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PLASTIC POLLUTION OF THE ENVIRONMENT:
A GLOBAL PROBLEM AND APPROACHES TO ITS SOLUTION

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The mass production and widespread use of synthetic polymer materials, thanks to their low cost and high consumer qualities, has now given rise to a growing problem of environmental pollution from degradation-resistant plastic waste, which has become the most common, diverse, and widespread. The global scale and level of danger of pollution is comparable only to global warming and climate change. Microparticles of synthetic polymer materials (microplastics) are now found in all natural environments – soil, water, snow, air, and living organisms. However, microplastic pollution is only a visible part of the broader problem of environmental pollution by anthropogenic microparticles. Among these, in addition to microplastics, the most common microparticles include fiberglass, modified cellulose fibers, glass beads from road markings, microfragments of glass objects, elastomer microparticles (e.g., from tire abrasion), soot (a product of incomplete combustion of coal, diesel fuel, biofuels, and biomass), microparticles of composite materials, metal corrosion, brick deterioration, and so on. The sources, transport routes, behavioral characteristics, and environmental impacts of these microparticles have been virtually unstudied. Waste water-soluble polymeric materials, which are also widely used in various areas of human activity and enter the environment, require separate consideration and study. These polymers are used in the manufacture of paints and various coatings, as additives in paper and concrete production, seawater desalination, treatment at wastewater treatment plants, and oil production, and as additives in pesticides, fertilizers, cosmetics, and pharmaceuticals. The vast majority of scientific studies devoted to this problem document the presence of pollutants in certain environments, their quantity, and composition, without a thorough analysis of the sources, factors, pathways, and mechanisms of plastic objects or their particles appearing in a given location. Our research shows that the fight against plastic pollution is only partially within the realm of industrial ecology, while a significant portion lies within the realm of social ecology. The availability of appropriate technologies and infrastructure cannot guarantee a solution to the problem of plastic pollution without widespread public support for waste disposal regulations. Approximately half of all plastic products manufactured are packaging, containers, and wrappers, which have a useful life of less than one hour, after which they become plastic waste, which can degrade in natural conditions for thousands of years. The use of synthetic textiles and personal hygiene products containing plastic microparticles is equally widespread. The global population of 8.142 billion people (2024) produces approximately 1 billion tons of plastic waste annually, so it's crucial to determine whether compliance with waste disposal regulations is common practice in a given region.

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