How EU policy can tackle microplastic pollution

SEAS AT RISK

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Microplastics are everywhere in the environment in the ocean and on land, even in remote regions of the world still considered pristine.

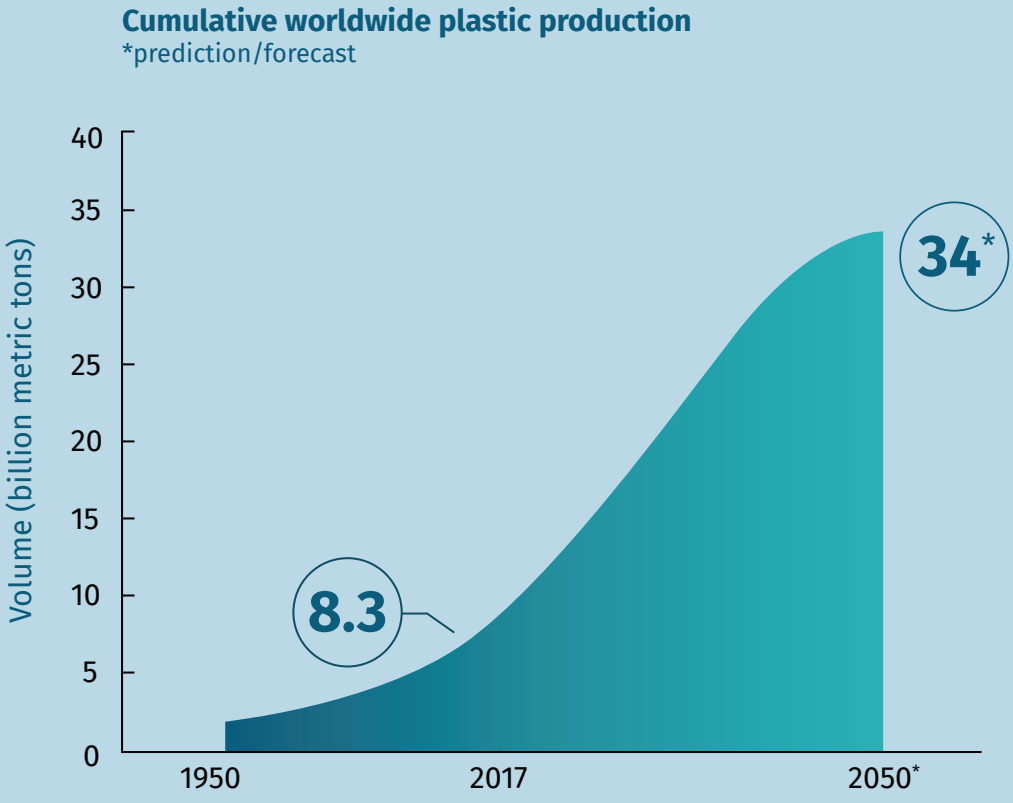
Microplastic pollution has recently been evaluated at 24,4 trillion particles in the ocean surface alone.

A significant number of unnecessary microplastics are intentionally added to products in detergents or personal care products such as toothpaste and shower gel. However, most of the microplastics found in the environment result from the degradation of larger plastic products when exposed to solar irradiation, abrasion or erosion. Even if direct microplastic emissions to the ocean were to stop entirely, microplastic pollution would still increase, as the degradation of macro plastic remaining in the water would continue. Overcoming plastic pollution therefore requires to fight both macro and microplastic pollution.

