

About plastics and how they get into our environment

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What are plastics?

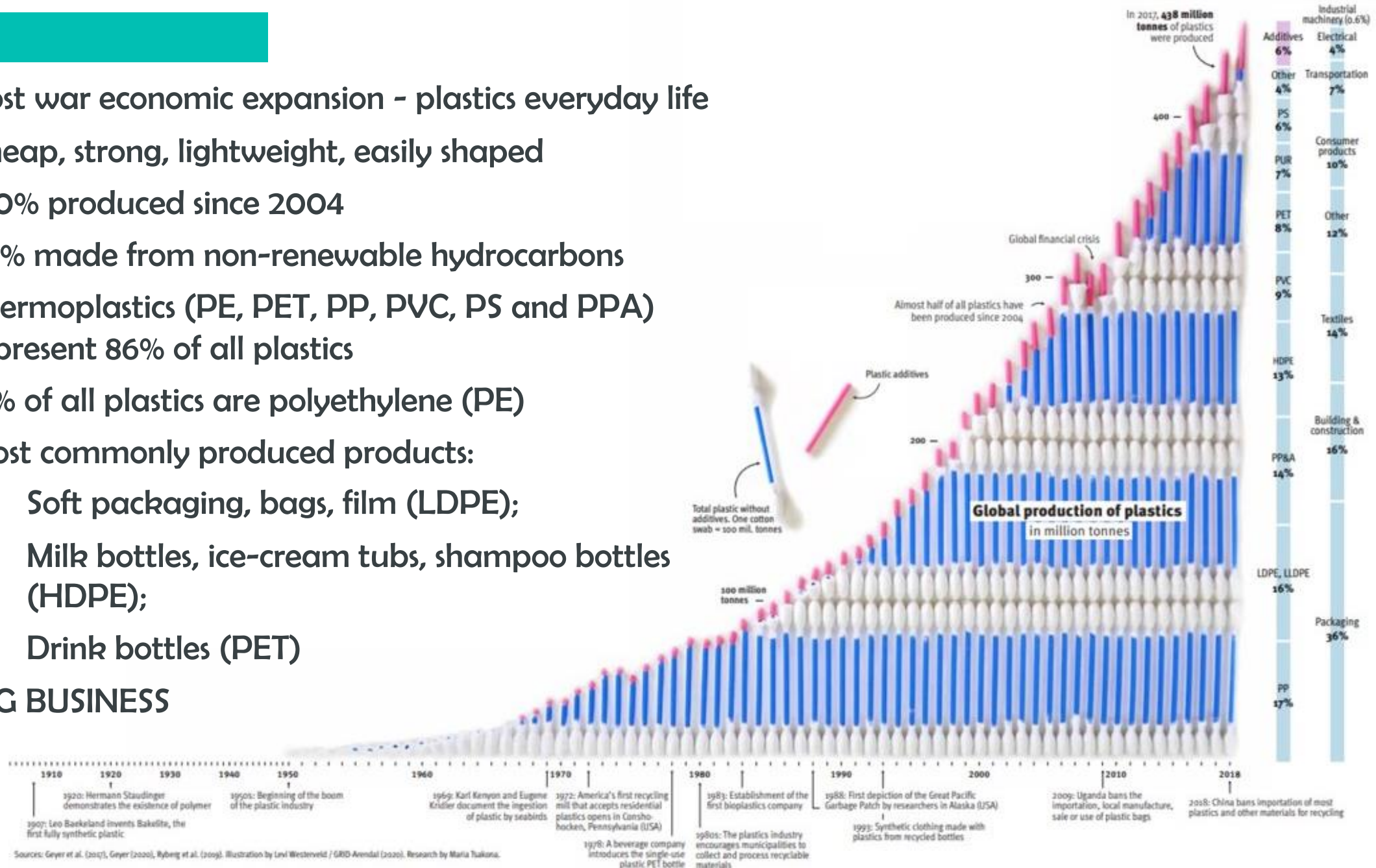
- Synthetic or semi-synthetic polymers
- Short for thermoplastic = mouldable using heat
- Organic compounds
 - just like wood, paper or wool
- Made from natural materials
 - mainly crude oil or natural gas (99%), but also coal, salt (all non-renewable resources) and cellulose, sugars and vegetable oils (renewable resource)

