

Practices on regulated plastics in China

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Polymer

Polymer types are diversified, it can be classified by different manners, such as thermoplastics and thermosets, fossil-based plastics and bio-based plastics, biodegradable and non-biodegradable

Plastics

Chemical

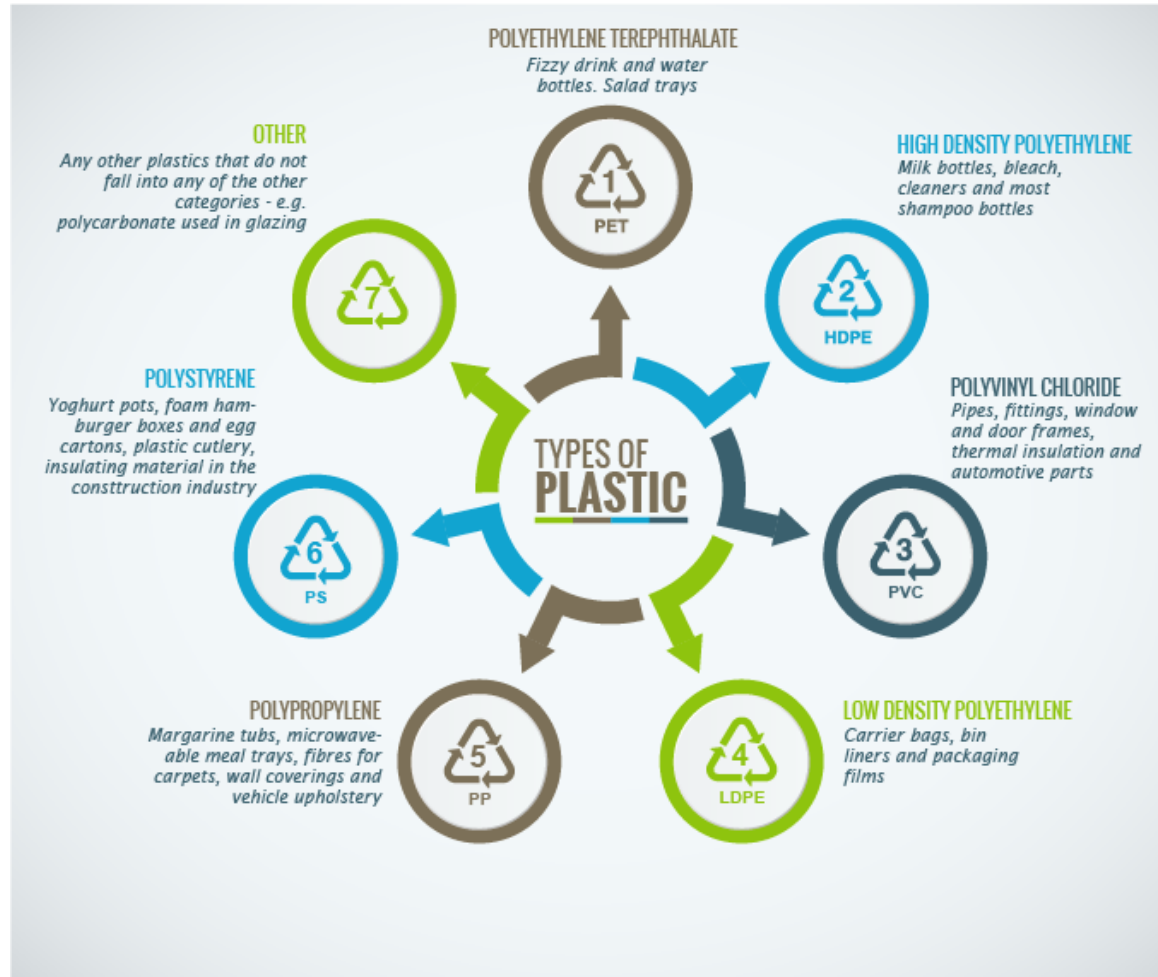
- Additives: added to plastics to bring about certain changes to the characteristics of the plastics as desired
- Processing aids: used to improve the processability and handling of high-molecular-weight polymers

“Polymer” appears 79 times in Zero draft text of the international legally binding instrument on plastic pollution, including in the marine environment:

- primary plastic polymer
- chemicals and polymers of concern
- chemicals, groups of chemicals and polymers
- chemical or polymer
- chemical, polymer or product
- polymers, plastics, and plastic products

