



BUSTING THE MYTHS AND MISCONCEPTIONS RELATED TO MARINE LITTER SOLUTIONS

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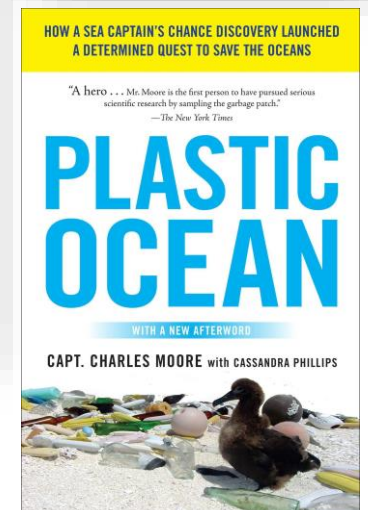
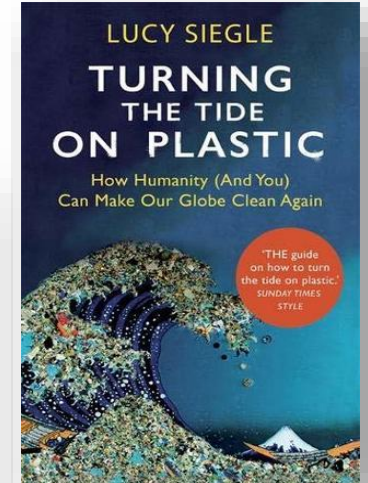
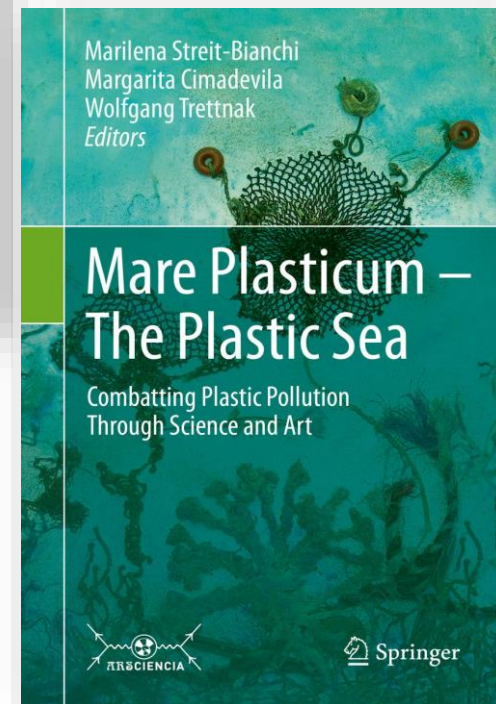
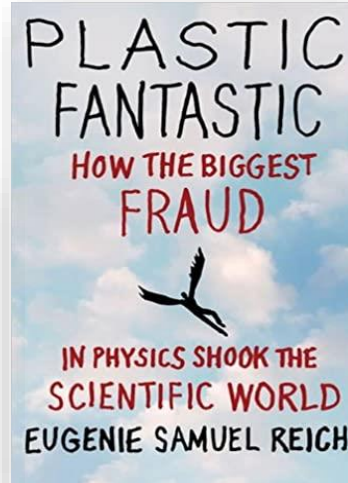
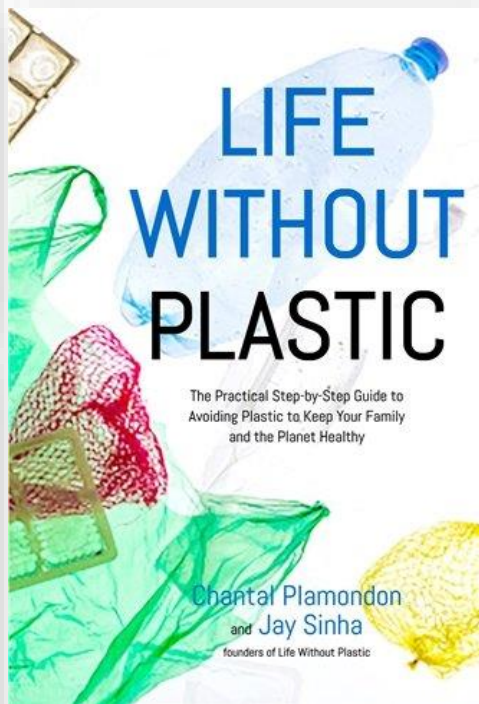
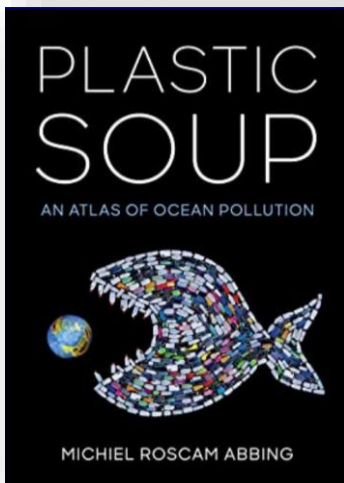
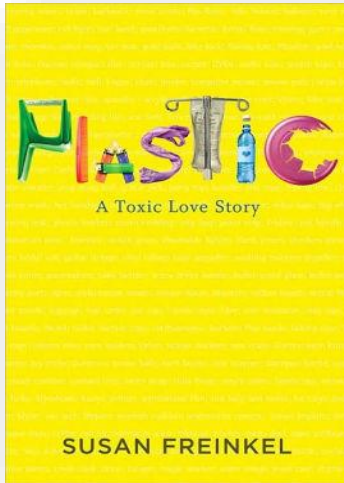
MEMBER OF THE MSFD TECHNICAL GROUP ON MARINE LITTER
MEMBER OF THE UNEP/MAP CORMON GROUP
WP LEADER OF THE PLASTIC BUSTERS CAP
MARINE LITTER EXPERT OF WES