Data sources: <https://theconversation.com/the-world-of-plastics-in-numbers-100291> and <https://www.plasticseurope.org/en/about-plastics/what-are-plastics>

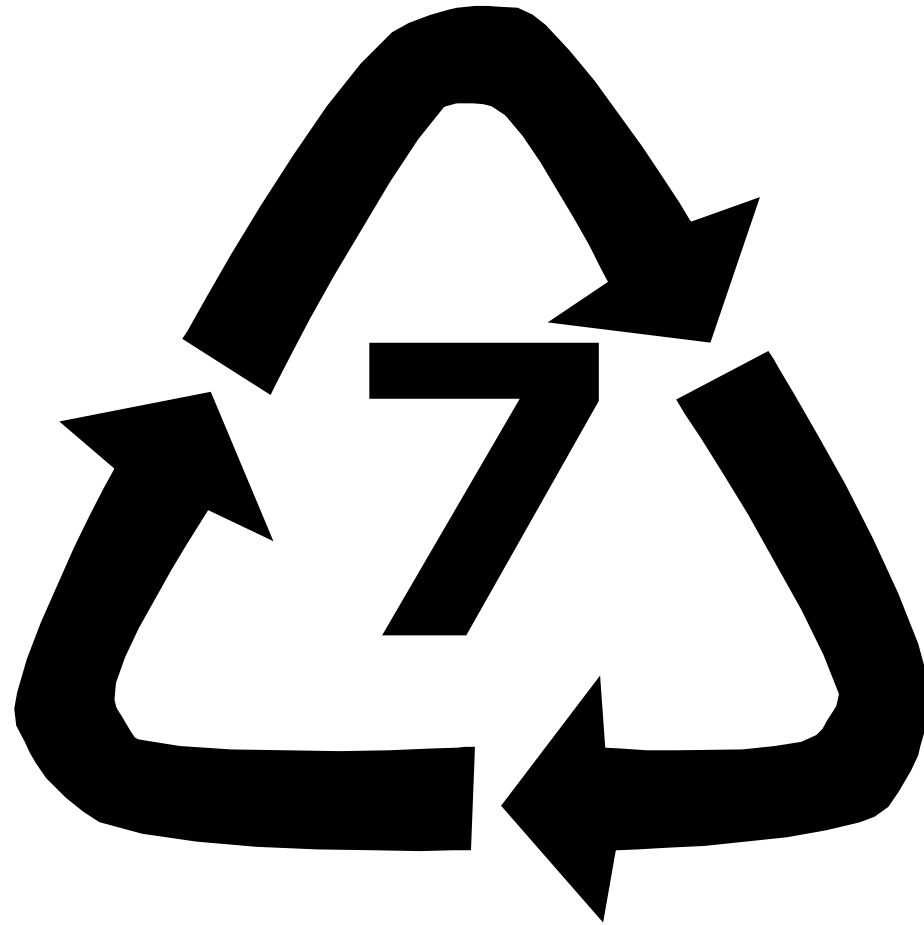
Plastics Production

From: United Nations Environment Programme (2021). *Drowning in Plastics – Marine Litter and Plastic Waste Vital Graphics*. <https://tinyurl.com/DrowninginPlastics>

- Post war economic expansion - plastics everyday life
- Cheap, strong, lightweight, easily shaped
- >50% produced since 2004
- 99% made from non-renewable hydrocarbons
- Thermoplastics (PE, PET, PP, PVC, PS and PPA) represent 86% of all plastics
- 31% of all plastics are polyethylene (PE)
- Most commonly produced products:
 - Soft packaging, bags, film (LDPE);
 - Milk bottles, ice-cream tubs, shampoo bottles (HDPE);
 - Drink bottles (PET)
- BIG BUSINESS



What does this symbol mean?



