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MARLITER



# Litter in the sea



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# Plastic as marine litter

Marine litter consists of different materials and is found in sizes from over a meter to less than a micron.

It is found not only on the beaches and on the shoreline, but also floating on the sea surface or in the water column. Most items eventually sink to the seafloor because they lack buoyancy or are transported by natural processes.

Between 60 and 90% of beach litter consists of plastic items.

Most surveys of floating litter and litter on the sea bottom indicate that 80-90% of all items are from artificial polymers.

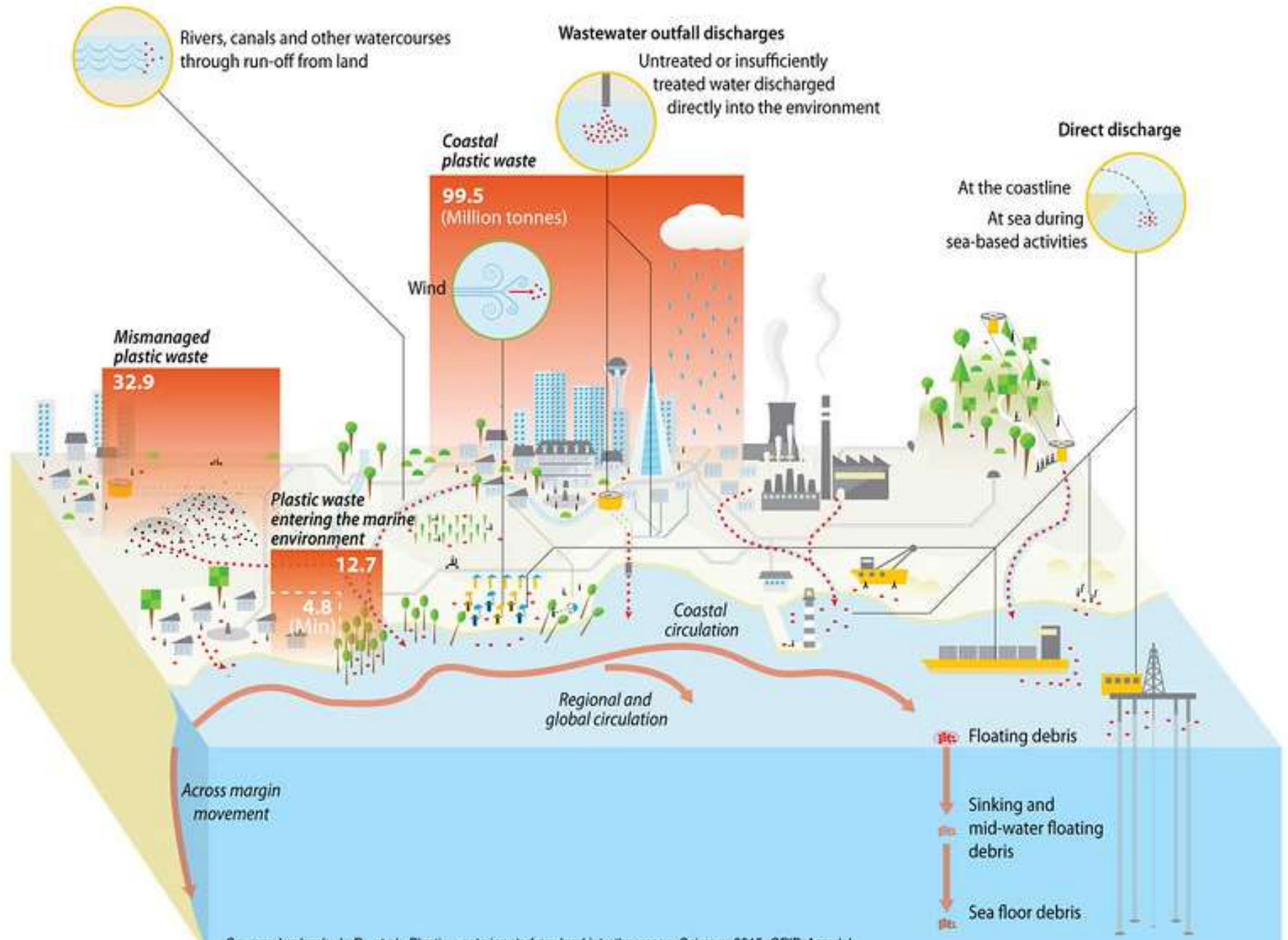
# How plastics reach the sea?