Mediterranean e-course on marine litter monitoring & mitigation

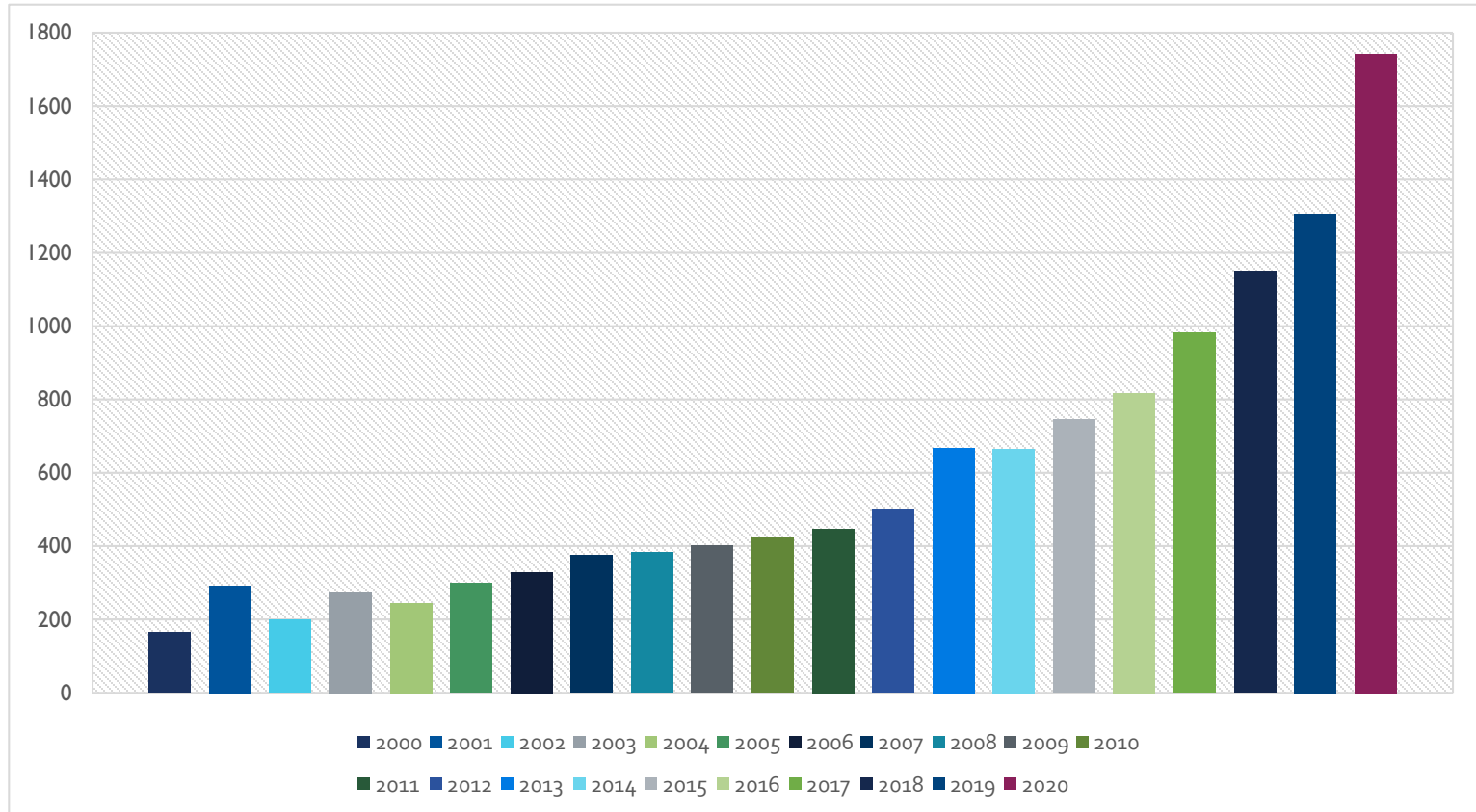
17 & 19 January 2023, 10.00 – 14.00 CET

FROM THE ANTHROPOCENE TO THE PLASTOCENE...

