8.3 billion tons—that is how much plastic has been produced worldwide since 1950, half of it in the last 13 years alone. But of all this plastic, only about 30% is still in use, while the rest has been disposed of. For although 99% of plastics are produced from the valuable and non-renewable resources of oil, natural gas and coal, plastic has become a cheap disposable product. **95% of plastic packaging is used only once**, after only one month half of the plastic has become waste. Of the approximately 6.3 billion tons of plastic discarded so far, only 9% has been recycled (mostly downcycling to lower quality products), and 12% has been incinerated, but 79% has ended up in landfills or in the environment.

## The sea—a rubbish dump

Whether from landfill or through littering, most of the global plastic waste ends up in the sea, most of it through rivers: **10 million tons of plastic waste must be swal-lowed by the oceans every year. It's like tipping a truck-load of plastic into the ocean every minute**. Scientists assume that in 2050 there will be more plastic than fish in the sea if the constant littering of the waters is not brought to an end.

For sea creatures, our waste becomes a trap: whales, albatrosses and sea turtles mistake the plastic parts for food and die an agonizing death. Fishing lines or nets strangle seals, dolphins and sea birds. At least 2,249 marine species are endangered by plastic waste worldwide. And in the ocean, some of the plastic's properties, such as its longevity and high water resistance, become an additional problem. While a newspaper decomposes in the water after six weeks, an apple housing after two months and a cotton shirt after two to five months, plastic lasts much longer:

<ul> <li>Plastic bag</li> </ul>	10-20 years
<ul> <li>Styrofoam cup</li> </ul>	50 years
<ul> <li>Plastic drinking straw</li> </ul>	200 years
Plastic bottle	450 years
<ul> <li>Fishing line</li> </ul>	600 years

In this case, however, degradation does not mean that the plastic has been returned to the biological cycle, it has only changed its shape. While in the sea, plastics disintegrate through UV light, salt water and other environmental influences into tiny parts, into microplastics (smaller than 5 millimetres) and further into nanoplastics, which can even penetrate into tissue and blood vessels. A large proportion of the plastic is transported by ocean currents to one of the five large marine vortexes. The plastic concentration is highest in these "trash vortexes". However, the plastic waste we see on the sea surface is only the tip of the iceberg. The plastic fragments floating in the



water form a veritable "plastic soup". But most of the plastic sinks to the ocean floor, which is why the plastic concentration there can be a thousand times higher than on the surface.

## Microplastics in cosmetics and clothing...

But microplastics also get into the oceans through household wastewater. There are still cosmetic products such as peelings, shower gels, sun creams or toothpastes that contain micro-sized plastic pellets. Particularly high quantities of plastic particles come from our clothes. More than 60% of the clothing produced worldwide consists of synthetic fibres such as polyester, acryl, nylon or polyamide, in other words plastic. For every 5 kg of synthetic textile washing, 6 million microfibres are washed into the water, and a single fleece jacket loses 250,000 fibres per wash. This microplastic is so tiny that it is neither filtered out of the water by washing machines nor by sewage treatment plants. In addition, several hundred thousand tons of plastic are splashed onto the fields every year by the spreading of sewage sludge. Approximately one third of the annual volume of plastic produced worldwide ends up in inland waters and in the ground. Depending on the surroundings, the degree of pollution there is between 4 and 23 times higher than in the sea. Together with the abrasion of car tyres, synthetic fibre textiles make up the largest group of microplastics that end up directly in the environment. It also happens time and time again that containers filled with so-called "nurdles"—pellets the size of a lentil and required for plastic production-go overboard from transport ships in stormy weather, emptying millions of plastic parts into the oceans all at once.

# ...in the rain, in drinking water and in the human body

Microplastics and nanoplastics are so small that not only the water, but also the wind carries them around the globe and they are found even in the water vapour of the clouds. **Microplastics are everywhere**, which means that they can be found in drinking water (both tap water and bottled water), salt, honey, fish and shellfish, as well as in rainwater, in the Arctic ice and even in human excrements.