Plastic resin codes

 PETE 	 HDPE 	 PVC 	 LDPE 	 PP 	 PS 	 OTHER 
 Kerbside	 Some kerbside	 Difficult to recycle	 Some in shops	 Some kerbside	 Difficult to recycle	 Difficult to recycle
						

Plastic additives

- Every plastic item contains additives – but no transparency or reporting system
- Weakly bound additives leach out; degrade, spread far, persist and bioaccumulate in organisms
- Human health and environmental hazards
- Difficult for recycling chain - problems for recycled food packaging or toy products

Five types of plastic additives



Functional

Includes, for example, stabilizers, antistatic agents, flame retardants, plasticizers, lubricants, slip agents, curing agents.

22% of additives



Colourants

Substances such as dyes or pigments added to give colour to plastic. Some of them are added to give a bright transparent colour.



Fillers

Added to change and improve physical properties of plastics. They can be minerals, metals, ceramics, bio-based, gases, liquids, or even other polymers.

50% of additives



Reinforcement

Used to reinforce or improve tensile strength, flexural strength and stiffness of the material. For example: glass fibres, carbon fibres.



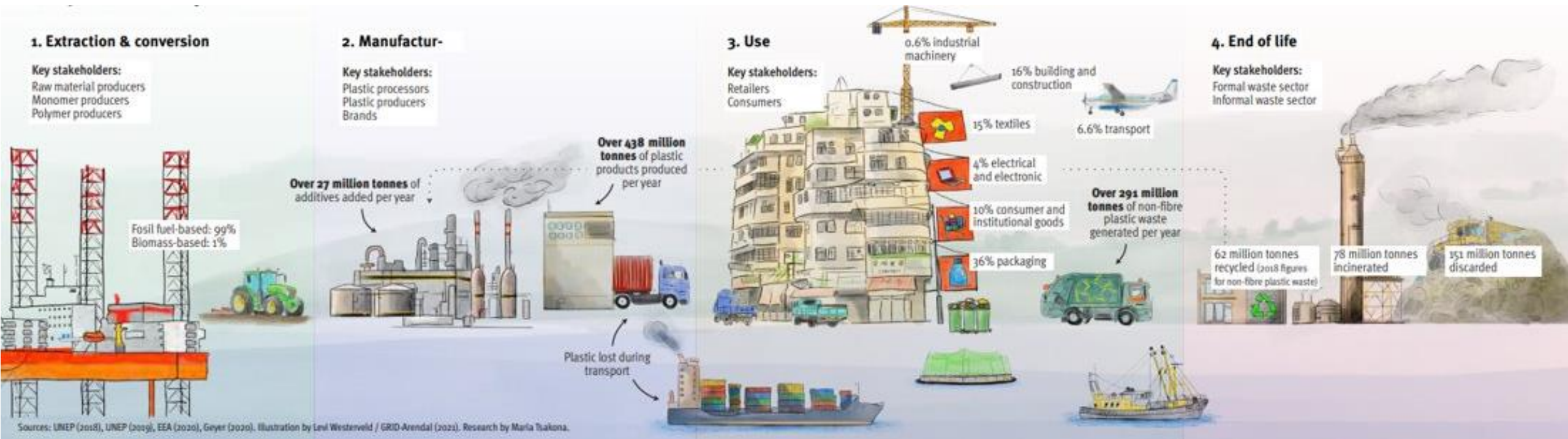
NIAS

Non-intentionally added substances. They arrive in products from processes, such as reaction by-products or breakdown products.

Source: Hansen et al. (2013). Illustration by GRID-Arendal (2020).

