2014). Icon graphics from Noun Project.

Data is based on global estimates from Jambeck et al. (2015) based on plastic waste generation rates, coastal population sizes, and waste management practices by country

This is a visualization from OurWorldinData.org, where you will find data and research on how the world is changing.

Plastic waste generated in coastal regions is most at risk of entering the oceans; in 2010 coastal plastic waste – generated within 50 kilometres of the coastline – amounted to 99.5 million tonnes;

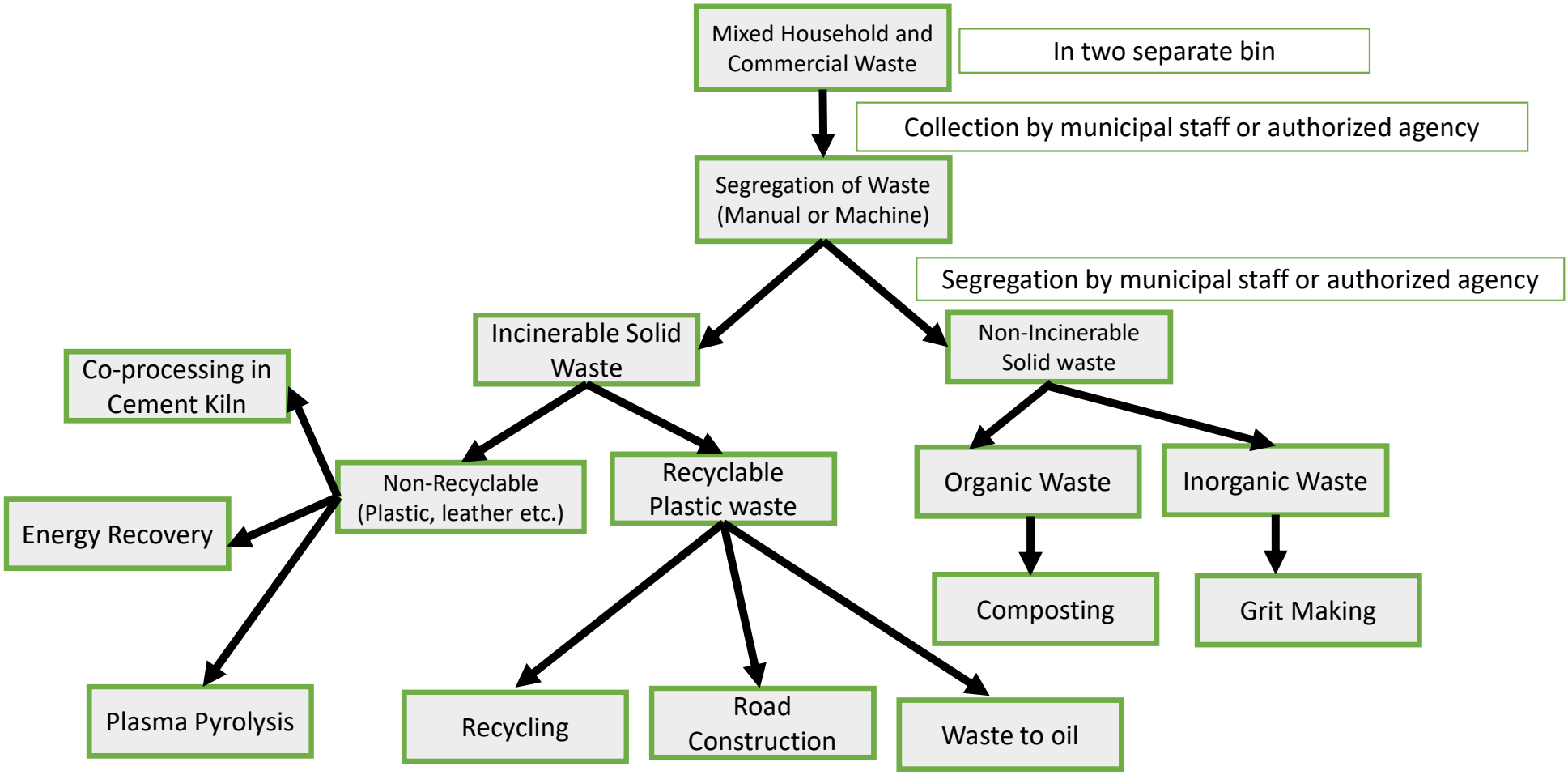
Plastic waste which is improperly managed (mismanaged) is at significant risk of leakage to the environment; in 2010 this amounted to 31.9 million tonnes;

of this, 8 million tonnes – 3% of global annual plastics waste – entered the ocean (through multiple outlets, including rivers)