Most plastics are a blend of polymers and additives

Common types



Classification by American Society for Testing and Materials on main types of polymers to facilitate recycling

- Plastic waste almost exclusively¹¹ consisting of one non-halogenated polymer, including but not limited to the following polymers:

- Polyethylene (PE)
- Polypropylene (PP)
- Polystyrene (PS)
- Acrylonitrile butadiene styrene (ABS)
- Polyethylene terephthalate (PET)
- Polycarbonate
- Polyethers

- Plastic waste almost exclusively¹¹ consisting of one cured resin or condensation product, including but not limited to the following resins:

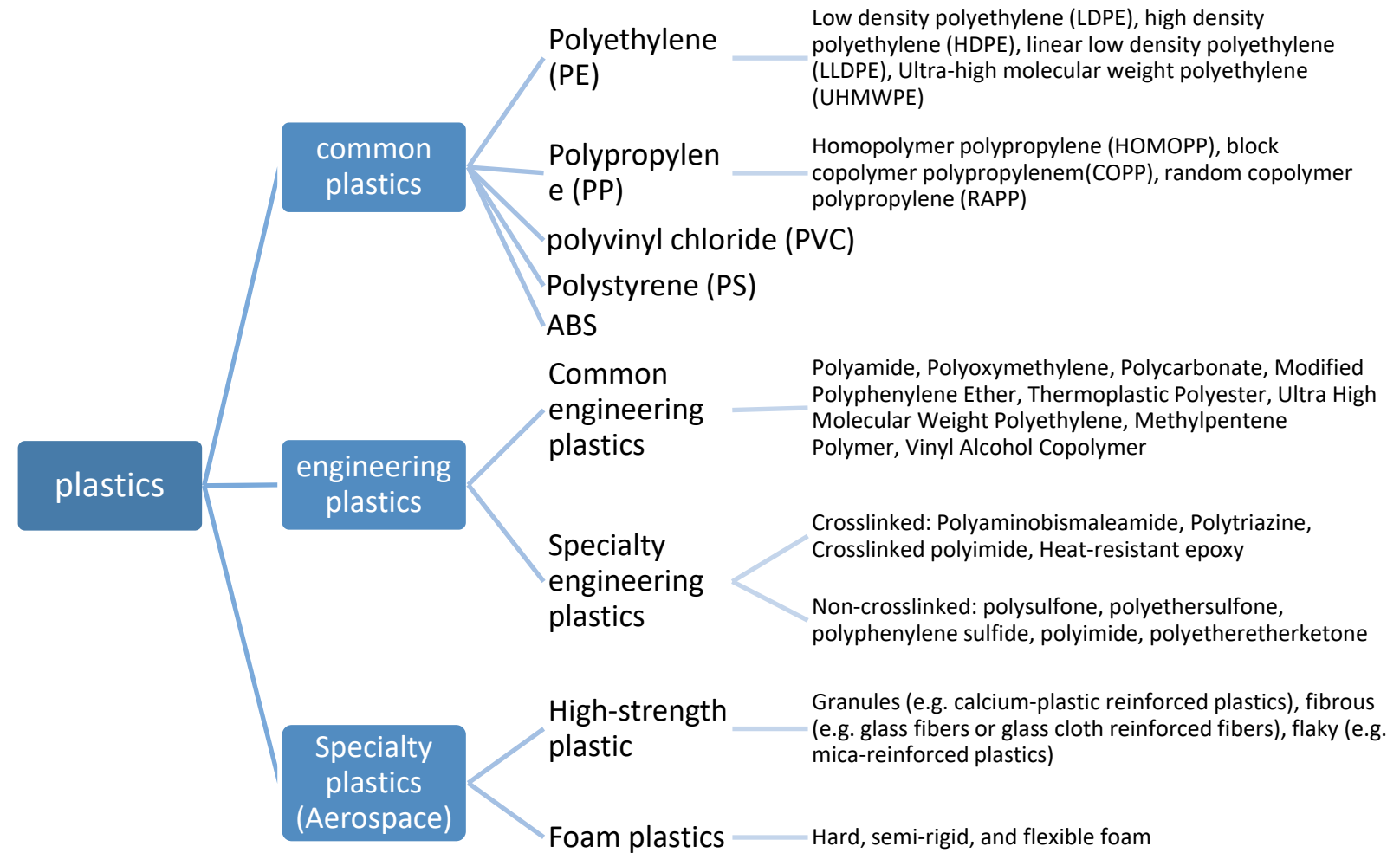
- Urea formaldehyde resins
- Phenol formaldehyde resins
- Melamine formaldehyde resins
- Epoxy resins
- Alkyd resins