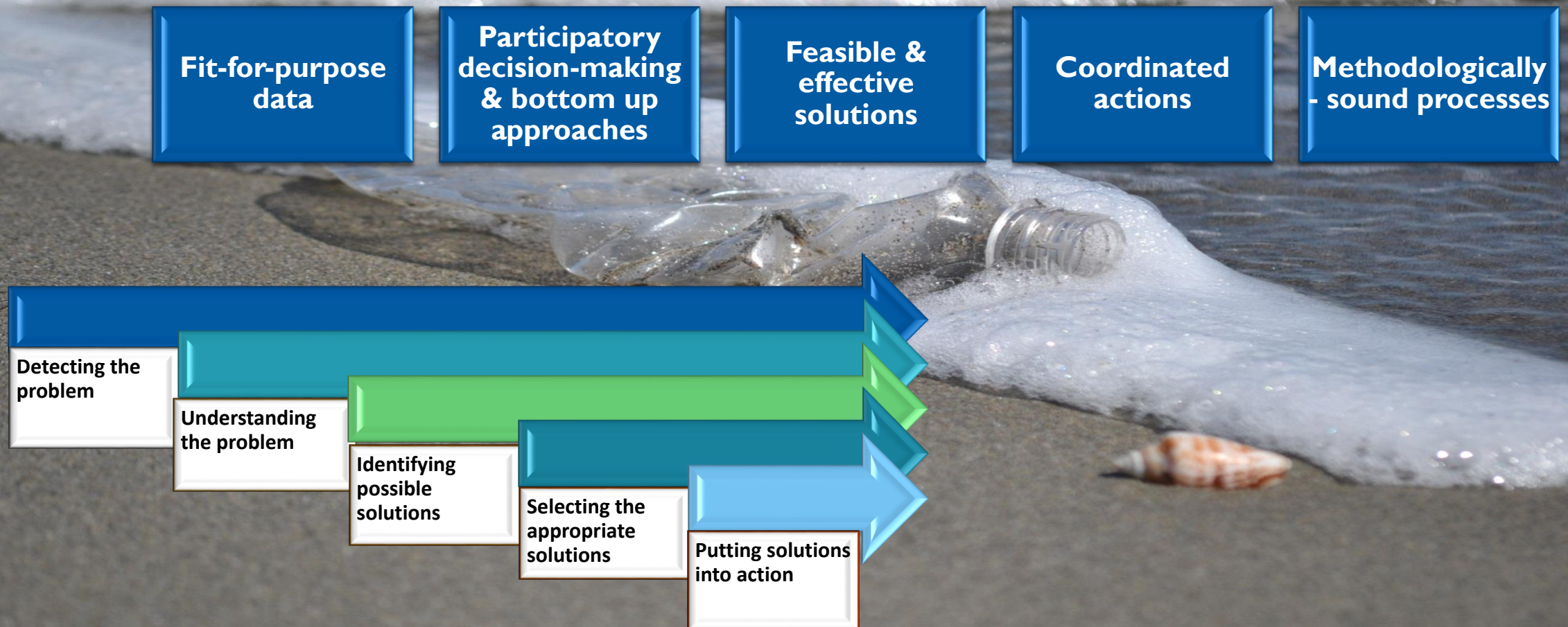


MARINE LITTER & MARINE PLASTIC POLLUTION | AN INDISPUTABLE GLOBAL THREAT THAT IS GROWING

Some 12,400
research articles
have been
published in the
last 20 years
documenting the
marine litter and
marine plastic
pollution threat

