

# The Cause and Consequence of Plastic in the Ocean

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## Global Fishing Industry

178 million tons of [aquatic animals](#) were processed in 2020. 89 percent, or 157 million tons, were used for human consumption and 20 million tons for non-food uses. Since 1961, the global consumption of aquatic animals has increased on average by 3 percent annually. This rate is nearly double the annual world population growth. Consumption of aquatic animals has increased as supply has become more accessible due to improved equipment, technological advancements, and income growth.

## Plastic in the Ocean

[460 million tons](#) of plastic waste is produced globally per year. The United Nations Environment Programme (UNEP) estimates that [11 million metric tons](#) of plastic pollute the ocean each year, accounting for more than 85 percent of marine litter. This mass amount of marine waste comprises more than an estimated [170 trillion](#) individual pieces of plastic.

[1.8 trillion pieces of this plastic](#) waste accumulate in the Great Pacific Garbage Patch that floats in the open ocean between California and Japan and is estimated to be larger than the size of France.

Where is this plastic coming from, and who is to blame?

## Sources of Plastic Pollution

Plastics that enter the ocean may last up to 600 years, causing the risk of harm to extend far beyond the product's ability to hold form. Many plastics degrade through [solar UV-radiation-induced photo-oxidation reactions](#). Therefore, the degradation rate slows as plastic sinks further from the sun. The slow degradation of plastic contributes to the [continuous build-up](#) of ocean plastics since they are not entering and degrading at equal rates.

The ocean is polluted with macro and microplastics. Macroplastics are visible and can easily be observed, while microplastics enter the ocean as tiny particles or are the pieces left behind by macroplastics that have broken down. Microplastics range in size from [5mm to nano](#) proportions. Microplastics [invade](#) our food chain, drinking water, and even the air. Macro and microplastics enter the ocean from one of two sources: consumer waste or fisheries.

Researchers have observed a [significant increase](#) in ocean plastic pollution since 2005. In 2021, the world generated [139 million metric tons](#) of single-use plastic waste. This is 6 million metric tons more than in 2019. The Covid-19 pandemic surged an increase in medical protective equipment and single-use items. In Italy, an additional [160,000 to 440,000](#) metric tons of waste is estimated to have been produced in 2020. Overall, a global increase in single-use plastic has occurred despite governments implementing policies to reduce single-use plastics like plastic bags, bottle caps, plastic water bottles, and styrofoam cups. Plastic is used more in consumer and industrial products because of its [durability, low cost, and malleability](#). Recycling has not expanded at the same pace to be able to handle the influx of plastic production. The United Nations Environment Programme (UNEP) states that only [9 percent](#) of global plastic waste is recycled, and mismanagement causes 22 percent of plastic waste to become litter.

The fishing industry dispatches roughly [4.6 million](#) fishing vessels that contribute 100 million pounds of lost fishing gear, also called ghost gear. [Ghost gear includes](#) nets, lines, pots, and traps used in commercial fishing. Lost fishing gear accounts for [a majority of](#) plastic pollution in the ocean. In fact, [most plastic](#) in the Great Pacific Garbage Patch is fishing waste, and studies have found that 70 percent of macroplastic pollution floating on the ocean's surface is ghost gear. Increased fishing activity in the [Pacific Ocean](#) largely contributes to the large presence of ghost gear. An estimated [3,000 sq km of gill nets, 740,000 km of longline mainlines, and 25m pots and traps](#) pollute the ocean.

Ghost gear is an especially dangerous pollutant because the fishing gear is designed to capture sea animals. Because of this, ghost gear continues to catch, cause harm, and eventually kill marine organisms. This phenomenon is referred to as ghost fishing.

Ghost gear [enters the ocean](#) due to bad weather, gear malfunctions, vandalism, and snagging on bottom habitat, among other causes; fishing vessels also purposefully discard gear. Intentional loss of fishing gear is not accounted for in the estimated amount of plastic entering the water from fishing activities, suggesting that the actual amount is likely much higher.

## Harm to Marine Life

Sea life is at risk of becoming entangled in abandoned gear or macroplastics and ingesting microplastics. [UNESCO](#) declares that more than one million seabirds and 100,000 marine animals die yearly from ocean plastic, including sea lions, seals, and turtles. [In 2019, 300 sea turtles](#) were found dead entangled in ghost gear on the coast of Oaxaca, Mexico.

Ghost gear is considered [the deadliest](#) form of ocean plastic, so much so that 66 percent of marine animals and 50 percent of seabirds are estimated to be affected by ghost gear. When animals are caught by ghost gear, they endure a slow and painful death from exhaustion and suffocation.

As previously discussed, as macroplastics degrade, they are broken down into microplastics which continue to cause damage. As the plastics break down into smaller pieces, animals mistake them for [food and ingest them](#). Ingesting plastic can cause marine animals to choke, slowly die from starvation, or suffer intestinal injury. In fish, plastic ingestion travels up the food chain to larger fish, marine mammals, and human consumers. [25 percent of fish at California markets](#) have been found to have plastic microfibers in their bodies.