- Plastic waste almost exclusively¹¹ consisting of one of the following fluorinated polymers:¹²

- Perfluoroethylene/propylene (FEP)
- Perfluoroalkoxy alkanes:
 - Tetrafluoroethylene/perfluoroalkyl vinyl ether (PFA)
 - Tetrafluoroethylene/perfluoromethyl vinyl ether (MFA)
- Polyvinylfluoride (PVF)
- Polyvinylidene fluoride (PVDF)

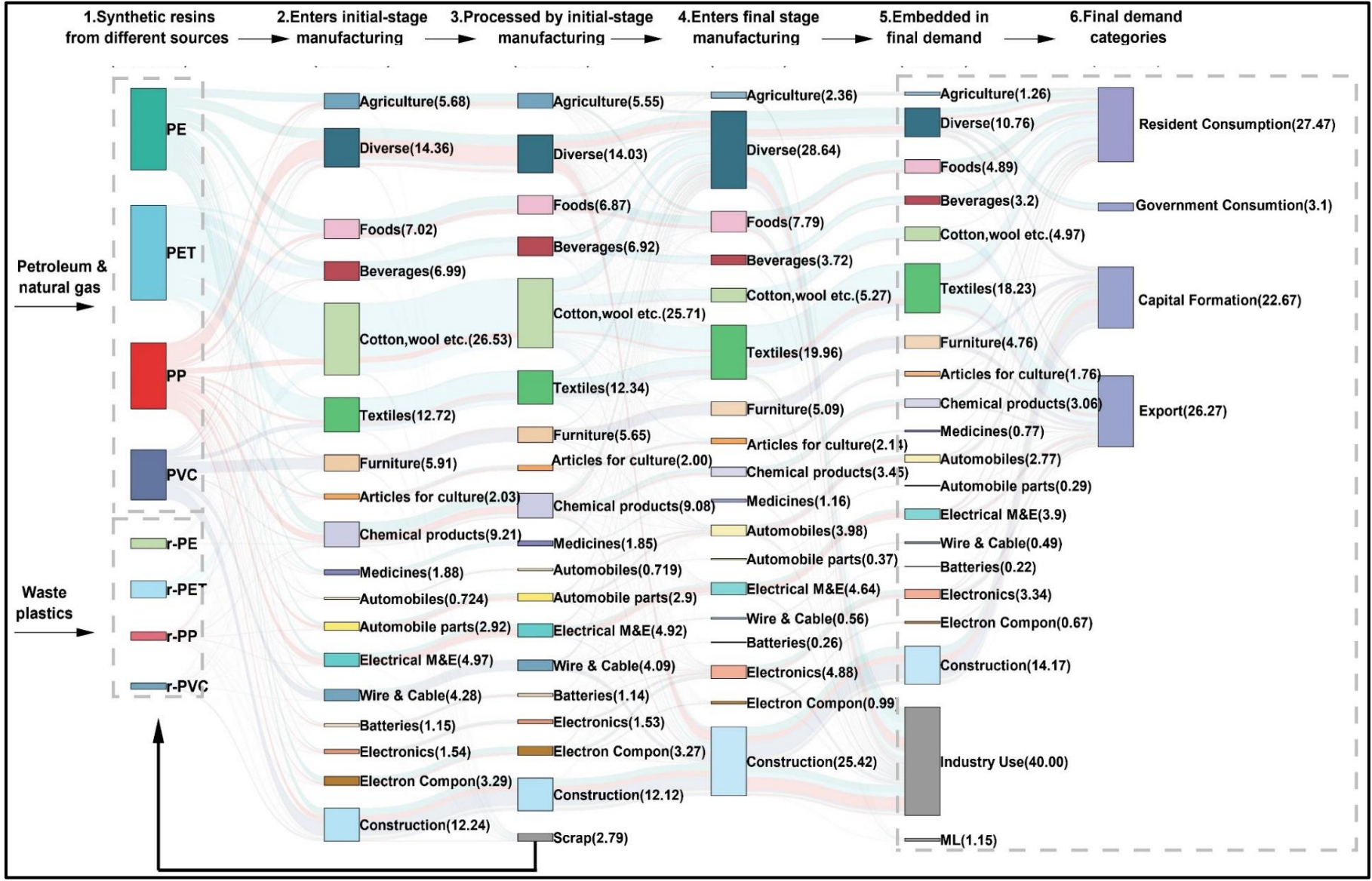
Polymer type listed by <Basel Convention>