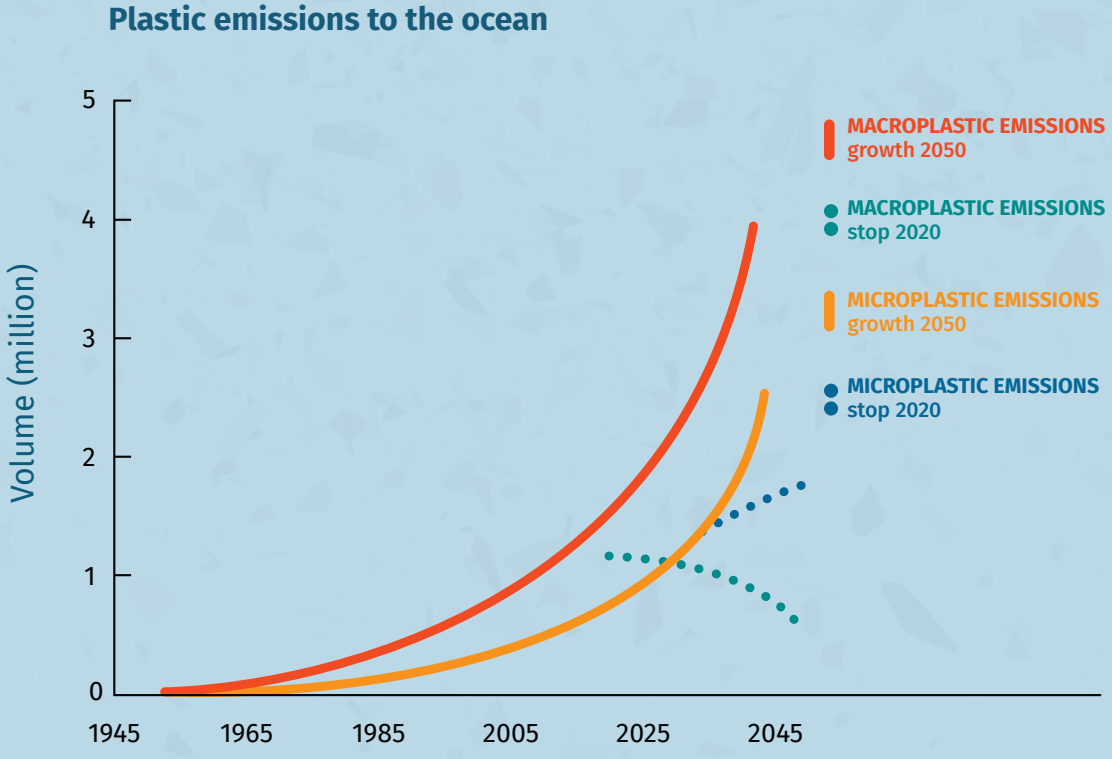
Research has found solid and extensive evidence of the negative impacts of microplastics on the environment, marine life, global ecosystems and habitats. It is also found to exacerbate climate change, via release of GHG emissions during their whole lifecycle (production, transport), including during the degradation process from macro to microplastics. The accumulation of microplastics in human bodies, also raises concerns in the scientific community.

With plastic production expected to skyrocket in the coming years - quadrupling before 2050 - microplastic pollution is set to become a runaway challenge if adequate preventive measures are not put in place very soon.

Microplastics are synthetic plastic particles that are smaller than 5mm and that have either a **regular or an irregular shape.**



Graph 1 Cumulative world-wide plastic production and forecast.



Graph 2 Emissions of macro and microplastics to the ocean.

Sources of microplastics

Textiles

70% of textiles produced today are synthetic and shed large quantities of microplastics into the environment, accounting for 35% of total microplastics released into the ocean. The dispersion of **synthetic fibers and fabrics from clothing** is not only the result of washing and wear, but also takes place during production. **Geotextiles** - often used to retain and reinforce soil layers or as agricultural mulches – also release microplastics, due to the action of UV rays, physical damage and poor maintenance.

Personal Care Products

A variety of personal care products contain intentionally added microplastics (e.g. glitter, microbeads in face/body scrubs). These products wash down drains and represent 2% of total microplastics released into the marine environment.

Fishing, Aquaculture and Shipping

Microplastics are released by ships' greywater flowing unfiltered into the ocean, degradation of lost fishing gear, marine paints and coatings, single-use plastic waste from fishing and aquaculture, and lost maritime containers, containing plastic goods.

Agriculture

A variety of **agricultural sources contribute to dispersing microplastics into the ground**, for example through the widespread use of cultivation films, irrigation pipes, nutrient pills, seed coating, and **sewage sludge** from wastewater treatment plants used as soil fertiliser. With half of all sludge in Europe returned to land, this is a widespread problem.