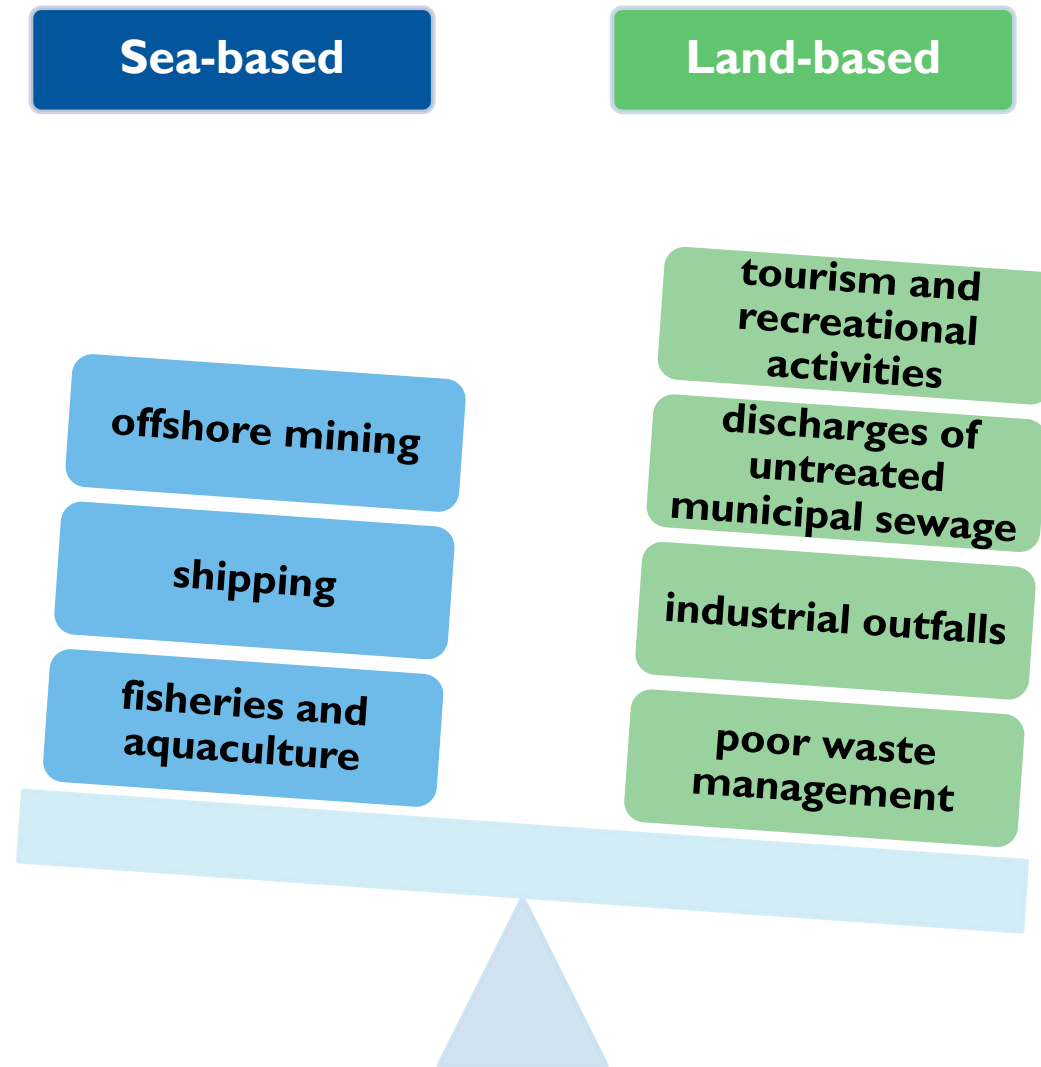


MYTHS & MISCONCEPTIONS ALONG THE MANAGEMENT CYCLE OF MARINE LITTER



MARINE LITTER & MARINE PLASTIC POLLUTION SOURCES | FACTS

- ▶ **Assessing the relative importance of the different sources is challenging** given that a considerable percentage of litter items cannot be attributed to a specific source.
- ▶ **Beach litter research results are biased towards reflecting marine litter inputs from tourism and recreational activities** as most beach litter surveys are carried out in tourism destinations.
- ▶ **The origin (transboundary effect) of marine litter** is difficult to be determined.
- ▶ **The riverine inputs of marine litter are substantial.**



MARINE LITTER COMPOSITION | FACTS

- ▶ Plastics are ubiquitous in the coastal and marine environment accounting for some **70-90%** of all litter items found. Leakage of plastics into the ocean can occur at all stages of the production-use-disposal cycle.
- ▶ A large amount of litter items found in the Mediterranean are **single-use plastic items**.
- ▶ **Fishing and aquaculture related items account for some 37.5%** of total items recorded in certain areas of the Mediterranean (Vlachogianni et al., 2018).
- ▶ There are **no reliable estimates of the microplastics** quantities entering the marine environment.
- ▶ **Microplastics greatly outnumber large plastic items in marine systems**. Even if all releases of plastic to the environment were to cease immediately, the number of microplastics in the ocean would be expected to continue to increase as a result of continuing fragmentation.



© Thomas Vlachogianni

MARINE LITTER IMPACTS ON MARINE SPECIES | FACTS

A walrus is swimming in green water, with its head and whiskers visible above the surface. The walrus is facing towards the left of the frame, and its reflection is visible in the water below it.

663 marine species worldwide have been reported to have encountered marine litter

A 40 % increase of affected species in the last years has been reported

~ 15 % of the species affected through entanglement and ingestion are included in the **IUCN Red List of Threatened Species**

- ▶ **Uncertainties remain regarding the extent of harm caused to marine species by ingestion** of microplastics and their exposure to hazardous chemicals leaching from or adsorbed on microplastics.
- ▶ **Currently there is no evidence to support or refute potential bio-magnification** of particles or associated chemicals.
- ▶ **Basic toxicological data on the consumption of microplastics and nanoplastics by humans** for a food risk safety assessment are lacking.
- ▶ **Measuring the full economic cost of marine litter** e.g. including the inhibition of the proper functioning of marine ecosystems is not possible.

MARINE LITTER IMPACTS | FACTS

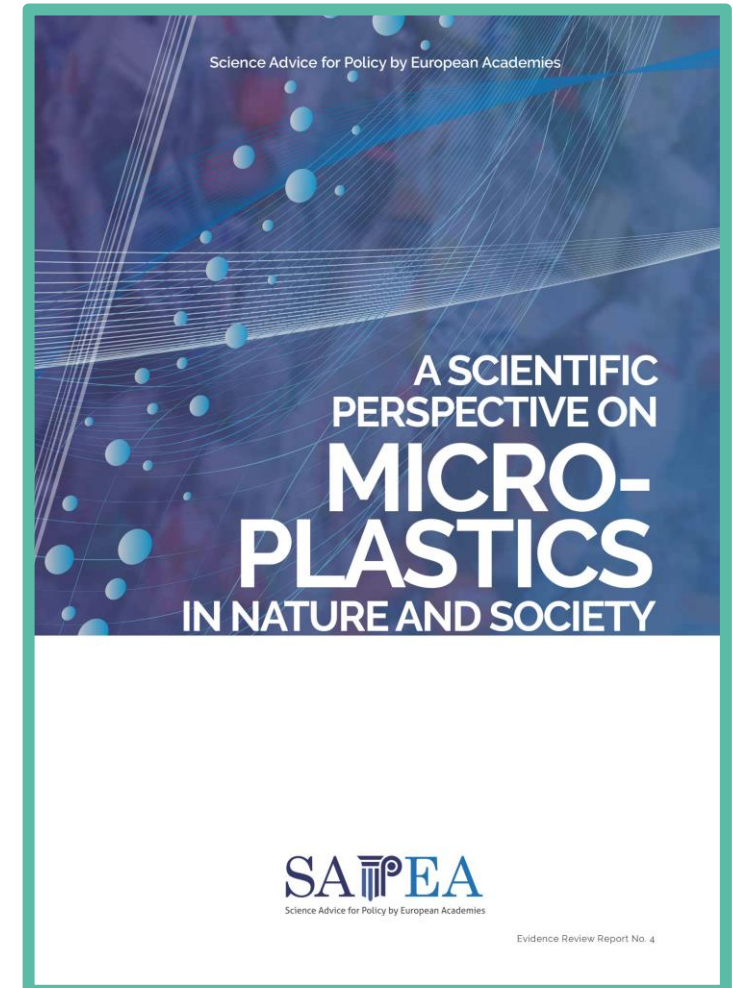


Photos © Thomais Vlachogianni

Stomach contents of sea turtles that were dissected at the Talamone Sea Turtles Rescue Centre located in south Tuscany

