

# What Are Nurdles? And Why They Are A Big Problem

We face global plastic pollution, with microplastics at the forefront of our pollution problems. Have you ever wondered what manufacturers use to produce larger plastic items?

They use microplastics known as nurdles. Nurdles are tiny plastic pebbles plastics producers melt together to create larger plastic items. Nurdles are no larger than 5mm and constantly terrorize the environment's health, especially the marine environment.

You might have noticed these colorful objects lying in clusters scattered around your favorite beach spots. They interfere with the health of our natural ecosystems and many marine organisms.

This article explores how nurdles enter the environment and the places plagued by nurdle spills. We will also examine their multiple environmental impacts and the cleanup efforts made by various agencies.

## What are nurdles?

Nurdles, also known as plastic pellets, are the foundation of most plastic products in the environment. These very tiny and circular pellets are produced from highly concentrated plastic. They are less than 5mm in size, making them microplastics.

The production of nurdles occurs in polymeric production industries and some recycling facilities. There is no plastic production process without nurdles. For better understanding, you can refer to them as the raw material used to produce the plastic products you use daily.

Manufacturers make them from polyethylene, polypropylene, polyvinyl chloride, polystyrene, and synthetic resins. They process the pre-production plastic pellets in a special machine, melt them down, and use the resulting plastic to produce many single-use plastics and end-products, such as toys, car parts, and almost every other plastic object.

## How do plastic nurdles enter the environment?

Manufacturers transport these tiny pellets to factories using trucks, railway vessels, and ships. Spills can occur at any point during the production of the pellets up to the production of the final consumer item.

The spills can occur directly from the production factory. A study conducted at a Sweden polyethylene production factory showed that 4086 pellets enter its surrounding environment every hour. This means that about 70,000 nurdles enter the environment daily [\[1\]](#).

These production factories also require proper disposal methods for excess nurdles to prevent them from entering the environment. They wash their workshop to clear all nurdles,

but the storm drains in place regularly lack proper filtration systems to prevent these little pellets from entering the environment. So, the nurdles enter the drainage system, which leads to other water sources in the area.

Most of the nurdles found in the marine environment are from the land. Nurdle spills also occur during transportation, especially when there is a collision. Nurdles have tiny sizes, and to keep costs low, they pack them in thin, film plastic bags weighing 25kg (including the nurdles). These bags get damaged easily, and when they do, the pellets get into various water sources and the soil fauna because of transportation errors [\[2\]](#).

## Shipping accidents

Shipping accidents often cause big spills. For instance, the X-Press Pearl disaster happened in Sri Lanka on May 20, 2021. The X-Press Pearl caught fire and sank on the coast of Sri Lanka after 12 days. All the containers holding the nurdles on the cargo ship went missing and were completely damaged, leading to tonnes of nurdles entering the water [\[3\]](#).

Another instance of nurdle spills happened near Hong Kong. In 2012, a typhoon caused about 150 tonnes of nurdles to spill into the ocean close to Hong Kong. However, the director of Plastic Free Seas, Dana Winograd, noted they gathered 102 tonnes of the lost pellets [\[4\]](#).

In 2018, a nurdle spill occurred at the Port of Durban, South Africa. During a hurricane, two ship vessels collided and spilled 49 tons of nurdles into the ocean. These nurdles spread 1,200 miles along the coastline, reaching Western Australia [\[5\]](#).

On August 2, 2020, a shipping container fell off the New Orleans Coast. It released tons of nurdles into the environment, reaching up to the shores of the Mississippi River [\[6\]](#).

Millions of these tiny pellets enter the environment, causing plastic pollution. And we know how negatively plastics impact the environment. The next section of the article explores places with severe plastic nurdle problems.

## Where are the most concentrated spots of nurdle spills?

Nurdle pollution is prevalent around oceans and beaches. Since the first discovery of nurdle pellets in the 1970s, environmentalists have organized nurdle hunts worldwide, rescuing the environment from microplastics [\[7\]](#).