Road Transport

Tyre wear, road markings and road abrasion account for more than 35% of all microplastics released into the environment. Tyre wear alone generates over 1.3 million tonnes of microplastics in Europe each year. **"Recycling" of old tyres** is often problematic, as their use in artificial reefs, sports pitches or school playgrounds directly releases microplastics into the environment.

Plastic Manufacturing

Pellets are virgin or recycled plastic beads used as raw materials in manufacturing most plastic products. However, **plastic pellet, flakes and powder loss** occurs all along the plastic production, transport and recycling value chains

Tourism

Particular pressure is exerted by **tourists' waste on local waste management systems,** cruise ships' wastewater discharges and the massive use of single-use plastic products and packaging.

Negative impacts of microplastic pollution

Impacts on marine biodiversity

Microplastics poses major risks to the environment, and marine life in particular. 94% of all plastic waste entering the ocean ends up on the seabed, where it will take centuries to fragment and degrade. That degradation process releases microplastics, nanoplastics and chemicals, all of which have serious negative impacts on marine life, habitats and the entire food chain.

Microplastics hotspots frequently coincide with biodiversity hotspots and vulnerable nursery grounds, such as estuaries, deep sea canyons, coral reefs and mangroves. This increases the impacts of microplastics on large groups of important marine species.

The level of microplastic contamination of marine species depends on their location and feeding techniques. However, all ocean areas are known to be affected: between 40% and 68% of fish in the Mediterranean Sea, 80% of fish larvae and 100% of plankton in European estuaries have ingested microplastics, as have all sea turtle species and most seabird species in our seas.

Injuries due to ingestion

Microplastics are routinely ingested by marine life, and often mistaken for food by marine fauna. Microplastics aggregation in marine organisms causes local blockages, inflammation and injuries.

Toxicity

Toxic additives released by microplastics cause significant harm to marine fauna, from energy depletion and fertility issues to behavioural problems and death. In the US, for example, run-off from road dust containing tyre wear and toxic additives has caused mass mortality of salmon fish in local rivers. Microplastics absorb and concentrate hazardous substances from the local environment in particularly high quantities, which then accumulate in the plankton and marine species that ingest them. Their harmful concentrations increase as they go up the trophic web.

Vector for invasive species

Microplastics act as a vector for invasive species, bacteria and viruses, transporting and spreading them across long distances and undermining the balance of local ecosystems worldwide. That dissemination of invasive species and pathogens is expected to accelerate with the multiplication of floods, cyclones and other climate change-related events. Microplastics are lighter than plastics and thus can travel further and faster on winds and currents.

Impacts on land biodiversity

Microplastics in soil, sediment and freshwater could have a long-term negative effect on ecosystems. Accumulation and degradation of plastics in soil varies and depends on the type of plastic used (oxo-degradable plastics are of particular concern), as well as the occurrence of a number of climatological, biological and anthropogenic drivers (UV radiation, microbiotas and tilling).

Soil degradation

Microplastics on land cause soil contamination and degradation. The negative health impacts on soil animals could enhance trophic accumulation, as well as affect the organisms that perform essential ecosystem services. Crop productivity could be affected. Microplastics may also result in uptake by plants.

Injuries due to ingestion

Microplastics are ingested by terrestrial species, with effects similar to those recorded in marine life. Among the most common effects are indigestion, infection and obstruction, with birds particularly prone to lethal injuries.

Toxicity

Similar to the marine environment, terrestrial species' tissues are **contaminated by the ingestion and absorption of microplastics** containing heavy metals, plasticisers, organic pollutants, pesticides and other chemicals.

Impacts on climate

GHG release

Once exposed to solar radiation, **plastics and microplastics undergo a gradual degradation and fragmentation process.** This releases powerful greenhouse gases such as ethylene and methane, which is 34 times more potent than CO2 and is thus a significantly harmful climate change factor. Microplastics release 76 metric tonnes of methane emissions globally each year, directly contributing to climate change. This figure does not account for greenhouse gases released through the exploration, production or processing of the raw materials used to make petrochemicals, thus the greenhouse gases released across the whole plastics lifecycle would be far higher.