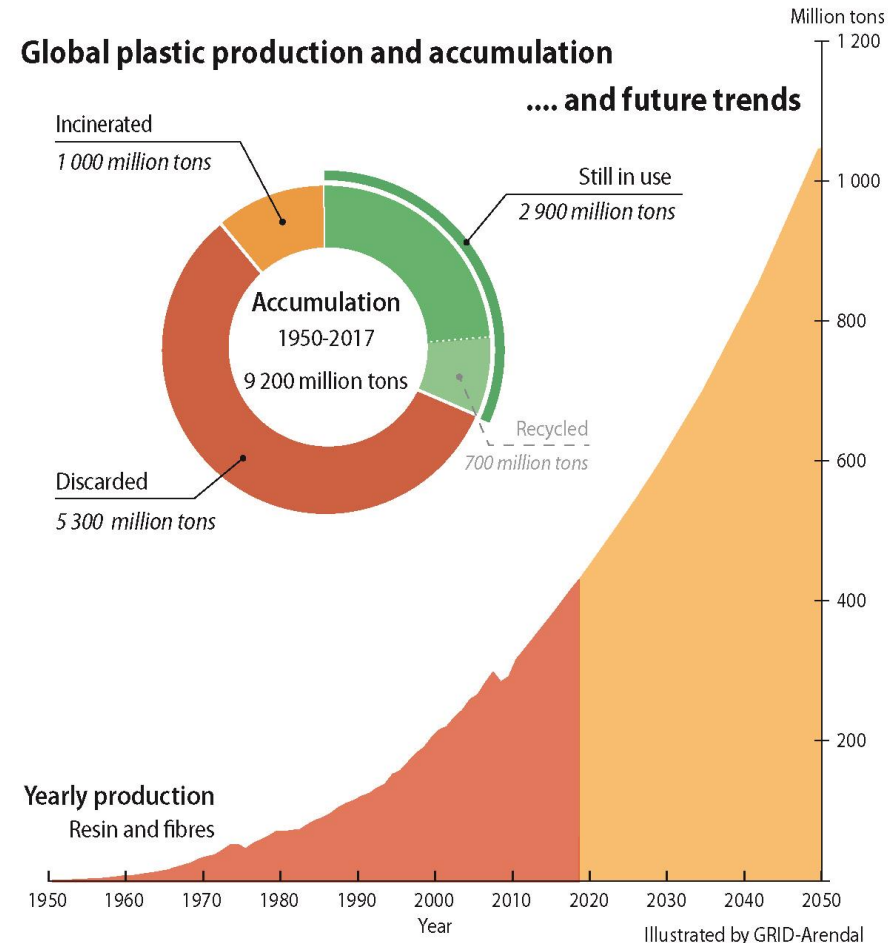
MICROPLASTICS – WHAT DO WE KNOW?

- ▶ A lot is already known about microplastics, and more knowledge is being acquired, but some of the evidence remains uncertain and it is by its nature, complex (for instance, differences in size, shape, chemical additives, concentrations, measurements, fates, unknowns, human factors, actions).
- ▶ There is a fair knowledge of microplastics concentrations for freshwaters and the ocean surface, but little is known about concentrations and implications of microparticles below the ocean surface.
- ▶ Most microplastics go in and out of most organisms, and as with many chemicals, 'the poison is in the dose'. Most effect studies are performed using concentrations that are much higher than those currently reported in the environment, or using very small microplastics for which limited exposure data exists, or using spherical ones which are not representative of real-world types of particles, or using relatively short exposure times. Currently, it is not known to what extent these conditions apply to the natural environment. This limits the reliability of the risk assessments.



THE PLASTIC AGE

Plastics have become the basic component for manufacturing numerous everyday products, and since the 1950s, their production has consistently grown, with their global production expected to double by 2035.



UNEP (2021). From Pollution to Solution: A global assessment of marine litter and plastic pollution. Nairobi.