The majority of plastics come from mismanaged waste or from eroded materials washing off land.

Main paths are:

- rivers and watercourses
- wastewater discharges
- direct discharge at the coastline or during sea-based activities

# Pathways and fluxes of plastics into the oceans





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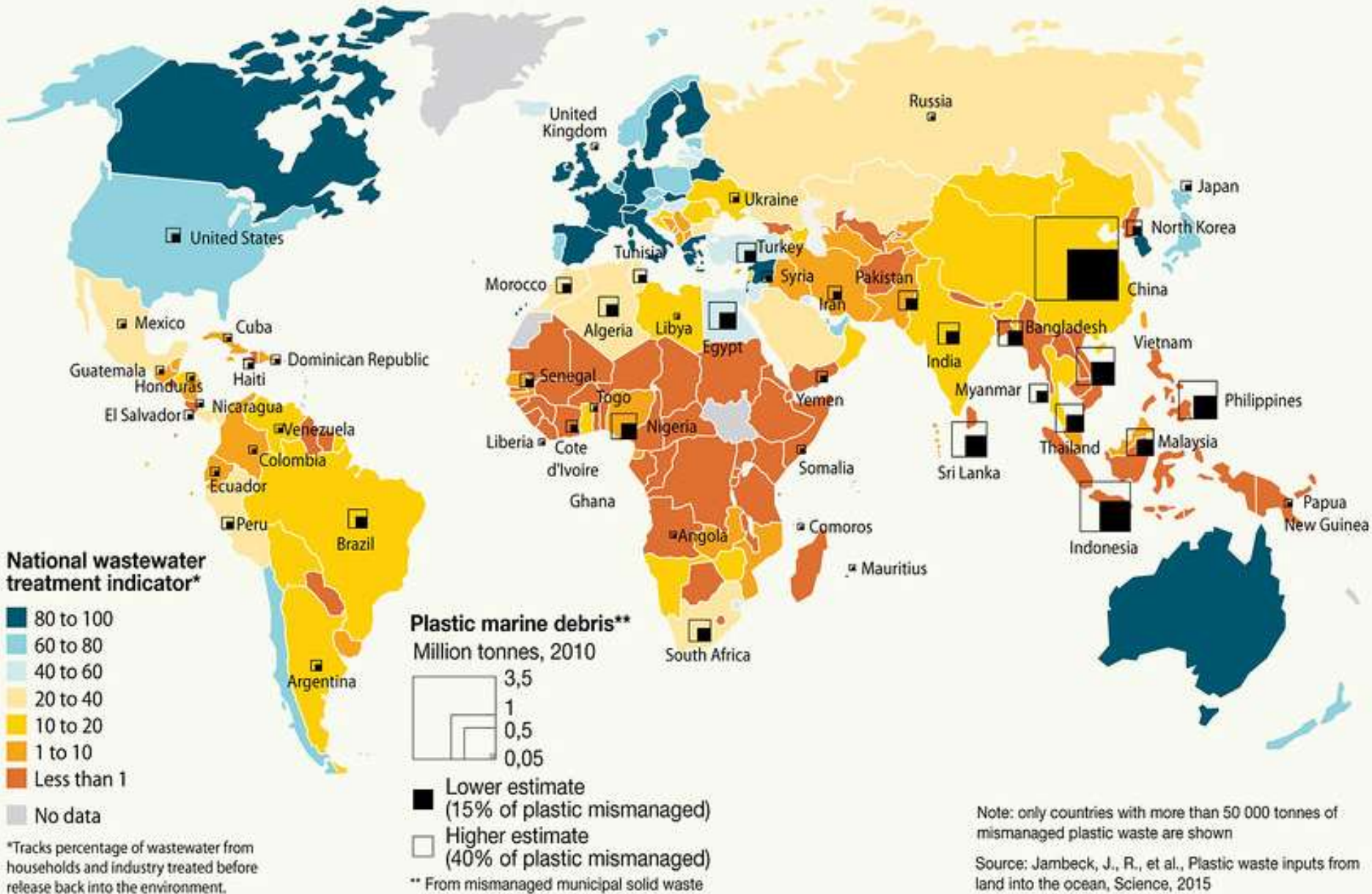