Adapted from: United Nations Environment Programme (2021). *Drowning in Plastics – Marine Litter and Plastic Waste Vital Graphics*. <https://tinyurl.com/DrowninginPlastics>

Plastics Life Cycle



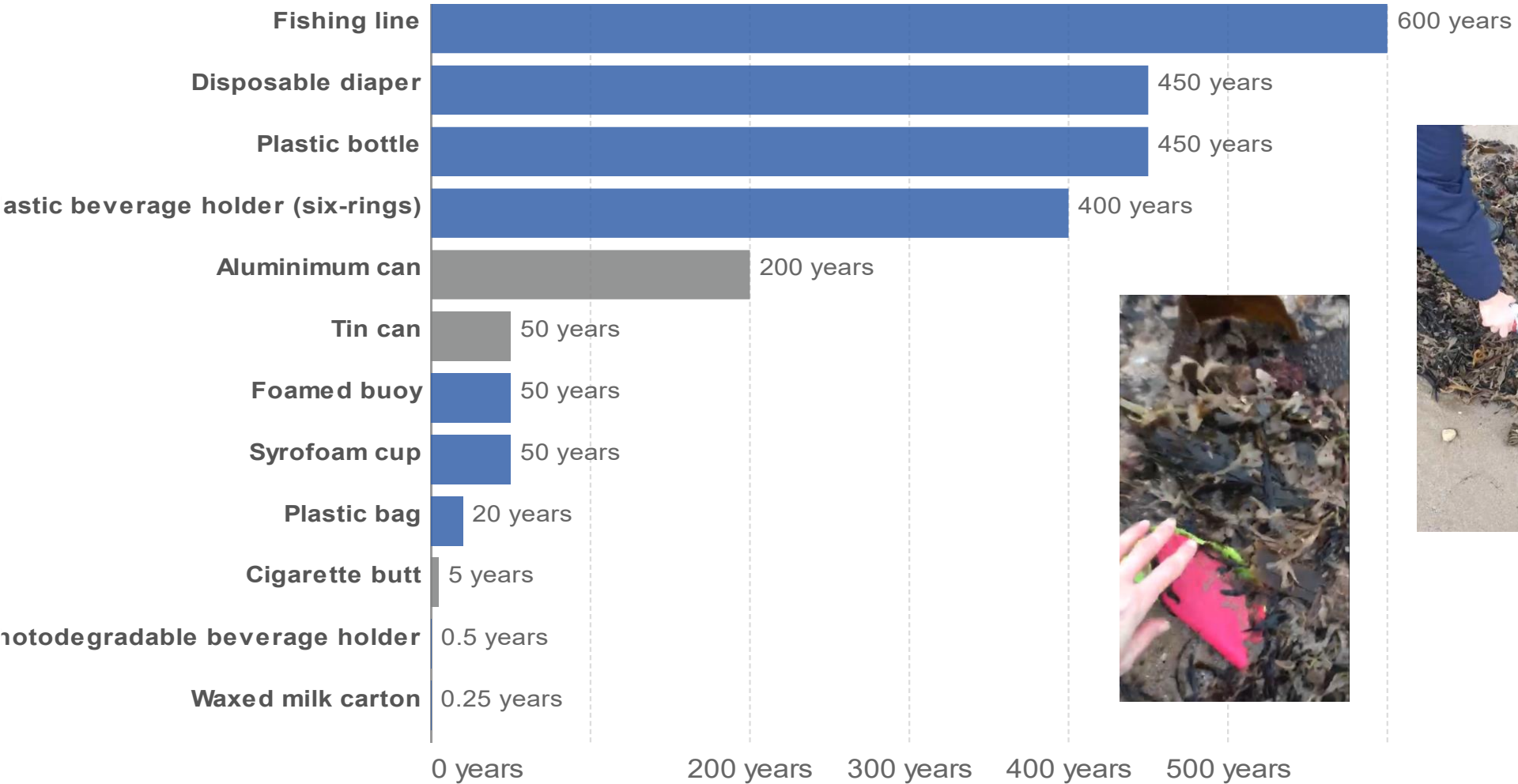
From: United Nations Environment Programme (2021). *Drowning in Plastics – Marine Litter and Plastic Waste Vital Graphics*. <https://tinyurl.com/DrowninginPlastics>

What are plastics?

Decomposition rates of marine debris items

Average estimated decomposition times of typical marine debris items. Plastic items are shown in blue.

Our World
in Data



Source: U.S. National Park Service; Mote Marine Lab; National Oceanic and Atmospheric Administration Marine Debris Program

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The good, the bad and the ugly...