### **Harm to the Environment**

Ghost gear and plastics emit toxins, host invasive species, and disrupt the nearby ecosystem and habitats. Plastic is produced using [fossil fuels](#), like oil and gas. Plastics produce greenhouse gas emissions throughout their whole lifecycle. As plastics degrade, toxic chemicals, like bisphenol A (BPA), and colorants are released into the water, becoming an environmental and [climate issue](#). In addition to physically harming organisms, plastic chemicals produce planet-heating pollution.

Communities of small crabs, anemones, and other coastal creatures have been found living on plastic debris [thousands of miles](#) from their native home. This discovery illustrates the possibility of new floating ecosystems becoming common. The consequences of species existing in places they previously have not been able to survive are unknown, but it can be assumed that drastic changes among and within these floating communities are occurring.

Marine debris has the potential to alter [food webs](#) in the ocean. Autotrophs, like plankton and algae, produce their own nutrients from the sun and carbon. As plastics gather at the surface, plankton and algae are blocked from the sun. If the plankton and algae population decreases, a domino effect of food scarcity will occur throughout the food chain.

### **Harm to Human Health**

As previously covered, plastics leak harmful pollutants like BPA. In addition to causing environmental harm, BPA is linked to [health problems](#). Plastics are also known to absorb pollutants. In the ocean, plastics can absorb PCBs, and [pharmaceutical and industrial waste](#), which enter our food system after being ingested by sea animals. Chemicals like BPA and PCBs are correlated to acute human health issues like developmental disorders, reproductive abnormalities, and cancer. Many of the actual health effects of ocean plastics are still unknown.

### **Environmental and Health Injustice**

Wealthier countries produce more plastic waste, while developing countries suffer from receiving the waste. A majority of plastic waste can be [linked to](#) the US, Japan, South Korea, China and Taiwan. In developing nations, waste management is less advanced and the burden of moving mismanaged waste is exacerbated by the lack of infrastructure. The economies of developing countries who are subjected to plastic waste and whose economies are highly dependent on coastal activities, disproportionately suffer.

## What is Being Done?

Without action, the United Nations Environment Programme (UNEP) projects that the amount of plastic produced yearly will [triple by 2060](#). Prevention, monitoring, reducing marine litter, and spreading awareness are [essential](#) to addressing plastic pollution.

Improving fishing gear and practices is essential to reducing the amount of ghost gear in the ocean. Fishing gear designs need to be altered in consideration of why fishing gear is lost. As discussed, fishing gear may go overboard due to bad weather, malfunctions, littering, or snagging. How can these issues be avoided? To start, [biodegradable](#) fishing gear is being designed. Biodegradable gear will hopefully be less toxic to the environment and human health and will prevent the entanglement of any sea animal. Designers are also working to develop satellite-traceable buoys. This advancement will assist fishers to be able to locate lost traps.

Organizations like [The Ocean Cleanup](#) have already begun addressing plastic pollution by starting the cleanup process using a U-shaped barrier with a net-like skirt that hangs below the water's surface to collect the larger pieces of plastic. Though helpful, this solution may be missing [70 percent](#) of marine debris that has sunk to the bottom of the ocean. Removing plastic from the ocean is only a component of the needed action, policies are needed to curb the rate of plastic entering the ocean.

Promisingly, the UN Environment Assembly is taking steps to halt plastic pollution. The goal is to compose the world's first global plastic pollution treaty by 2024. This treaty will provide legalities surrounding the full life cycle of plastic from its production and design to its disposal.

[Canada](#) has implemented a mandatory policy of reporting lost gear and the marking of gear. This intervention improves the ability to trace lost gear to the polluter and hold them accountable.

Many single-use plastics are made up of polymers. The production of polymers creates a mass amount of greenhouse gas emissions. To further persuade companies to reduce the production of polymers, a polymer tax is proposed as an incentive. The [“polymer premium”](#) will be placed on each kilogram of plastic polymer made from fossil fuels. Companies and people will hopefully find the tax unattractive and avoid producing and consuming polymer plastics.

## What Can be Done?

As individuals, three habits can be used in our everyday lives to begin reducing plastic pollution immediately.

1. Each consumer can make the responsible decision to reduce or eliminate the use of single-use plastics. Accessible alternatives include using reusable shopping bags, durable dinnerware, and bringing reusable cups to take-out restaurants. When available, individuals should aim to use items that contain minimum amounts of plastic and instead use products made of other materials like biodegradable materials, glass, or metal.
2. To reduce the amount of ghost gear and ghost fishing, individuals can reduce or halt their consumption of marine animals. Once the demand of aquatic animals for consumption decreases, the number of fishing vessels submitting gear into the ocean will decrease too.
3. Lastly, recycle. Recycling has become more available in the public. If plastic is used, be sure to properly recycle the item.

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