The Great Global Nurdle Hunt of 2019 showed that 28 out of 32 countries across all continents have nurdle pollution. It was the first global nurdle hunt of its kind, organized by the environmental charity known as [Fidra](#). 352 hunts took place in 34 countries, and they discovered that 84% of the beaches had plastic pellet pollution [\[8\]](#).

These places include the Gulf of Mexico, Abu Dhabi, Ecuador to South Africa, the Galapagos Islands, and the Ferrycraigs beach in Scotland. On each beach visited by over 1200 people, they found nothing less than 100 pellets [\[8\]](#).

12.5% of the beaches visited had over a thousand pellets. On Tortuga Bay, they found over 9000 pellets. On the FerryCraigs beach in Scotland, they found 330,000 nurdles. They found 11,557 nurdle beads in Hong Kong in under 2 hours [\[4\]](#).

Nurdle pollution is also prevalent in the United Kingdom. The environmental charity, Fidra, organized a nurdle hunt on 85 beaches along the British coast. They found nurdles in 93% of the locations checked. They found nurdles in Aberdeenshire, Barra, Grangemouth, and North Queensferry. Fidra volunteers discovered a shocking amount of nurdle microplastics on North Queensferry. They gathered 450,000 nurdle beads within two hours [\[9\]](#).

The most recent Global Nurdle Hunt occurred from September 20th to 17th October in 23 countries. 1,365 volunteers found nurdles in all countries except Indonesia. However, they found nurdles in Japan, Oman, and South Korea for the first time [\[10\]](#).

They also found nurdles in less than 1000 nurdles in Bangladesh, 11 in Malaysia, and 2,496 in Kimmeridge Bay, England. Nurdles are part of the plastic pollution in Canada, South Africa, the Netherlands, and Australia [\[10\]](#).

In Australia, there are six hotspots for nurdle pollution. During the 2022 Aussie Nurdle Hunt, volunteers found over 4,500 nurdles on Aspendale Beach, Victoria, and over 2600 nurdles in Swan River and Jenalup Beach. They also found 966 nurdles in Semaphore Beach and 162 in Frenchman's Bay La Perouse, New South Wales, and Cocos Keeling Islands, along the Indian Ocean [\[11\]](#).

## Environmental impact of plastic products used for the production of plastic products

The plastics industry uses nurdles as building blocks to create everyday objects and materials. However, they lead to plastic pollution, causing lots of damage to the natural environment.

Below, we explore the impact of pellet pollution on biodiversity and human health. First, let's examine the toxic substances used in plastic pellet production.

### Toxic chemicals found in nurdles that affect the environment

Manufacturers use plastic polymers, monomers, and additives to create the nurdles for plastic products. These chemicals protect the plastic object from UV radiation and also give it specific properties and colors.

The plastics industry uses over 10,000 chemicals in the production process of plastics, with over 2400 chemicals being potentially toxic. Many of these chemicals and additives leach into the environment, causing harm to several living organisms [\[12\]](#).

Some of these chemicals are:

## Benzotriazole Ultraviolet Stabilizers (BUVs)

Benzotriazole Ultraviolet Stabilizers (BUVs) are a group of light stabilizers commonly used to protect plastics from ultraviolet rays. This additive regularly leaches into the environment. It is also hydrophobic, accumulating in river and marine sediments and wastewater.

Since BUVs leach into the environment, nurdles can also absorb more BUVs than the quantity they already may contain. The various BUVs found in plastic are :

- UV-P
- UV-PS
- UV-9
- UV-
- UV-327
- UV-328
- UV-329
- UV-350

In a study conducted by IPEN, they discovered that many BUVs are persistent, bioaccumulating, and toxic. Only UV-328 is under assessment for persistent organic pollutants in the environment [\[12\]](#).

## Poly chlorinated Biphenyls

PCBs are hazardous substances that plastics absorb in the environment. Manufacturers do not add them during production. Polychlorinated Biphenyls are chemicals used in various applications like transformers, paint, paper, lubricating oil, plastics, etc.