- Recyclable
- Low emissions

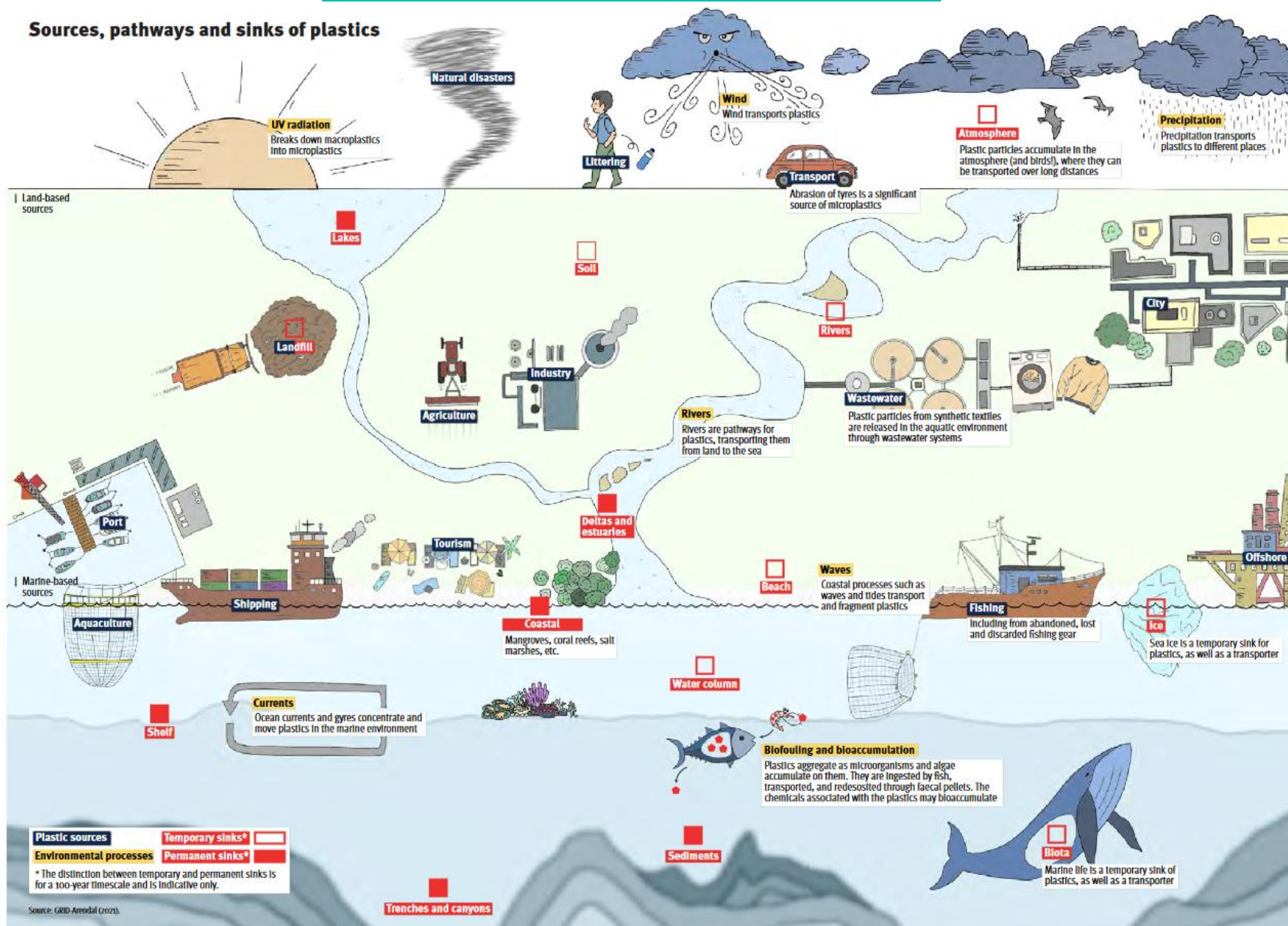
- Additives
- Polymers degrade

- Leaching
- Cheap to make virgin
- Production increasing
- Many superfluous single use items
- Persistent waste – taking many 100s of years to breakdown