- It's reported more than 30 types of plastic polymers and hundreds types of plastics are industrial produced
- Production statistics vary in different reports and literatures, the scope covered by the various studies differs

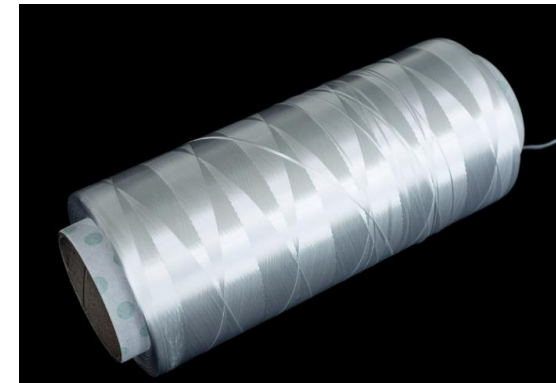
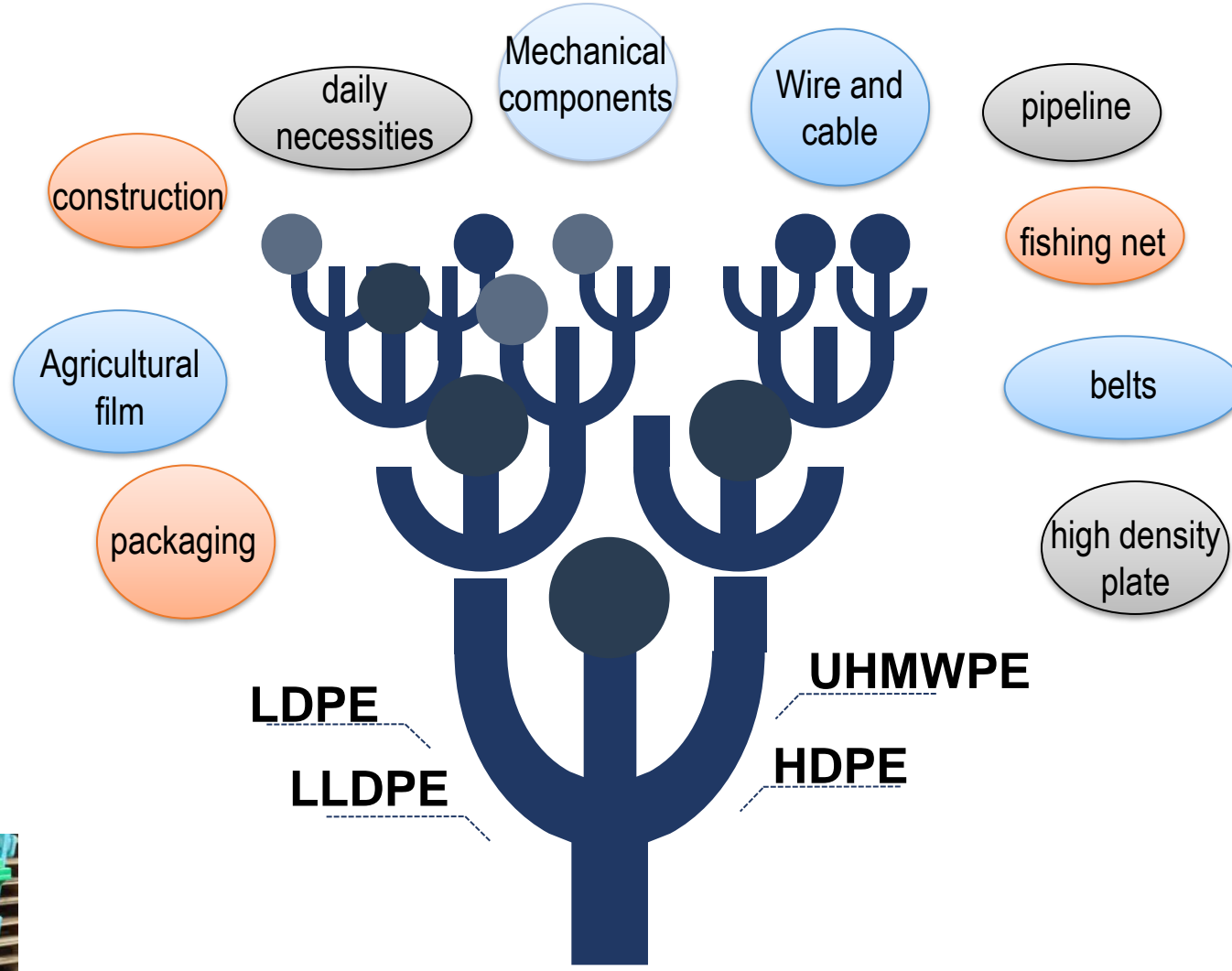
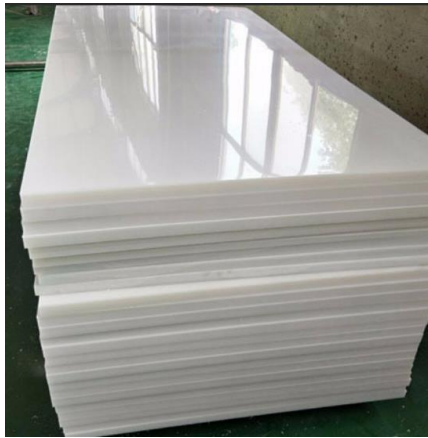