# Municipal solid waste and wastewater

The efficiency of solid waste collection and treatment is linked to the amount of marine litter.

Wastewater plants may be a source of microplastics, if they are not equipped to filter out small particles.

# Plastic input from municipal solid waste and wastewater



# Which plastics float and which sink in seawater?

Plastics are a range of polymer materials,  
each with different density.

Depending on the density of the particular  
polymer, plastic items will:

- float on the surface
- float in the water column, or
- sink to the seafloor

# Seawater density

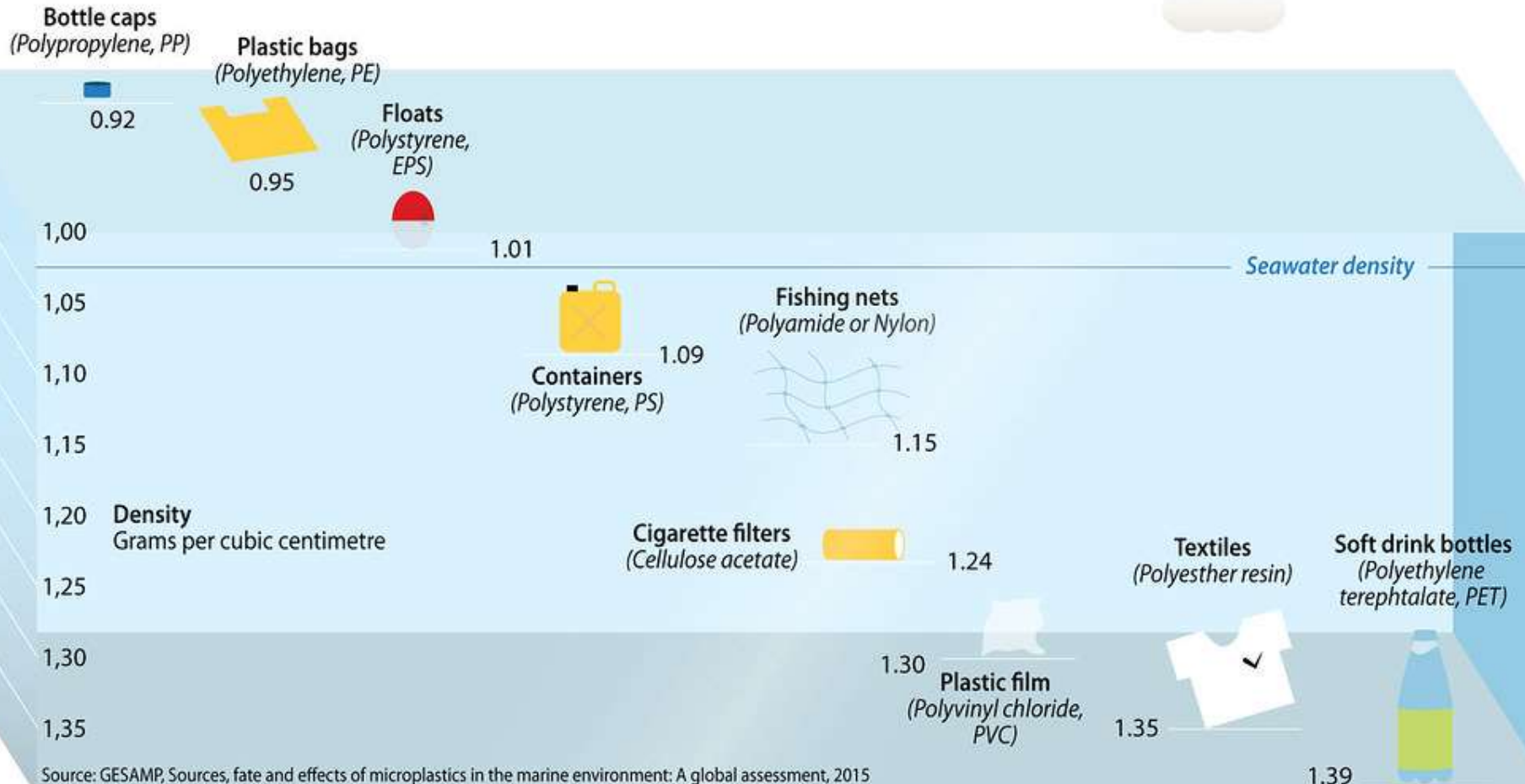
Seawater density depends on temperature salinity and pressure. Pressure is determined by depth.