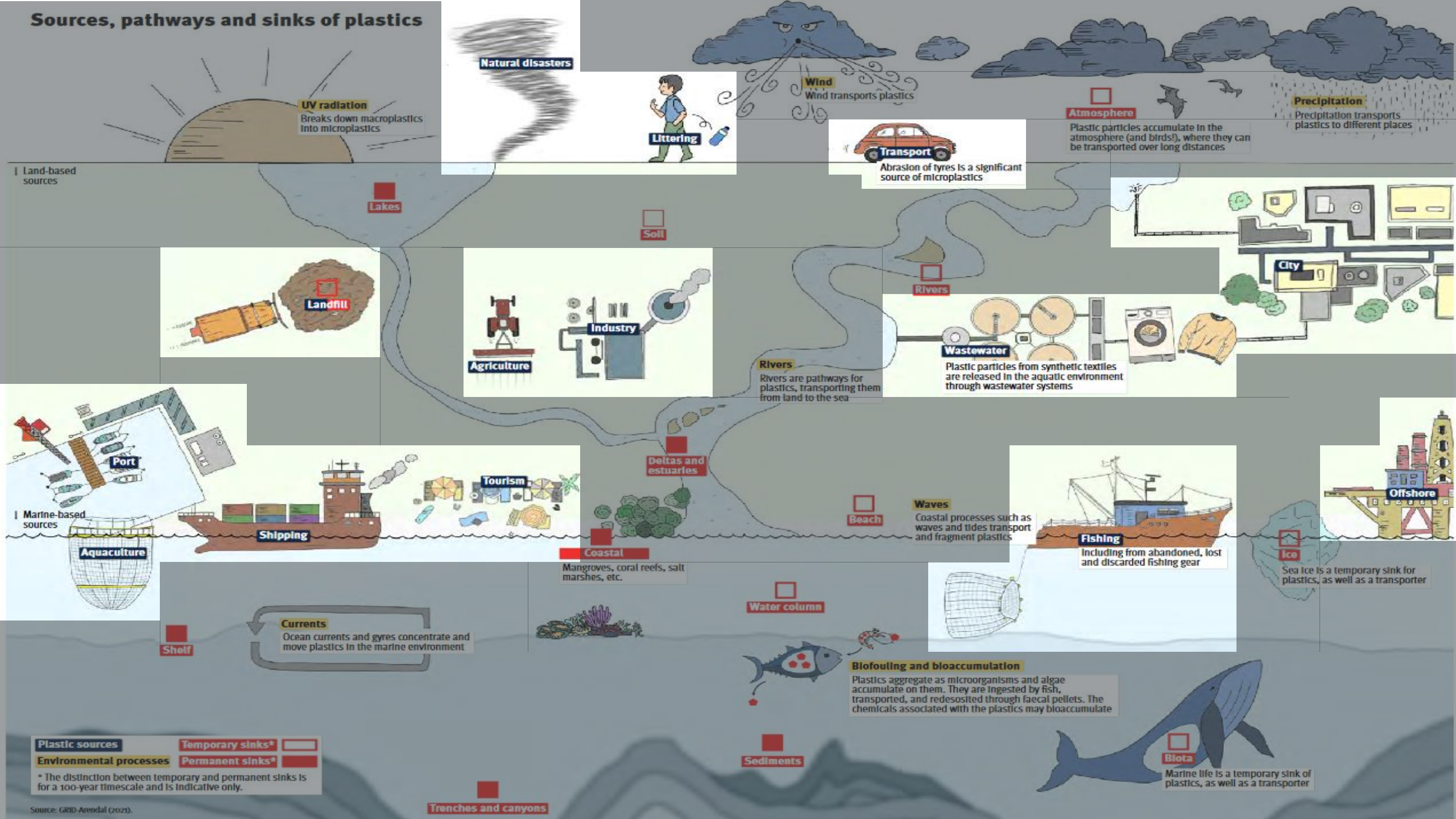
Environmental pollution

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