Some types of plastic polymers

01 Polymer use



- Take polymers of top production, PE, PET, PP and PVC, as an example, polymers applications varies obviously along the manufacturing stages
- From specific polymer perspective, it is difficult to tell where it ends up



Considerations for regulated plastics in China

Focus on plastic products consumer sectors

Easy to
leak

Difficult
to collect

Able to
substitute

mall and
supermarket

food-
delivery

express

agriculture

hotel

retail
market

restaurant

single-use plastic bags, single-use plastic cutlery, single-use plastic straws, takeaway packaging, express packaging, agricultural film, pesticide packaging waste, hotel single-use products, single-use plastic cotton swabs

SHOPPING BAGS: WHAT ARE THE BETTER OPTIONS BASED ON LIFE CYCLE ASSESSMENTS

Considerations of geographical and technological and policy context

	Bags reused many times	Bags used only a few times
NO FORMAL WASTE MANAGEMENT unsanitary landfill, open dumps, open burning, no policy support for recycling and/or composting	Reusable bag (cotton or durable plastic)	Insufficient evidence for preference between Single-use paper bag or: Reusable bag (cotton or durable plastic)
FORMAL WASTE MANAGEMENT BUT POOR RECYCLING sanitary and/or incineration with/without energy recovery, weak policy support for recycling and/or composting	Reusable bag Heavy-duty plastic (LDPE) bag must be used >40 times* Non woven PP bag must be used 15-20 times* Cotton bag must be used 100-175 times*	Lightweight plastic bag Fossil-based PE (especially if landfilled) or bio-based LDPE (preference depends on the impact category)
FORMAL WASTE MANAGEMENT WITH HIGH RECYCLING AND RECOVERY strong policy support for recycling	Reusable bag Heavy-duty plastic (LDPE) bag (with recycled content) must be used >40 times* Non woven PP bag must be used 15-20 times* Cotton bag must be used 50-100 times*	Single-use bag Fossil- or bio-based PE with high recycled content; Paper bag, if recycled or incinerated after use and produced (and recycled) with largely renewable energy and avoid littering.

■ Reusable bag preferred
 ■ Single-use bags preferred
 ■ No clear preference for reusable or single-use bags

* Compared to a conventional lightweight single-use HDPE bag

Reusable bags have lower impacts than single-use bags in most environmental impact categories (regardless of the material) provided they are actually used a sufficient number of times. However, there are many factors like production technologies, energy sources and end-of-life management systems that determine the extent of the relative benefit.

In contexts where there are under-developed waste-management systems and poor infrastructure for collection and recycling, SUPPs should be avoided because of their littering potential, and reusable bags should be considered. In contexts where incineration is prevalent, paper, cotton, and other bio-based bags should be promoted due to their climate-neutral advantage. In contexts where sanitary landfills are prevalent, landfill gas should be collected to reduce climate impacts.

However, reducing the environmental impacts of bags is not just about choosing, banning, recommending or prescribing specific materials or bags, but also about changing consumer perceptions and behaviour to increase reuse and avoid littering.