### The fact is, we breathe and we eat plastic, about 5 g per week, which is roughly the equivalent of a credit card.

# Sick by toxic plastic

Pollutants originate virtually throughout the entire life cycle of plastics, from the extraction of raw materials to transport, production, consumption and disposal. Almost every plastic is toxic. Polyvinyl chloride (PVC) and polyurethane (PU) consist of toxic substances and a high proportion of highly toxic chlorine. Equally problematic are the hardeners or plasticizers, flame retardants or stabilizers contained in the plastic. Hormonally active substances, such as bisphenol A (BPA) in polycarbonate (PC), are particularly problematic. Possible health consequences of everyday contact with such plastics include asthma, obesity, hyperactivity/ ADHD, low IQ, embryonic developmental disorders and low birth weight in babies, premature onset of puberty in children, thyroid disease, diabetes, infertility, low sperm count and prostate cancer in men and breast cancer in women.

Not only do plastic parts in the ocean release toxins, they also attract other pollutants like a magnet, such as the insecticide DDT or the carcinogenic environmental toxin PCB (polychlorinated biphenyls). On the surface of the plastic particles, the concentration of toxins can therefore be up to a million times higher than in the surrounding water. When marine organisms absorb the plastic particles through their breathing or eating, the toxins also get into their bodies. Of course, the concentration of toxins and microplastics increases along the food chain—and ultimately they end up in the human body.

# It is imperative to take responsibility

Unless we change something quickly, by 2050 we will have created 12 billion tons of plastic waste and 52.5 gigatons of CO<sub>2</sub> from plastic production. According to projections, by 2025 we will be producing around 600 million tons of plastic a year, producing a volume of waste that our current recycling systems can no longer handle. Bio-plastics are no alternative. Typically, plants such as corn, sugar cane or potatoes required for their production are grown under highly industrialised conditions using pesticides and genetic engineering. To date, there are no bio-plastics that are degradable quickly enough in water or soil and do not hinder the composting process. In industrial plants, the bio-plastic would have to rot at 60 degrees Celsius for twelve weeks. In practice, only four weeks are usually available for this process, because otherwise the installations would not be profitable. Therefore, most bio-plastics are simply incinerated.

## "The greatest threat to our planet is the belief that someone else will save it."

Robert Swan (Polar explorer and environmentalist)

Although plastic has become a threat to humans, animals and the environment, plastic manufacturers want to increase production even further in the coming decades. Through aggressive lobbying, the industry is steering the discussion away from production towards waste management and recycling to avoid their own responsibility. Although there are now many agreements and initiatives to curb the plastic flood, they are not coordinated and all focus on disposal. The packaging industry and companies such as Coca-Cola, PepsiCo, Nestlé, Danone and Mondelez—the world's five largest plastic polluters are not being held responsible.

If we want to master plastic pollution, we must above all produce and use less plastic and develop, produce, consume and reuse products, packaging and materials in a way which will not be harmful to the Earth and her creatures.

## I want to start taking action! What can I do?

- Do not buy any personal care products (shower gel, toothpaste, etc.) that contain microplastics. Best is to use natural cosmetics, or make your own care products so you know exactly what is in them!
- Avoid packaging wherever you can. Buy your food at the market or directly from the farmer, or have your own garden. More and more cities have shops where you can buy your products without packaging.
- Wear clothing made of natural fabrics such as cotton, wool, silk, hemp or linen. To wash microfibre cleaning cloths or sportswear, use a special washing net to catch the microfibres.
- Try to reduce waste to a minimum. Buy high quality long-lasting recyclable products and have them repaired whenever possible instead of throwing them out right away.
- Do not use disposable dishes. If you are on the move, there is now a huge selection of reusable tableware, drinking bottles or cups made of stainless steel, bamboo or glass.
- When shopping, take your own reusable bags and fruit/vegetable nets with you.
- Get actively involved, take part in clean-up activities in your area.
- Write to policy makers and especially to manufacturers and retailers, telling them that you desire products without plastic packaging.

We are always happy to answer your questions!

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# Plastic It Is Time to Clean Up!