PCBs contain 209 chemical substances related to each other by structure, origin, or function. Japan was the first country to ban these chemicals in 1972 after realizing their high environmental toxicity. However, they still exist in the environment despite the ban in several industrialized countries [\[12\]](#).

These chemicals unintentionally enter the environment through paint production and leakage from electrical transformers and contaminated sites. Also, it enters the environment through the disposal and recycling of e-waste.

A study on nurdles from 31 countries showed various levels of PCBs and BUVs. They found the highest concentrations of BUVs in nurdles from Morocco, Jamaica, Tanzania, Senegal, and Congo. They found the highest concentrations of PCBs in nurdle samples from Senegal and Tunisia, followed by Tanzania, Congo, and Morocco [\[12\]](#).

## Environmental impact on marine animals

Nurdles mostly end up in marine habitats, putting marine wildlife in danger. Almost every marine animal has contact with these microplastics in their habitats, from seabirds to sea turtles to whales and seals.

About 8 trillion nurdles enter the oceans annually [\[13\]](#). Nurdles enter the marine food chain, and marine animals eat them, often mistaken for fish eggs. Marine life often mistakes them for food because of their sizes and bright colors. In Sri Lanka, a dead fish with a mouth full of nurdles washed up on a beach near Wellawatte [\[14\]](#).

In 2019, researchers conducted multiple autopsies on a dead Manx shearwater, showing that it consumed nurdle beads with its regular diet. Another marine wildlife that is a victim of plastic pollution in the ocean is northern fulmars. 93% of northern fulmars contain at least two nurdles.

When these animals consume nurdles, they aren't only consuming plastic. They are also consuming toxic chemicals and persistent organic pollutants. First, consuming plastic tricks animals into thinking they are full and satisfied. They can't eat the proper food, leading to starvation.

Second, all the toxic pollutants absorbed by the nurdles transfer into the animal's body that ingests it. It damages the health of animals, leading to premature deaths.

A study conducted on the European Seabass showed microplastics alter some parts of its intestines within three months of consumption. The disruption happened quicker if the nurdle ingested absorbed hormone-disrupting chemicals like DDT and PCBs [\[15\]](#).

Further studies show that the Benzotriazole Ultraviolet Stabilizers present in nurdles can activate the aryl hydrocarbon pathway in zebrafish. The aryl hydrocarbon pathway triggers hormonal imbalance, metabolic imbalance, carcinogenic activities, and developmental effects [\[12\]](#).

They have found these BUVs in liver samples from arctic seals, preen glands in seabirds, blood plasma of bottlenose dolphins, and other fish species [\[12\]](#).

Nurdle waste also has an indirect effect on the marine ecosystem. They can change the temperature and permeability of the beach sand, affecting animals like sea turtles, who incubate their eggs on shores.

Furthermore, nurdles can also become habitats for invasive species, leading to ecological instability as the nurdles transport non-native species to habitats where they might become invasive [\[16\]](#).

## Environmental Impact on human health

Apart from impacting the natural environment and marine life, nurdle pollution also affects our health. Because of the high demand for single-use plastics and other plastics, we are battling with frighteningly increasing microplastic pollution around us. These microplastics interact with our food chain and water sources. They are, presently, unavoidable.

Fish and other seafood consume nurdles, which can enter our food chains, and we are also at risk of consuming it. This is because fish and other marine life are a staple in our daily

lives. We may likely end up eating fish with a couple of nurdles in them without knowing. Thus, transferring it into our system.

Research shows that there are plastics in the human bloodstream, and they can travel into human organs. Scientists discovered small particles of polystyrene beads in the human placenta [\[17\]](#).

Our unknowing consumption of plastics that can subsequently enter human organs poses a tremendous risk to human health. Various research and studies show microplastic exposure leads to disturbances in the gut microbiota and critical intestinal functions. It reduces lipid digestion in the vitro gastrointestinal system. It also hampers nutrient assimilation [\[18\]](#).