TOP BENEFITS OF PLASTICS

Durable

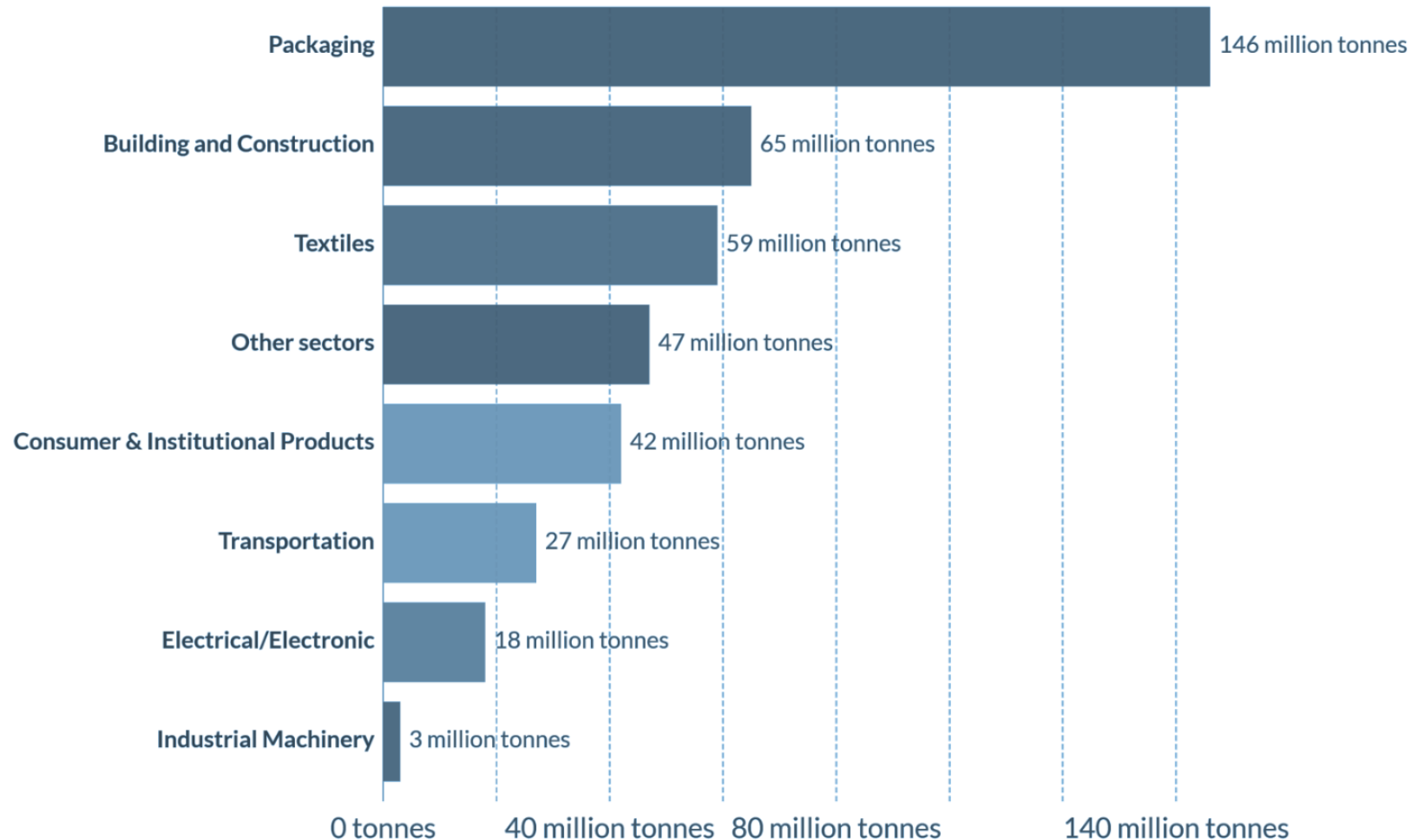
Lightweight

Versatile

Inexpensive?

There are hidden costs associated with the environmental consequences of plastic production.

GLOBAL PLASTIC PRODUCTION BY INDUSTRIAL SECTOR, 2015



The
world
produces
more than
400
million
tons
of plastics
every year

Source: Geyer, R., Jambeck, J. R., Law, K. L., 2017. Production, use, and fate of all plastics ever made. *Science Advances*, 3(7), e1700782.

WISE USE OF PLASTICS WITHIN A CIRCULAR ECONOMY

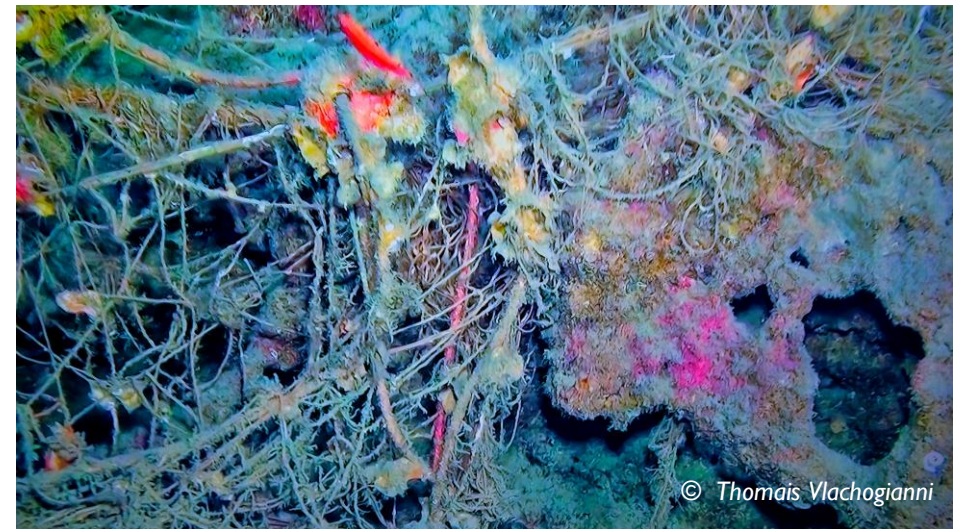


THE RECYCLING OF PLASTICS | LIMITATIONS & COMPLICATIONS

- ❑ The complexity of plastic recycling brings high costs associated with infrastructure and processing. In addition, the quality of plastic degrades during recycling and may contain contaminants that can compromise the integrity and safety of recycled products.
- ❑ Extended Producer Responsibility schemes can result in design changes that enable the effective and efficient recycling of product waste.
- ❑ Mandatory use of recycled content in plastic products increases the demand for recycled.



CAN MARINE PLASTICS BE RECYCLED?



WHAT ARE PLASTIC ITEMS MADE OF?