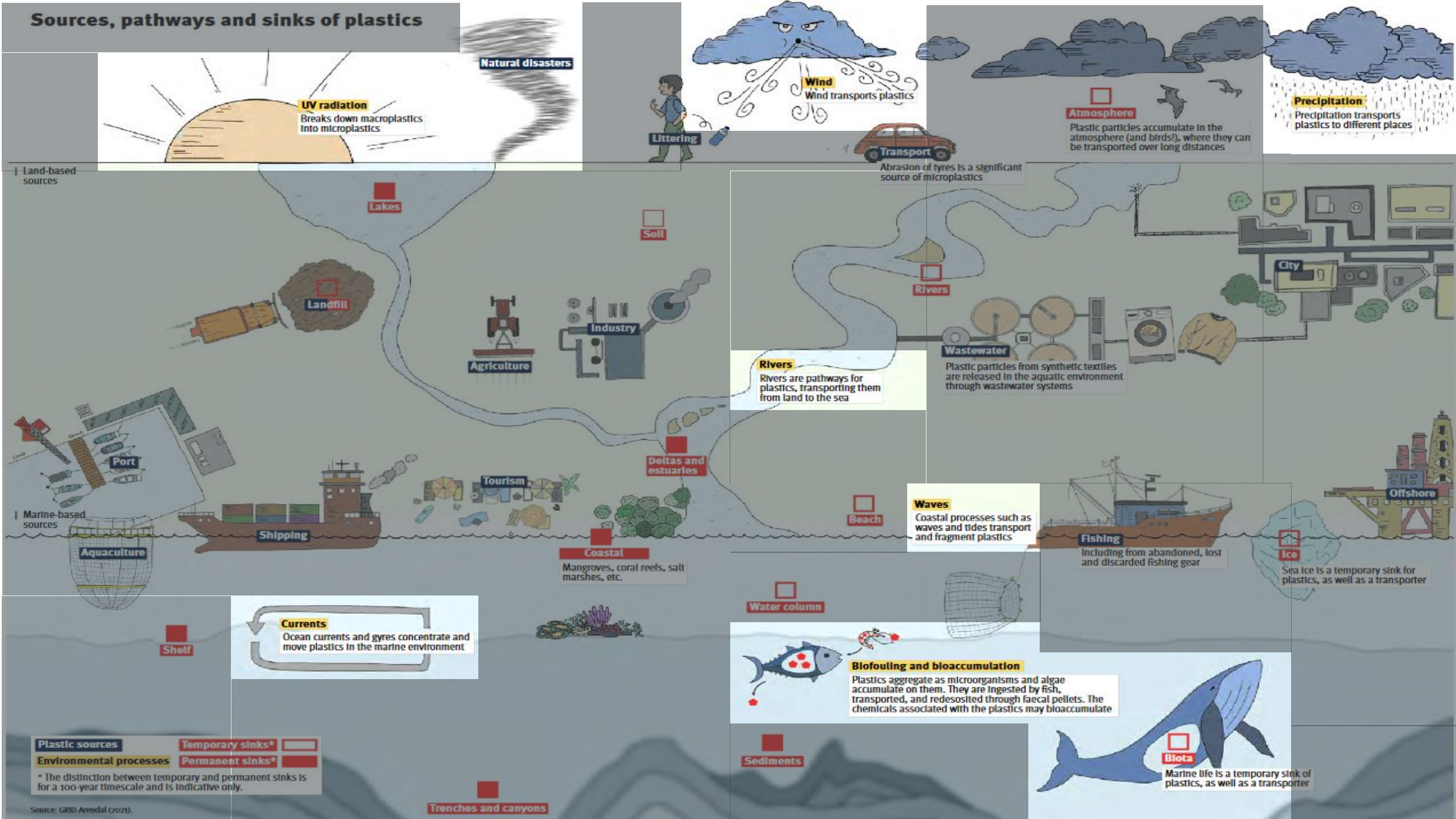
How do they get into our environment?