There is a difference in seawater density between the Black Sea and the world ocean due to salinity.









	World ocean	Black Sea
Salinity, ‰	35	17-18
Density at the surface, g/cm <sup>3</sup>	1.0281	1.0115
Density at depth 1000 m, g/cm <sup>3</sup>	1.0329	1.0173



# Which plastics float and which sink in seawater?



# Polymer densities

Symbol	Polymer name	Application	Density, g/cm <sup>3</sup>
	Polyethylene terephthalate (PET)	Polyester fibers, soft drink bottles, food containers, microfiber towels	1.38
	High-density polyethylene (HDPE or PEHD)	Plastic bags, bottle caps, rubbish bins, oil cans, plastic lumber, toolboxes	0.94
	Polyvinyl chloride (PVC)	Window frames, plumbing pipes, flooring, bottles for chemicals	1.30-1.45
	Low-density polyethylene (PE)	Plastic bags, buckets, cutting boards, squeeze bottles (for ketchup, mayonnaise, etc.)	0.917-0.930
	Polypropylene (PP)	Flower pots, bumpers, industrial fibers, ropes, food containers for microwave oven, DVD cases	0.895-0.92
	Polystyrene (PS)	Toys, beverage/food containers (e.g. yoghurt); EPS, XPS: food containers, packaging, building insulation	0.96-1.05 0.016-0.64
	Other plastics: nylon, acrylic, polycarbonate, polylactic acid	Various applications in consumer goods and industry	1.15 1.18 1.20-1.22 1.21-1.43
	Acrylonitrile butadiene styrene (ABS)	Computer plastic, TV cases, phones, coffee machines, car parts, Lego bricks	1.06-1.08

