

Waste plastics poison the food chain and contribute to global warming

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A growing body of research shows that waste plastic is becoming a major source of environmental pollution, including as a potentially significant contributor of greenhouse gases, a principal cause of global warming. As has long been the case with fossil fuels, the plastics industry is attempting to suppress knowledge of the problem.

The rate of plastics production is dramatically accelerating. Industry projects a 40 percent increase in the next decade. Already, more plastic was produced during the first decade of this century than in all previous history (mass production of plastics began after the Second World War). However, less than a fifth of that material is recycled. In addition to the huge quantities being dumped in landfills, increasing attention is being drawn to the massive amounts of waste plastic accumulating in the world's oceans.

It is estimated that approximately 18 billion pounds of waste plastic are currently being added to the world's oceans annually. Though dispersed throughout, these materials tend to concentrate in areas of circular ocean currents, called mid-ocean gyres, which constitute 40 percent of the world's ocean surfaces. There are five major ocean gyres. The largest of these has been dubbed the "Great Pacific Garbage Patch." Located between Hawaii and California, it is three times the size of France.

In total, studies suggest that there are now between 15 and 51 trillion pieces of plastic in the world's oceans. At the current rate of deposit, by 2050 the total weight of plastic in the oceans will likely outweigh that of fish. Significant quantities of plastic debris are also found in inland bodies of water, such as the Great Lakes in North America.

This steadily growing mass of material has significant damaging effects on the environment and ultimately on

humans.

In its original form (e.g., bottles, bags, etc.), fish, birds, and mammals are enveloped by or ingest these materials causing injury and death by asphyxiation, strangulation and starvation. Moreover, as they degrade into increasingly small pieces, what are called "microplastics" (less than five millimeters long), these particles enter the food chain and are ingested by animals, accumulating as growing quantities of indigestible material in their stomachs, leading to injury or death, and releasing toxic materials that bioaccumulate up the food chain, including into the diets of people consuming seafood.

For example, fish in the North Pacific have been found to ingest between 12,000 and 24,000 tons of plastic each year. A quarter of fish in California markets were found to have plastic in their guts. A 2014 study by Belgian researchers concluded that seafood consumers in Europe could be consuming 11,000 microplastic particles every year. The health implications of these toxic materials, such as cancer and liver damage, are ominous.

Another recently identified danger from plastic waste is its emission of greenhouse gases. In a just-published article in the scientific journal *PLOS ONE* (1 August 2018), titled "Production of methane and ethylene from plastic in the environment," Dr. Sarah-Jeanne Royer and colleagues report that "the most commonly used plastics produce two greenhouse gases, methane and ethylene, when exposed to ambient solar radiation."

Extended exposure to sunlight substantially speeds degradation of the plastics, releasing increasing amounts of gas. As heat and physical actions cause the discarded objects to fragment, more surface area is exposed, accelerating the process even more. Both of these gases are known to contribute to global warming.

Although the individual emissions from any single piece of plastic are small, and the main source of greenhouse gases remains the burning of fossil fuels, given the massive amounts of plastic waste that has accumulated along shorelines and is floating on ocean and lake surfaces, and its continuing trend towards growth into the future, the potential cumulative effect of this finding is significant. It was already known that degrading plastics emit carbon dioxide.

The authors conclude, “Our results show that plastics represent a heretofore unrecognized source of climate-relevant trace gases that are expected to increase as more plastic is produced and accumulated in the environment.”

Another study, by researchers at the Helmholtz Centre for Ocean Research Kiel, “Rapid aggregation of biofilm-covered microplastics with marine biogenic particles,” published in the *Proceedings of the Royal Society B* (29 August 2018), report that laboratory experiments indicate that microplastics aggregate into clumps held together by biofilms formed by bacteria and unicellular algae. They hypothesize that this process takes place in the ocean. Presumably a similar progression would occur in freshwater bodies as well. These aggregates may continue to float or sink to the bottom. Their subsequent fate, being consumed by pelagic or bottom-dwelling organisms for example, would be the subject of future research.

In a comment to the BBC, Dr. Montserrat Filella, a chemist at the University of Geneva, said, “As research expands our knowledge, we are realising that plastics can be insidious in many other ways. For instance, as vectors of ‘hidden pollutants’, such as heavy metals present in them or, now, as a source of greenhouse gases. And, in all cases, throughout the entire lifetime of the plastic.”

It should be noted that, although plastics degrade and change form over time, they remain in the environment indefinitely. Plastic has already begun to become part of Earth's geological record.

Attempts by Dr. Royer to obtain information from the plastics industry were met with silence. “I think the plastic industry absolutely knows, and they don't want this to be shared with the world,” she told the BBC.

Plastics are wonderful, highly useful materials. Their reckless disposal, however, is a major factor in the environmental degradation and climate change that

threaten devastating consequences for humanity and all life on Earth. A major, coordinated effort is needed on the part of scientists, engineers and others around the world to address the current conditions and develop ways of benefiting from the intelligent use of these materials in the future without their negative effects (e.g., effective recycling, biodegradability, etc.). However, this will not happen under capitalism, in which the overriding motivation of the ruling class is the maximization of profit, regardless of the consequences. Instead, what we get is ineffective token gestures, such as the recent campaign to get rid of plastic straws.



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