Thermoplastics

capable of being repeatedly moulded, or deformed plastically, when heated

Polyethylene Terephthalate (PET); Polypropylene (PE); Low Density Polyethylene (LDPE); High Density Polyethylene (HDPE); Polystyrene (PS); Expanded Polystyrene (EPS); Polyvinyl-chloride (PVC); Polycarbonate; Polypropylene (PP); Polylactic acid (PLA); Polyhydroxyalkanoates (PHA)

Thermosets

once formed, cannot be remoulded by melting

Polyurethane (PUR), Phenolic resins, Epoxy resins, Silicone, Vinyl ester, Acrylic resins, Urea-formaldehyde (UF) resins

Polymer	Plastic product
HDPE	Milk bottles, freezer bags, shampoo bottles, ice cream containers
PET	Bottles for water and other drinks, dispensing containers for cleaning fluids, biscuit trays
LDPE	Bags, trays, containers, food packaging film
PP	Microwave dishes, potato chip bags, bottle caps
PS	Cutlery, plates and cups
EPS	Hot drink cups, insulated food packaging, protective packaging for fragile items

BIO-BASED VS PETRO-BASED PLASTICS

Bio-based plastics
made from renewable
resources

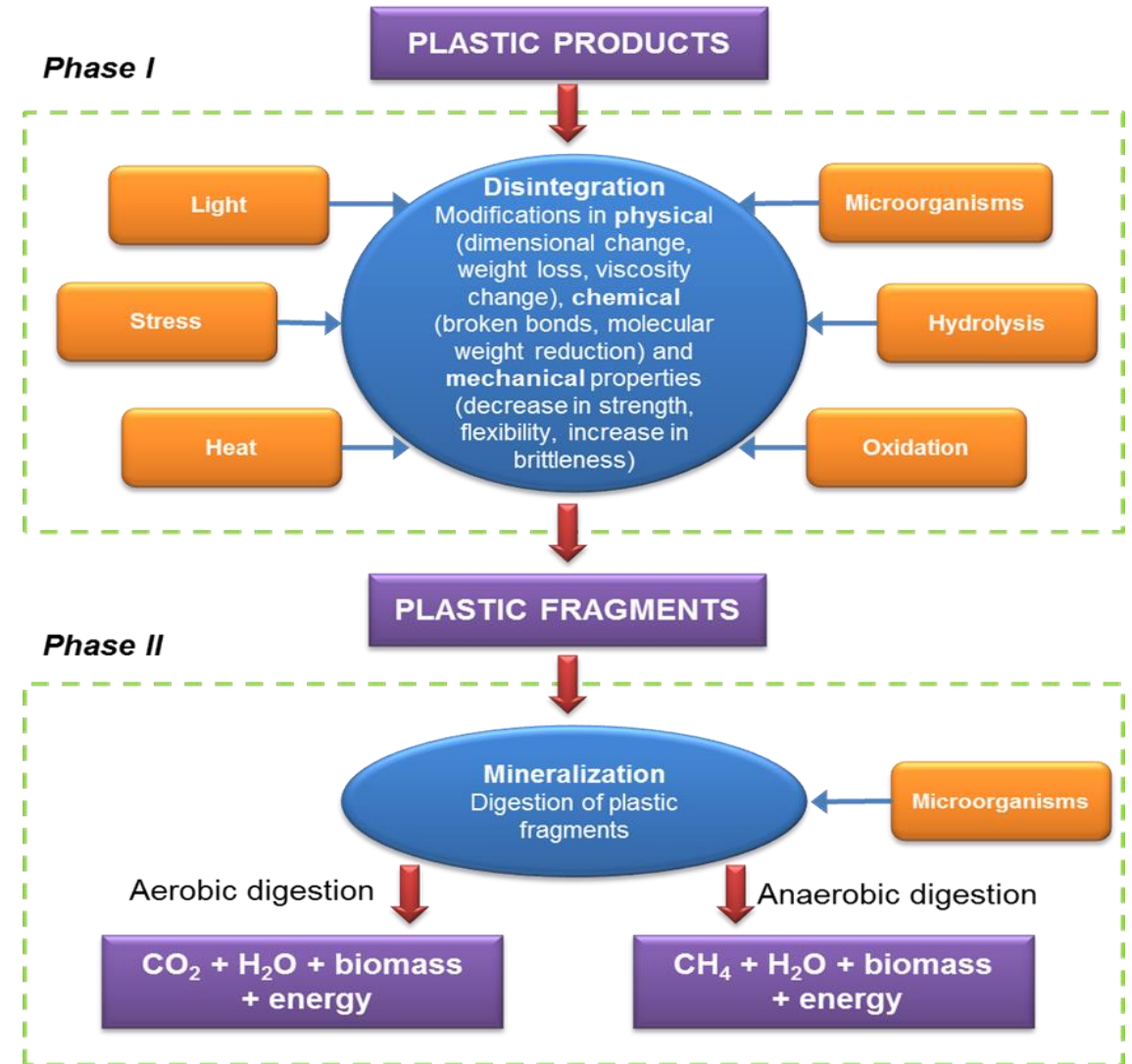
Petro-based plastics
made from non-
renewable petroleum
based resources

- Renewable resources can include corn, potatoes, rice, soy, sugarcane, wheat, and vegetable oil.
- Two very common examples of bio-based plastics are bio-polyethylene and poly(lactide). While most of the conventional polyethylenes are produced from fossil fuel, bio-polyethylene a leading bio-based plastic is produced entirely from biomass feedstock.