# Distribution of plastics by natural processes

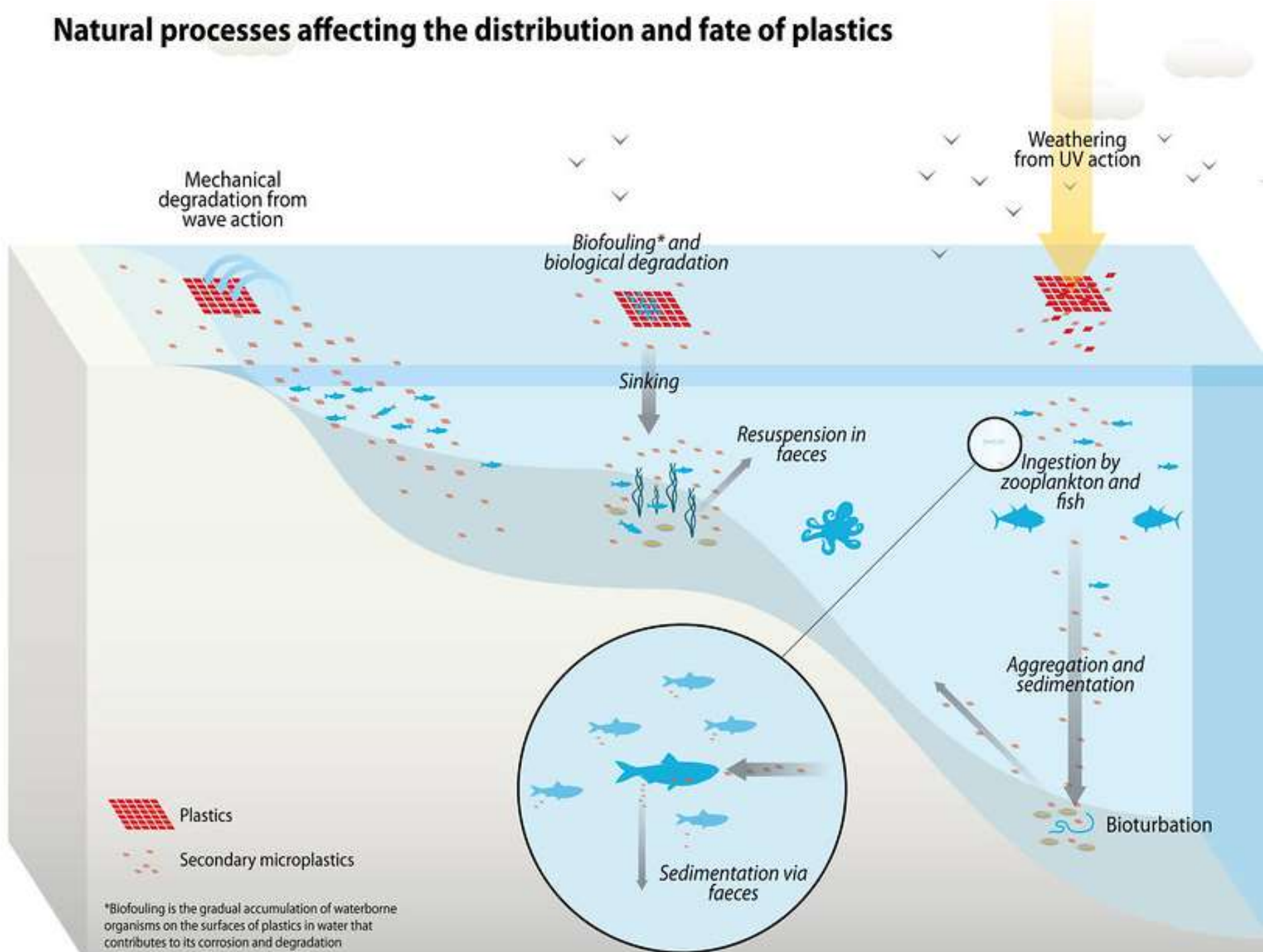
Marine litter is transported by winds, waves and currents.

Plastic pieces are broken to smaller fragments by waves and sunlight.

Biological process also add to their dispersion:

- Accumulation of water organisms on the surface of floating litter
- Ingestion
- Burrowing of animals living on the sea bottom