TAKE-AWAY FOOD CONTAINERS: WHAT ARE THE BETTER OPTIONS BASED ON LIFE CYCLE ASSESSMENTS

Reuse feasible **Reuse not feasible**

Considerations of geographical and technological context	CONTAINERS REUSED MANY TIMES*		CONTAINERS REUSED ONLY A FEW TIMES	CONTAINER CONTAMINATED WITH FOOD (preventing recycling)	CONTAINER NOT CONTAMINATED WITH FOOD (recycling is possible)
	EFFICIENT LOGISTICS AND WASHING during use-phase (energy efficient washing; short return distances)	INEFFICIENT LOGISTICS AND WASHING during use-phase (long distances; high energy use in washing)			
NO FORMAL WASTE MANAGEMENT unsanitary landfill, open dumps, open burning, no policy support for recycling and/or composting	Reusable plastic (PP) or glass	Reusable plastic or glass in case of renewable energy mix	Insufficient evidence for preference between Single-use paper-based, or Reusable plastic or glass	Single-use Paper/cardboard/wood	Single-use Paper/cardboard/wood
FORMAL WASTE MANAGEMENT BUT POOR RECYCLING sanitary landfill and/or incineration with/without energy recovery, weak policy support for recycling and/or composting	Reusable plastic (PP)	Case by case assessment needed in case of renewable energy mix Single-use in case of carbon-intensive energy mix; lightweight plastic (PS or XPS)	Single-use Lightweight plastic (PS or XPS)	Single-use Lightweight plastic (PS or XPS)	Single-use Lightweight plastic (PS or XPS)
FORMAL WASTE MANAGEMENT WITH HIGH RECYCLING AND RECOVERY strong policy support for recycling	Case by case assessment needed between single-use with high recycled content (rPET), and reusable aluminum, stainless steel Reusable plastic (PP) in case of renewable energy mix	Single-use regardless of energy-mix; PET with high recycled content (rPET); cardboard or paper-based	Single-use Cardboard or paper-based; plastic with high recycled content (rPET); bio-based plastic if composted	Single-use Bio-based plastics or paper-based with bio-plastic coating with co-disposal of food waste (composting or anaerobic digestion) (rPET)	Single-use Cardboard or paper-based; plastic with high recycled content (rPET)

■ Reusable/returnable container cups preferred
 ■ Single-use container preferred
 ■ No clear preference for reusable or single-use containers

* Compared to single-use PS containers, a reusable PP container needs to be reused around 20 times to break even in terms of its carbon footprint, and up to 40 times to break even against other environmental impacts (if we really can't fit it in, then perhaps can take it out - but then must delete the asterisk)

BOTTLED DRINKS & JUICES: WHAT ARE THE BETTER OPTIONS BASED ON LIFE CYCLE ASSESSMENTS

This matrix refers to non-alcoholic drinks sold in supermarkets and similar retail outlets. Bottled water is covered in a separate matrix, and so are drinks sold in take-away outlets, canteens and restaurants (covered under the beverage cups matrix).

Bottles used many times* **Bottles used few times**

Considerations of geographical and technological and policy context	EFFICIENT LOGISTICS AND WASHING during use-phase (energy efficient washing; short return distances)	INEFFICIENT LOGISTICS AND WASHING during use-phase (long distances; high energy use in washing)	
	NO FORMAL WASTE MANAGEMENT unsanitary landfill, open dumps, open burning, no policy support for recycling and/or composting	Returnable plastic or glass	Returnable in case of renewable energy mix
FORMAL WASTE MANAGEMENT BUT POOR RECYCLING sanitary landfill and/or incineration with/without energy recovery, weak policy support for recycling	Returnable plastic or glass	No Clear preference in case of renewable energy mix	Single-use Canon (especially small volume sizes); bio-based PET made from agricultural residues; fossil-based PET with energy recovery at end-of-life
FORMAL WASTE MANAGEMENT WITH HIGH RECYCLING AND RECOVERY strong policy support for recycling	No Clear preference in case of renewable energy mix between Single-use with high recycled content (rPET), and Returnable plastic and glass	Single-use regardless of energy-mix Aluminum cans (small volume sizes); PET with high recycled content (rPET); PET (large volume sizes)	Single-use Aluminum cans (small volume sizes); PET with high recycled content (rPET); PET (large volume sizes)

■ Returnable container preferred
 ■ Single-use container preferred
 ■ No clear preference for returnable or single-use container

For clarity in presenting plastic bottles and their alternatives in the summary matrices, drinking water is separated from soft drinks and juices. When safe to drink, tap water is always environmentally preferred to bottled water (even when the water needs to be boiled or purified with reverse osmosis). However, tap water is not safe to drink and/or available in all contexts and therefore water dispensers and bottled water become necessary.