The consumption of microplastics can also lead to local inflammation in tissues and human organs [\[19\]](#).

Another study shows that plastic can affect human micrological cells. The microglia cells are essential for coordinating the immune system's resources against neuro-inflammation associated with diseases [\[20\]](#).

Exposure to toxic chemicals from nurdles and other plastics can also lead to microglial apoptosis in human brains. This means that plastics in the human body can induce an immune system response in our bodies by producing cytokine and chemokine, two proteins associated with inflammatory diseases.

Also, plastic in the human body increases the risk of cancer. BUVs trigger hormonal and metabolic imbalances, carcinogenic activity, and developmental effects [\[12\]](#).

However, it's also worth noting that the long-term impacts of plastics in our diets due to nurdles and microplastic pollution are largely unknown. Because this is a relatively new phenomenon, additional studies over time are required to truly understand their longer-term impact on human health.

## Impact of Nurdles on the Climate

The production of nurdles requires lots of fossil fuels. Manufacturers continuously increase the number of nurdles they produce because of the growing demand for plastic production. To make this happen, they burn more fossil fuels.

Burning fossil fuels releases greenhouse gas emissions into the atmosphere—these greenhouse gasses (like methane and carbon dioxide) damage the ozone layer and increase global warming, causing climate change. Climate change causes catastrophic damage to the environment.

Apart from the emissions generated from the production of nurdles, there are also greenhouse gas emissions produced from pellet losses in the environment. The exposed nurdles in the natural environment react to solar radiation in the air and water, releasing methane and ethylene, further compounding the climate change problems associated with plastic production [\[21\]](#).

Also, it hinders the ability of living organisms to produce, capture, and keep oxygen. For instance, planktons are a major living thing that produces oxygen. However, plastic waste in the ocean affects their ability to produce and capture oxygen, turning a climate-positive role into a negative one[\[22\]](#).

## Efforts to Prevent Tiny Plastic Pellets from Entering the Environment

One of the fundamental problems is the need for more legal action against pellet pollution. State and Federal agencies aren't classifying nurdles as dangerous to the environment. They consider other pollutants like oil spills more dangerous, even though both damages the environment terribly. Non-governmental organizations and the International Maritime Organisation can only do so much to prevent nurdle spills.

NGOs can organize beach cleanups, lobby, and educate the masses on actions to take when encountering nurdles in the environment. However, some international maritime organizations are actively fighting for regulations to be implemented to prevent pellet losses and reduce their production rates.

### Operation Clean Sweep

US-based trade associations known as The Society of Plastics Industry (now known as PLASTICS) and the American Chemistry Council created Operation Clean Sweep in the 1990s. It is an environmental volunteer scheme that educates companies on ways to prevent pellet loss.

However, environmental justice is unachievable with this initiative because the companies within the plastic supply chain are refusing to take action. A few companies signed up under this initiative, yet not all adhere to the guidelines preventing plastic nurdles pollution [\[23\]](#).

### MARPOL

MARPOL is the International Convention for the Prevention of Pollution from Ships. It is the primary global regulatory body overseeing marine environment pollution by ships. The convention covers oil pollution prevention and regulates 250 other toxic substances that pollute marine habitats. It has regulations in place that prevent the disposal of plastic waste from entering the oceans.

Over one hundred states signed the convention, but not all of them adhere to or implement the rules and regulations that will prevent ocean pollution. This lack of cooperation from member states makes the convention obsolete [\[2\]](#).

## Conclusion

State and Federal agencies must classify nurdles as hazardous to the environment's well-being. These little plastic pellets are as dangerous as other forms of pollution because



manufacturers burn many fossil fuels to produce tons of nurdles. Apart from the damage incurred from making nurdles, they damage marine wildlife.

We should put strict legislation in place to ensure that manufacturing companies use filtration systems in their storm drains to prevent nurdles from entering our water sources. Also, the packaging used for nurdles needs to be stronger to avoid easy damage.

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