# Natural processes affecting the distribution and fate of plastics



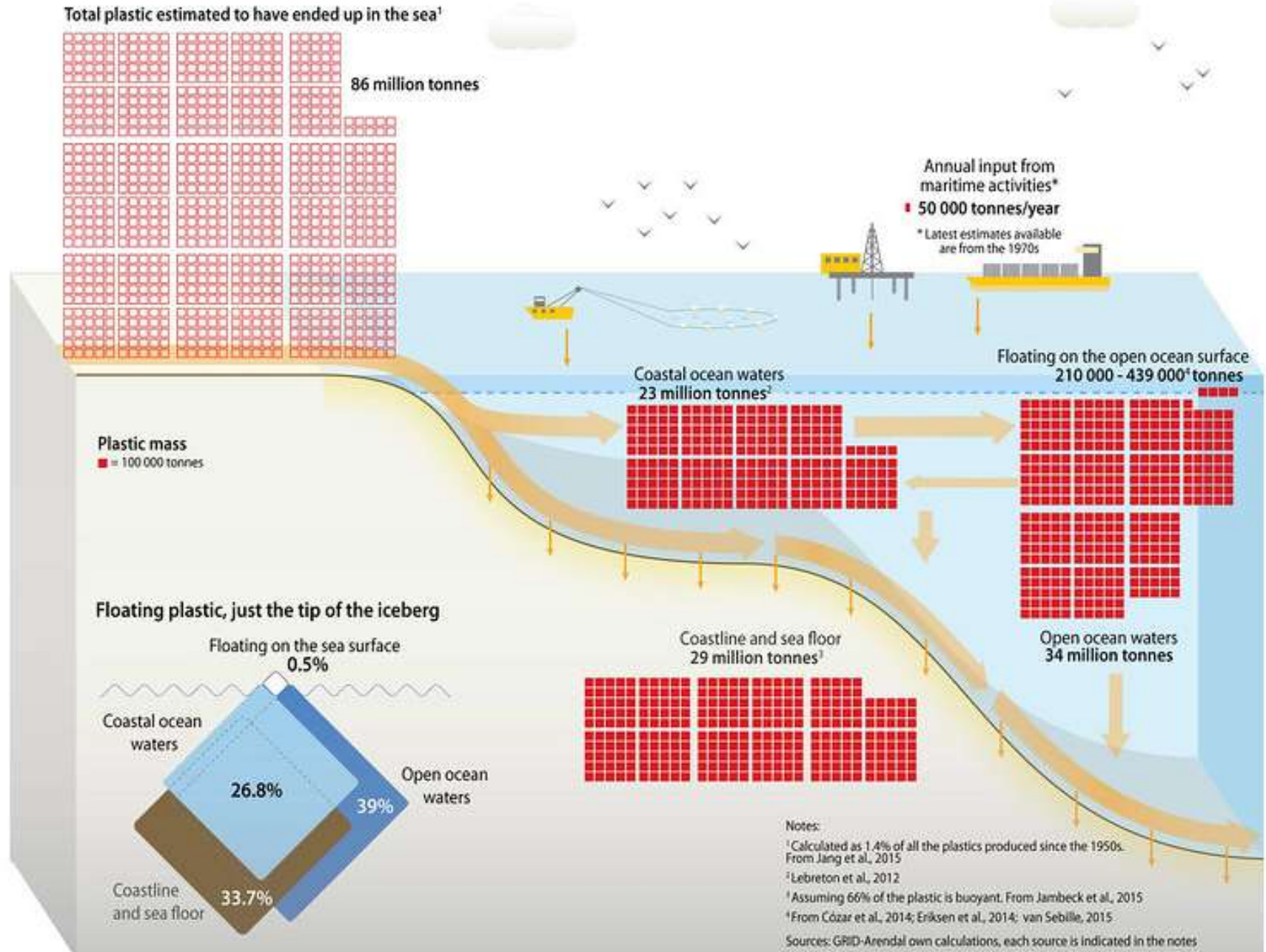
# How much plastics are in the oceans?

Between 86 and 150 million tonnes of plastics are estimated to be in the marine environment.

Distribution of all plastics in the sea:

- Floating on the surface: less than 1%
- Floating in the water column:  $\frac{2}{3}$
- Accumulating on the seafloor:  $\frac{1}{3}$

# How much plastic is estimated to be in the oceans and where it may be



# Limiting the impact of marine litter

Cleaning up marine litter from the sea is a complex and costly task.

**Prevention** is a better option. It can include:

- Awareness raising
- Research and innovation
- Policy implementation
- Economic incentives
- Investment in waste management and wastewater treatment infrastructure



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