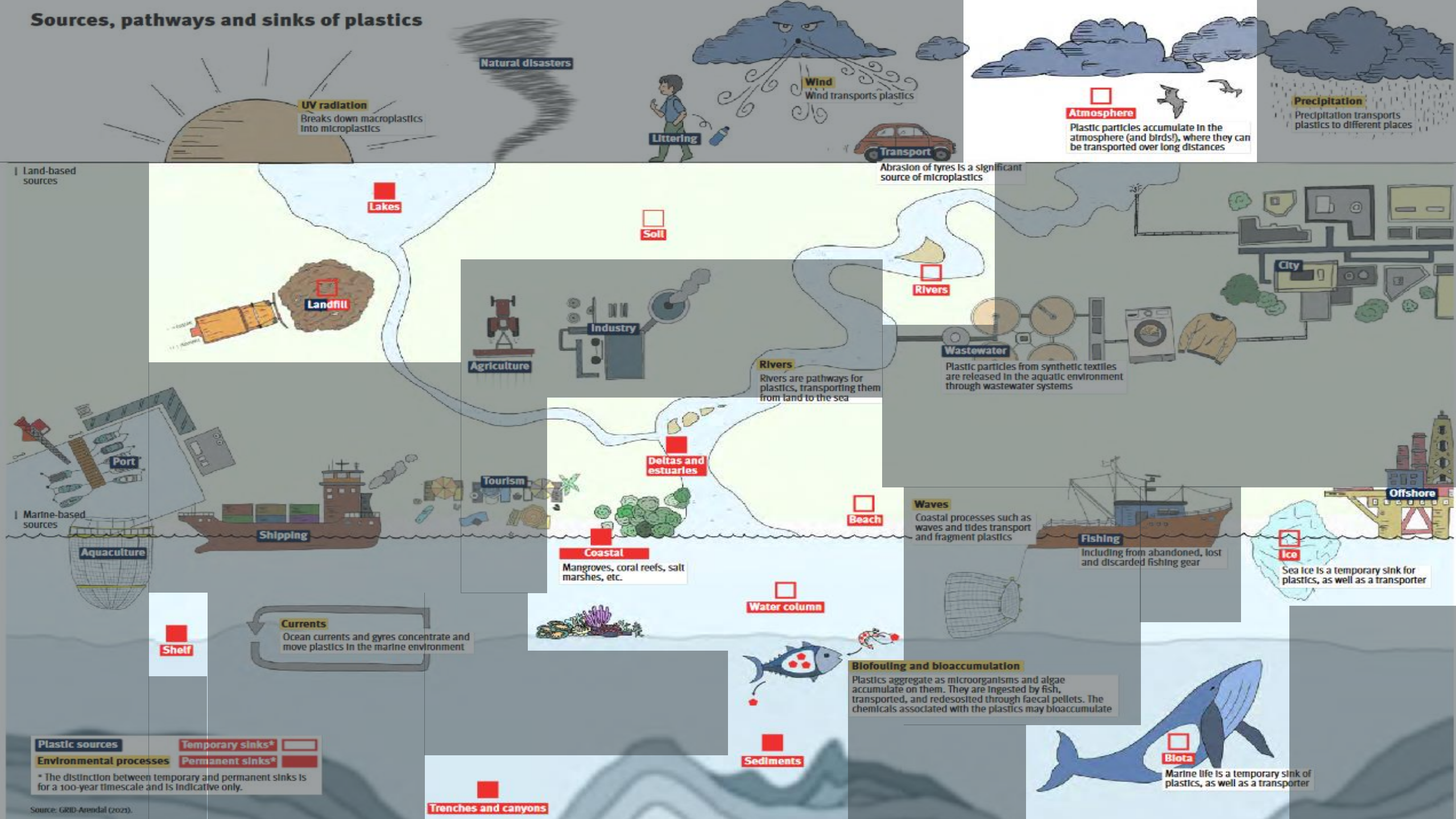
Sources, pathways and sinks of plastics



Sources, pathways and sinks of plastics



Sources, pathways and sinks of plastics



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Thank you for
listening