Reduced ocean carbon capture

The ocean, marine life and habitats are the most important carbon sink in the world, keeping carbon from entering the atmosphere as CO2 and mitigating climate change. However, when marine habitats and organisms are contaminated by microplastics, their capacity to capture carbon is compromised. The **toxic additives released by the degradation of plastics are absorbed by habitats and organisms**, distorting their morphology and reducing their growth and photosynthetic capacity.

Impacts on human health

While for long scientists assumed that plastic particles were too large to pass from the soil to the plant, recent research found microplastics contamination into apple, pears, carrots, potatoes and broccolis. Microplastics are present in commercial seafood, sea salt, home dust, city dust and drinking water: humans ingest an estimated 11,000 particles a year. Microplastics have also recently been found in human placenta. The accumulation of plastic polymers and additives in human bodies raises concerns in the scientific community and its impacts are currently being researched extensively.

Policy solutions

Microplastic pollution has been overlooked by policy makers, as its impacts are largely invisible.

However, with an expected increase of 33-36% in plastic pollution by 2025, and even more by 2030, effective and sustainable solutions must be implemented now to prevent microplastic pollution and minimise its impacts on our global ecosystems and climate for the generations to come.

Given their size and spread, it is virtually impossible to clean up the environment from microplastic particles. Rather, the problem can only be effectively tackled through preventive measures. Improving the design and composition of plastic products across sectors is a concrete and obvious way forward. For example, some plastic polymers release significantly more microplastics and greenhouse gases than others when degrading and could be simply excluded from production. Similarly, the additives in plastic products that have such negative impacts on marine life and ecosystems could also be selected out at the design stage.

Sources and sectors contributing to microplastic pollution vary between countries and regions, requiring different strategies adapted to local contexts (tourism, intensity of agricultural production, shipping, aquaculture or fishing activity, quality of local solid and sewage waste management, presence of offshore activities, etc).

Horizontal recommendations

- **Address all sources of microplastics unintentionally added in a comprehensive manner** not limited to pellets, textiles and tyres, with tough mandatory EU measures to prevent microplastics at source
- **Reduce plastic usage** via ambitious targets and rethink the use of plastic products
- **Include the environmental costs** of plastic pollution in the product price
- **Prevent macroplastic pollution** and phase out single-use plastics still on the market, which will reduce microplastics released by degradation
- **Ban intentionally added microplastics** in consumer products as soon as possible, as well as unsustainable microplastic applications (e.g. glitter, sequins and flocking in clothing, toys, plastic flowers, decoration)
- **Scale-up reuse and repair** of equipment and products, which is proven to be more economically and technically effective than recycling
- **Scale up Extended Producer Responsibility** and corporate social responsibility as fundamental tools to tackle global plastic pollution
- **Mandate the monitoring of microplastic pollution,** using indicators such as sediment, biota, water, soil and air
- **Ban the use of plastic granules,** flakes or pellets in the open environment (e.g. artificial turf pitches in school playgrounds or sports pitches) where microplastics can be released
- **Sanction microplastic spills and leakages** into the environment notably from pellets and biomedia
- **Fund, promote and scale-up citizen science** monitoring projects associated with litter and plastic and microplastic pollution
- **Raise awareness** of the human and environmental harm caused by plastic and microplastic pollution

Recommendations addressing specific sources

TEXTILES

- **Establish minimum eco-design requirements** for textiles, setting a maximum threshold for microplastic shedding, and develop manufacturing techniques to select the best performing fabrics at design and production stage
- **Limit microplastic release** at all lifecycle stages and assess the environmental impacts of particularly problematic garment manufacturing techniques, such as cutting, dyeing and 3D printing, which generate widespread release of microplastics
- **Mandate industrial pre-washing** of new textiles and garments, using filter systems to capture microplastics released throughout the manufacturing process
- **Introduce EU legislation** to ensure that all washing and drying appliances for domestic and industrial use (including onboard ships) are equipped with systems to filter greywater and capture microplastics