Water dispensers are a good alternative when tap water is not possible, provided reusable bottles/cups are used.

When bottled water is the only option, bottles should be returnable when possible, and recycled if return is not possible.

For sodas and fruit juices, returnable bottle systems are preferred when there are efficient logistics and washing during the use phase. In contexts where returnable systems aren't possible, plastic bottles made from recycled content are preferred over virgin-plastic options.

* A single LCA study on reusable bottles covered in the meta-analysis suggested that glass bottles need to be used at least three times to environmentally equivalent to single-use plastic bottles.

BEVERAGE CUPS: WHAT ARE THE BETTER OPTIONS BASED ON LIFE CYCLE ASSESSMENTS

Eco- or cost-conscious Consumer **Indifferent Consumer**

Considerations of geographical and technological context	EFFICIENT WASHING during use-phase (energy efficient dishwasher or hand wash in cold water)	CUPS REUSED many times	UNLIKELY TO LITTER / likely to recycle or compost	INEFFICIENT WASHING during use-phase (hand wash in hot water)	INSUFFICIENT REUSE of cups (Little consumer awareness)	LIKELY TO LITTER / unlikely to recycle
	NO FORMAL WASTE MANAGEMENT unsanitary landfill, open dumps, open burning, no policy support for recycling and/or composting	Reusable regardless of energy mix	Reusable Ceramic, glass, stainless steel; bamboo	Reusable Ceramic, glass, stainless steel; bamboo	Reusable in case of renewable energy mix	Single-use Max. PE or bioplastic-lined paper
FORMAL WASTE MANAGEMENT BUT POOR RECYCLING sanitary landfill, incineration with/without energy recovery, but no or low policy support for recycling and/or composting	No clear preference in case of carbon intensive energy mix	Reusable Ceramic, glass, stainless steel; bamboo; PP	No clear preference between reusable and single-use (EPS) if incineration with energy recovery and importantly if single-use are being collected and managed.	Single-use in case of carbon intensive energy mix	Single-use EPS, wax, PE, or bioplastic-lined paper	Reusable Ceramic, glass, stainless steel; bamboo
FORMAL WASTE MANAGEMENT WITH HIGH RECYCLING AND RECOVERY strong policy support for recycling	Reusable in case of renewable energy mix	Reusable especially recyclable materials such as PP, glass, and stainless steel	Single-use PE- or bioplastic-lined paper, rPET	Single-use regardless of energy mix	Single-use PE- or bioplastic-lined paper, rPET	Reusable PP; ceramic; glass; stainless steel; bamboo

■ Reusable cups preferred
 ■ Single-use cups preferred
 ■ No clear preference for reusable or single-use cups

