



## POLLUTION WITH PLASTIC WASTE (DAMAGE OF MICROPLASTICS)

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<https://doi.org/10.5281/zenodo.8058541>

**Abstract:** this article shows pollution by plastic waste, which is one of the most urgent problems today, and its level of damage to the environment and living organisms, including the human body. In addition, the serious harm of microplastics is also covered.

**Keywords:** plastic waste, microplastics, polyethylene, pollution, plastics, biodegradable plastics, plasticizers, polycarbonate, microplastic dust

According to the UN, about 13 million tons of plastic waste are thrown into the ocean every year. Plastics end up in the stomachs of marine mammals and birds in different ways. It is estimated to kill tens of thousands of birds, whales and turtles every year. Animals are wrapped in plastic nets or indigestible plastic waste accumulates in their stomachs, which has a negative effect on the functioning of internal organs and kills or weakens them. In addition, the wastes thrown in the ocean and fresh waters to a certain extent reach human life through the ways of consumption, which naturally causes diseases and their negative complications.

The substances used in the production of plastic products are divided into the following types:

### **Polyethylene terephthalate, PET, PETE, PET-R**

The product is not intended for repeated use, it may emit toxic compounds. It is used in making bottles. Low density polyethylene (high density).

**HDPE, HDPE, PE HD.** Plastic bags, as well as glass and chemical containers are made from it. Relatively safe polymer. It has the ability to absorb various substances and smells.

Polyvinyl chloride. PVC, PVC can emit toxic substances and compounds. It is not allowed to buy food products in PVC packaging. It is among the non-recyclable products. High pressure polyethylene.

**LDPE, PELD.** Low-density polyethylene, from which tubes for baby food and creams are made. It is relatively safe and recyclable than others.

**Polypropylene. PP.** Durability is distinguished by flexibility. Will be recycled. One of the safest plastics for the environment and humans.

**Polystyrene. PS.** Toxic plastic. Due to its low cost, manufacturers often use it. Reworkable, but difficult to deploy. Other types of plastic also include plastic, polycarbonate, and other compounds

90% of seabirds have plastics in their stomachs. It should be mentioned that plastics decompose in about two hundred years. Plastic that falls on the ground is divided into small particles, and harmful chemicals added to them during the production process are released into the environment. These can be chlorine, various chemicals, toxic or carcinogenic substances. Plastic and its small chemical particles end up in water sources, killing many

animals. Plastic makes up 80 percent of the world's ocean waste. Plastic collects toxic substances on the surface of microgranules. Currently, manufacturers offer two groups of naturally degradable plastics: oxo-degradable and biodegradable (degraded by organisms).

**Oxo-degradable.** This is polyethylene with additions of metal salts: cobalt, nickel, iron. Such plastics decompose in natural conditions in two stages. At the first stage, under the influence of light and oxygen, the plastic product is divided into small pieces. In the second stage, their fate is not clear, according to estimates, polyethylene pieces are split under the influence of microorganisms. The study showed that within 350 days, no more than 15% of oxoplastic polyethylene decomposes in the form of CO<sub>2</sub> in the soil. Unfortunately, these plastics turn into a mass of plastic mesh and small plastic particles that should completely disappear under natural conditions, as a result of which small plastic particles pollute water resources and soil. Therefore, this product cannot be classified as biodegradable plastics.

**Biodegradable plastics.** Biodegradable plastics are a large family of different polymers. They are produced from plant raw materials and decompose into harmless substances without harming nature. Some of them are decomposed in natural conditions, and the main part is decomposed during composting.

According to the European standard EN13432, plastic can be called biodegradable if it meets the following requirements:

- The ability of the product to decompose into CO<sub>2</sub> and H<sub>2</sub>O in the presence of microorganisms by at least 90% within 6 months;
- Complete disintegration of the material (after 3 months, the number of fragments > 2 mm should not exceed 10% of the total mass of the product).

Analytical data show that 2 billion tons of solid household waste are thrown every year, almost half of which is 44% - organic and food waste, another 17% is paper and cardboard, and plastic waste is about 12%.

Polycarbonate plastics contain the bioactive chemical bisphenol A (BPA), which is released when heated above 150 °C.

Plasticizers can cause birth defects, puberty, reproductive problems, and other health consequences. Some phthalates have similar effects. However, measuring the complex health effects of plastic products is problematic.

Microplastic dust appears as a result of the decomposition of plastic bags and bottles, when washing clothes, when the fibers of synthetic clothing are cleaned and spread around or fall into the sewer; microplastics are brought to agricultural fields, discharged into seas, etc. Microparticles can float in the air for a week and therefore can travel great distances, crossing continents and oceans.

According to research, 84% of microplastics in the air rise from intercity highways - this is the result of natural tire decay. 11% rises from the surface of the ocean. Plastic pollution sometimes causes plastic rain, a new type of acid rain.

It is estimated that by 2025 there will be one kilogram of garbage for every three kilograms of fish in the world's oceans, and by 2050 the mass of waste may exceed the combined weight of all fish on earth. Microplastics are abundant in aquatic ecosystems. Micro and nanoplastics have now been identified in more than 150 fish, 23 molluscs and 10 crustaceans.

Micro- and nanoplastics pose a great danger to living organisms. Mechanical damage to the internal organs of animals, damage to the organs responsible for breathing of living organisms

and other negative consequences. Chronic exposure to nanoplastics has changed the sex ratio of daphnia in the new generation, can lead to growth retardation and reduced reproductive abilities. For example, the accumulation of microplastics in the internal organs of honey bees increases their susceptibility to viral infections. This shows the negative impact of microplastics on the immune system of living organisms. Smaller plastic particles  $\leq 20 \mu\text{m}$  have stronger effects on fish behavior and neurological function, intestinal permeability, metabolism, and gut microbiome diversity.

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