DEGRADATION OF PLASTICS

- The degradation of plastics is defined as the process that induces changes in the polymer properties (deterioration of functionality) due to chemical, physical or biological reactions.
- Depending upon the nature of the causing agents, polymer degradations have been classified as thermal- (heat), photo- (sunlight), oxidative- (oxygen), hydrolytic- (water), mechanical- (stress), and bio- (microorganisms) degradation.



DEBUNKING THE MYTHS & MISCONCEPTIONS ABOUT MARINE LITTER PREVENTION & MITIGATION ACTIONS

Substituting 'conventional' plastics with biobased plastics is merely a distraction to the marine litter issue.

End-of-pipe solutions such as cleanup operations cannot address the issue.

Biodegradable and compostable plastics pollute our coasts and seas just like conventional plastics, as they behave quite differently in the marine environment than in a terrestrial setting (landfill, composter) where the conditions required for rapid biodegradation are unlikely to occur. In addition, mixing of such plastics with normal plastics in the recycling stream may compromise the properties of the newly synthesised polymer.

PHOTOGRAPH BY JUSTIN HOFMAN



EC GUIDELINES ON SINGLE-USE PLASTIC PRODUCTS

‘Plastics manufactured with modified natural polymers, or plastics manufactured from bio-based, fossil or synthetic starting substances are not naturally occurring and should therefore be addressed by the SUPs Directive. The adapted definition of plastics should therefore cover polymer-based rubber items and bio-based and biodegradable plastics regardless of whether they are derived from biomass or are intended to biodegrade over time’

Commission guidelines on single-use plastic products in accordance with Directive (EU) 2019/904 of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment (2021/C 216/01)



CAN CHEMICAL 'RECYCLING' SOLVE THE PLASTIC POLLUTION CRISIS?

energy-intensive

produces
greenhouse gas
emissions

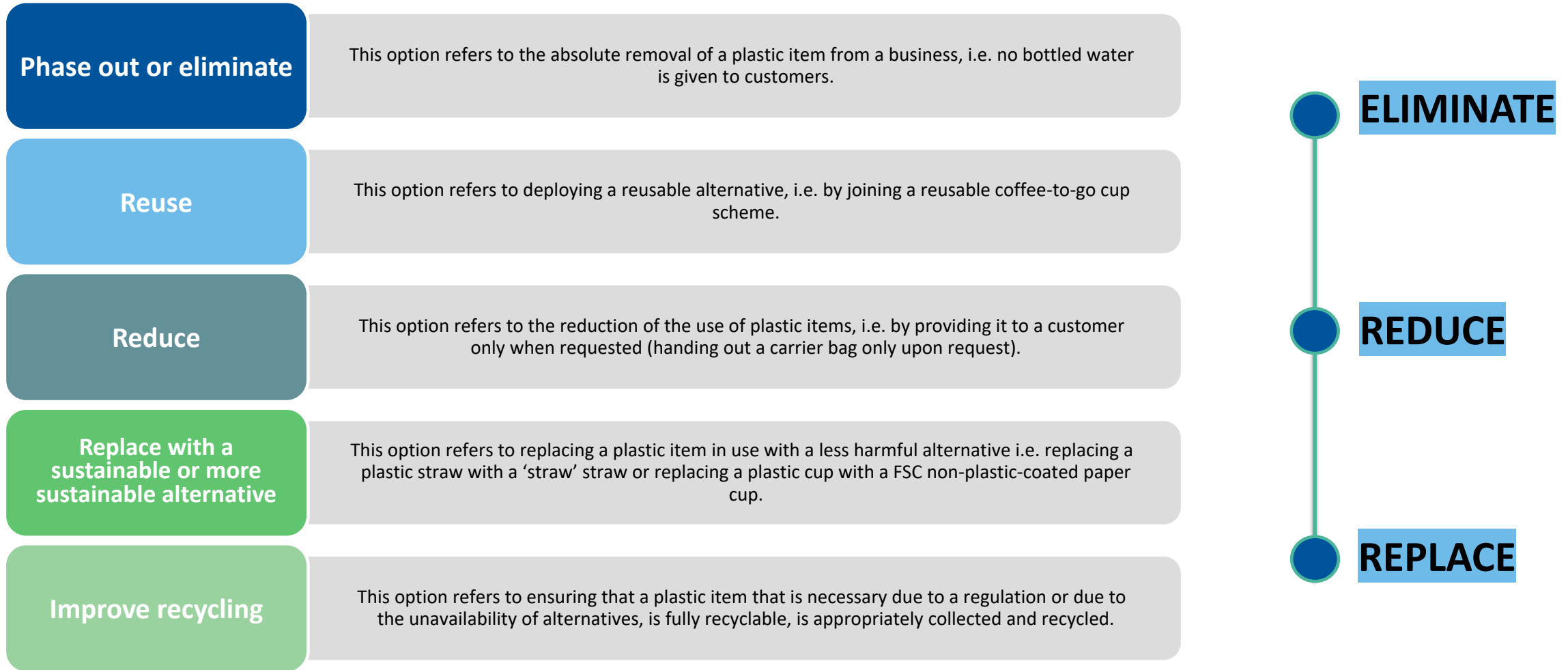
requires/emits
chemicals

logistical &
economic issues
related to
collection and
sorting



The related technology is still largely in the research and development phase.

THE EUROPEAN WASTE HIERARCHY AT THE HEART OF MARINE LITTER PREVENTION & MITIGATION INTERVENTIONS



THANK YOU FOR YOUR ATTENTION!

“ For a litter FREE Mediterranean