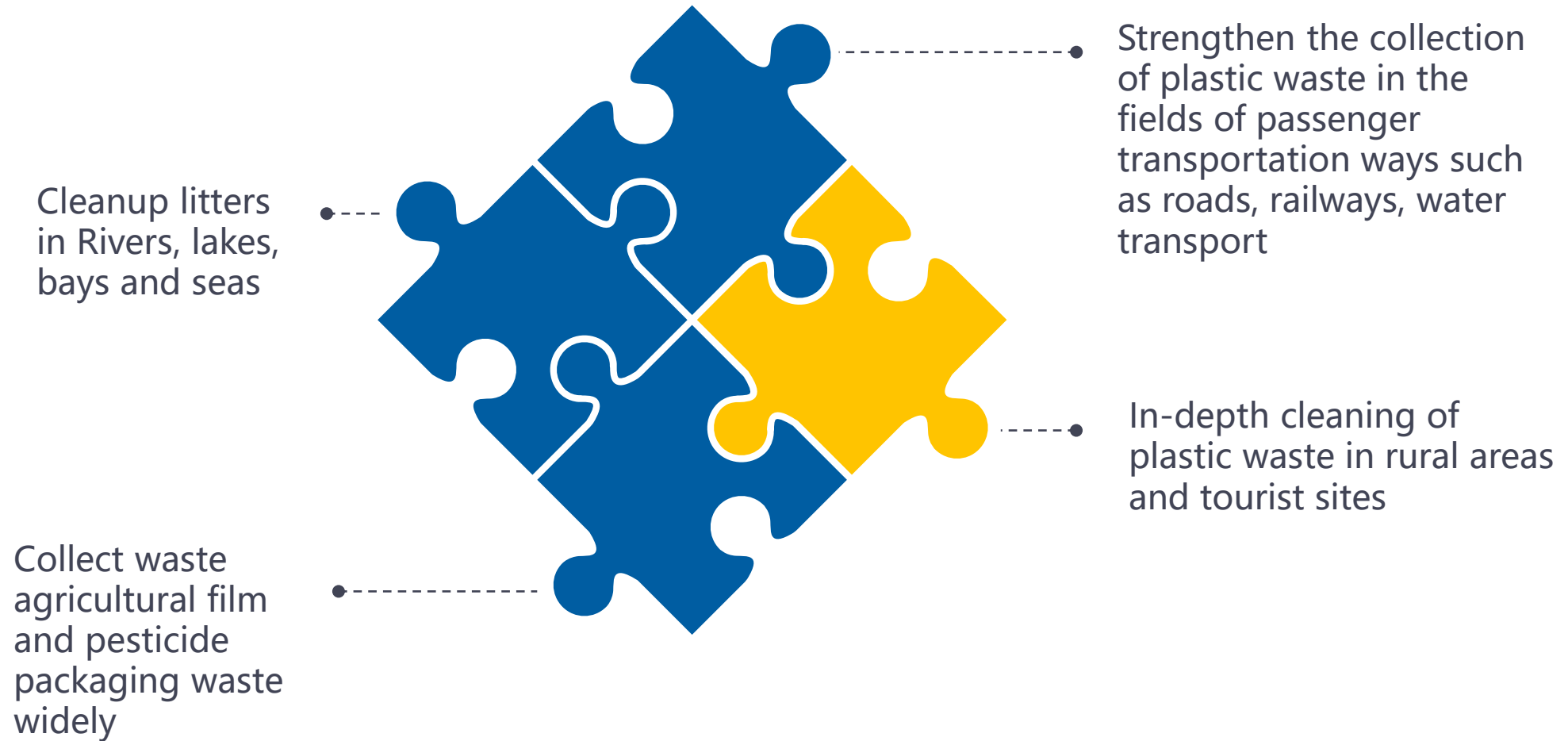
UNEP. Single-use Plastic Products (SUPP) and their alternatives: Recommendations from Life Cycle Assessments

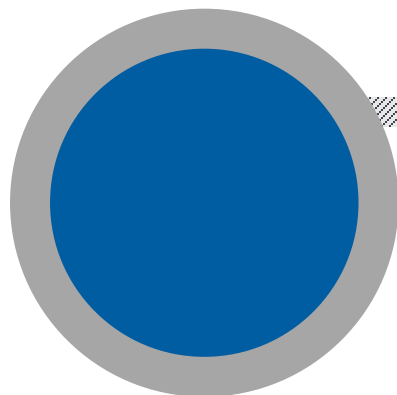
Plastic products prohibited to produce and sale

- Ultra-thin plastic shopping bags with a thickness of less than 0.025 mm
- Polyethylene agricultural mulch film with a thickness of less than 0.01 mm
- Daily life products containing plastic microbeads
- single-use foamed plastic tableware
- single-use plastic swabs

Control measure in key sectors

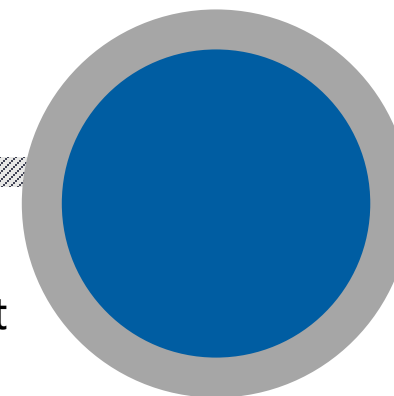
- Governance of excessive packaging of products
- E-commerce and food-delivery platform enterprises and express enterprises formulate platform rules for the reduction of single-use plastic products
- prohibits the use of non-degradable single-use plastic straws in restaurant
- prohibits non-degradable single-use cutlery gradually
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- The definition and scope should be clear, e.g. polymers, plastic polymers, plastics, plastic products, single-use plastic products
- A plastic polymer often has variety of applications, its hard to know which application will be influenced by restriction of polymer

- The application of plastic should be taken into consideration, focusing on which are easy to leak, difficult to collect, and able to be substituted
- Even for single-use plastic products, there is no one-size-fits-all approach, and the optimal solution should be selected according to the geographical, technological and policy contexts



THANK YOU

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