ROAD TRANSPORT

- **Reduce road transport** (passenger and freight) to limit microplastics release from abrasion of car and truck tyres
- **Introduce mandatory threshold limits** for microplastic release from tyres
- **Fund research on alternative brake pads** and friction equipment for all land vehicles to reduce the emission of fine particles into the atmosphere
- **Investigate the environmental impacts** of recycled tyre use (e.g. in road asphalt and school playgrounds) and prohibit the use and storage of tyres underwater or in the open environment

FISHING AND AQUACULTURE

- **Monitor concentrations of microplastics** in both wild and farmed fish and seafood
- **Mark and track fishing gear** to disincentivise discarding and enable recovery of lost gear
- **Mandate the reporting of lost fishing** and aquaculture gear to public authorities
- **Promote circular design for fishing gear,** including low impact and durable materials such as natural fibres or ceramics for fishing gear, traps and pots

PLASTIC PRODUCTION

- **Phase out synthetic foam polymers** (e.g. expanded polystyrene), as those are most likely to release microplastics throughout their lifecycle
- **Set up an open access database** of all additives used in plastic and recycled plastic products to increase supply chain and business' awareness and enable ecotoxicological research
- **Introduce mandatory containment** of pellet handling sites, as well as plastic production and recycling facilities
- **Oblige plastic manufacturers,** converters, recyclers and transporters to implement best practice to prevent plastic pellet loss into the environment, and organise yearly training for their employees

PLASTIC PACKAGING

- **Regulate food contact packaging** to ensure that it is toxic-free by design all along its lifecycle (e.g. free from all potentially hazardous substances, including chemicals that cause cancers, gene mutations, affect the reproductive and endocrine system or are persistent and bio-accumulative.), and integrate the generic approach to risk management in legislation.
- **Set reduction targets** and promote packaging-free options to reduce overpackaging in consumer products and delivery services
- **Mandate national or European Deposit Refund Schemes** and Extended Producer Responsibility schemes that also account for reusable and refillable packaging
- **Ban colourants in plastic packaging** as part of the EU sustainable product initiative

AGRICULTURE

- **Introduce EU legislation** to phase out the use of synthetic polymers in agriculture and horticulture
- **Phase out intentionally added microplastics** in agricultural and horticultural use, as rapidly as possible
- **Promote and incentivise sustainable alternatives** to plastic mulch and other soil-polluting microplastics, such as synthetic geotextiles
- **Set short-term reduction targets** for microplastic release from effluent and by-products (fat, sludge, etc.) of water treatment and wastewater treatment plants, followed by regulations to achieve zero emissions of microplastics in the longer term

SHIPPING AND CRUISE INDUSTRY

- **Establish regulations to prevent overloading of cargo ships** and mandate adequate storage of pellet containers below deck
- **EU ban on intentionally added microplastics** to hull paints, marine coatings, sealant joints and cleaners used for **hull scrubbing**
- **Apply the 'polluter pays' principle** to shipping companies, holding them accountable for clean-up and retrieval of containers lost at sea
- **Limit the release of microplastics** in greywater for all ships and vessels

WASTEWATER MANAGEMENT

- **Introduce EU legislation** to ensure that buildings have microplastic filtering systems installed between their greywater and sewage systems
- **Include biomedia in the scope of the policy measures** to address unintentional releases of microplastics with mandatory obligations to the waste water treatment sector to prevent biomedia spills into the environment
- **Regulate the monitoring of water treatment plants** and wastewater treatment plants, and apply the polluter pays principle to ensure that microplastics are not released into the environment through equipment malfunction or poor maintenance practices
- **Promote use and development of low-impact technologies** to protect ecosystems when capturing plastic litter in rivers and freshwater streams

→ More recommendations for policy development at EU level can be found in the 2021 study, **'Microplastics in the marine environment: sources, impacts and recommendations' (seas-at-risk.org)**, together with indicators to monitor pollution over time.

All economic sectors are the source and the solution to microplastic pollution – an integrated approach is needed.

Only complementary measures across all responsible sectors will generate the changes in plastic and microplastic production and consumption needed to reduce harmful microplastic pollution.

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