- To try to understand what happens to plastic waste when it enters the ocean, Slat et al. (2019) created a global model of ocean plastics from 1950 to 2015. The authors aimed to quantify where plastic accumulates in the ocean across three environments: the shoreline (defined as dry land bordering the ocean), coastal areas (defined as waters with a depth less than 200 meters) and offshore (waters with a depth greater than 200 meters).
- Their results suggest that macroplastics can persist for decades; can be buried and resurfaced along shorelines; and end up in offshore regions years later. This study challenges the previous hypotheses that plastics in the surface ocean have a very short lifetime, quickly degrade into microplastics and sink to greater depths.

- For more Information Check:
- https://ourworldindata.org/ocean-plastics

Plastic waste management - technology



Application of recycled plastic

Use of Plastic Waste for Pavement Blocks (Hyderabad)

- The tiles made from 30,000 plastic carry bags were procured last month from a Delhi-based company Shayna EcoUnified India Pvt. Ltd. The work on installing paver tiles has already started. With expert advise from Bamboo House India, the civic corporation is likely to complete the project in a few days.
- The tiles will be used to cover 1,500 square feet of area in Shilparamam and 3,500 sqaure feet in a pet park. Since Shilparamam is located right in the middle of the city and many software companies are in the same area, the paver tiled walkway made from plastic is likely to draw attention.

- The paver tiles from plastic come with twin benefits. It will solve the problem of road digging. Usually, when a water connection pipe is to be repaired or a telephone wire is to be installed the civic corporation digs a portion of road and the road has to be made again.
- As opposed to regular cemented roads, the paver tiles cost much less. While an average road construction costs up to Rs 10 lakhs, the paver tiles purchased by the GHMC cost around Rs 3 lakhs. Besides, the tiles can take approximately 20 tonnes of weight so the possibility of cracks is eliminated.

- Check Website:
- https://swachhindia.ndtv.com/plastic-waste-management-hyderabad-to-roads-to-get-paver-tiles-from-waste-plastic-24689/#:~:text=The%20paver%20tiles%20from%20plastic,has%20to%20be%20made%20again.

Application of recycled plastic

Use of Plastic Waste for Road construction (Bangalore)

- There are approximately 56 lakh kilometres of roads in India, and if we can use plastic waste to relay them with around 2 tonnes of plastic waste per kilometre, we would need around 1 crore 20 lakh tonnes of plastic. But the country produces only 10 lakh tonnes of plastic every year. K.K Plastic Waste Management Ltd has patented a technology known as **K K Polyblend**, which is made out of plastic bags and packing material, and acts as a bitumen binder which can be used in laying roads.
- A study by the Central Pollution Control Board (CPCB) titled ***Performance Evaluation of Polymer Coated Bitumen Built Road*** in 2008 claimed that such roads are performing much better than regular bitumen roads under similar conditions, with better resistance toward rain, increase in strength by 100 percent, and no development of potholes in the years monitored.
- **The Plastic Waste Management Rules 2016** recommend local bodies to encourage the usage of plastic waste in construction of roads as per the **Indian Road Congress guidelines**. **Reports** have pointed to developers being mandated to use plastic waste in construction of roads within 50 kms of the periphery of any city.

- Check Website:
- https://citizenmatters.in/road-construction-plastic-waste-management-environment-pollution-8804

Application of recycled plastic

Use of Plastic Waste for Road Construction

Gurugram

United Kingdom

- **Picture 1:** In a move aimed at dealing with tonnes of plastic waste generated in the city daily, Municipal corporation Gurugram (MCG) has made the use of such trash mandatory for the construction of all bitumen roads under its jurisdiction.

- Source: https://timesofindia.indiatimes.com/city/gurgaon/mcg-makes-use-of-plastic-waste-in-road-construction-a-must/articleshow/74017084.cms

- **Picture 2:** Enfield Council in North London became the latest authority to use asphalt mixes modified with waste plastic on its roads.

- Source: https://www.worldhighways.com/wh6/feature/bangalore-dumfries-plastic-waste-technology-reinforcing-our-roads