

## Plastic Society

A life without plastic? Difficult to imagine: Where we look, whatever we do, whether we play, work, eat or undergo medical treatment – plastic is our always present, practical companion. As material, plastic offers convincing advantages: It is easy to shape and dye, can be soft and hard, is low density and is therefore light and is resistant to acid and caustics. Also it is comparably cheap. It is, however, these seemingly pleasant qualities that are causing a global problem. A problem of an extent far beyond our imagination.

*Because plastic is so cheap, it is often treated as a disposable item*

### 1<sup>st</sup> Problem: Quantity

322 million tons – so much plastic is produced worldwide annually. This corresponds to the weight of the entire world's population in the year 2012 or of almost 2 million blue whales. Worldwide plastic production has increased 20 times from 1964 to 2014 and according to estimates by the Ellen MacArthur Foundation could rise three and a half times up to 1.12 billion tons per year. Wouldn't it be appropriate to reconsider our consumption and stop the plastic flood?

### 2<sup>nd</sup> Problem:

#### Waste Disposal – Oceans as Garbage Dump

Many plastic products are made to throw away. **95 per cent of our packaging material is used only once**—valuable resources are wasted and the economy annually loses around \$100 billion dollars this way. In the EU only 30 percent is recycled, in the USA only 9.5 per cent. What happens to the rest? It is burned or disposed of in landfills where it eventually ends in the seas. Annually, our oceans have to swallow around 19 million tons of plastic.

Expressed in an equivalent of 40-ton road trains, **this means that a lorry convoy of 475,000 vehicles annually disappears into the seas.** The convoy

would be nearly 6000km long – even further than the distance from the East to the West coast of America!



This fictitious convoy can be replaced: 80 per cent of the global plastic garbage ends up in the oceans via waterways. The rest is dumped directly out at sea. **The annual littering of our oceans is so immense that scientists in 2016 estimate that in the year 2050 there will be more plastic in the seas than fish.** For marine creatures, our garbage is turning into a trap: whales, albatrosses and marine turtles suffer a painful death with over-full stomachs filled with plastic junk, fishing lines and nets. Not to mention the plastic rings in diverse sizes that strangle sea lions, dolphins and marine birds.

**The slow decomposition of plastic is also problematic, as only the daily rising amount of plastic produced.** What it is appreciated by man, is now becoming fatal. Plastic's high resistance to water results in long decomposition times in the seas:

- Fishing rod: 600 years
- Plastic bottle: 450 years
- Disposable nappy: 450 years
- Polystyrene cups: 50 years
- Plastic bag 10-20 years



**Here decomposition does not mean a return into the biological cycle.** After 450 years a plastic bottle is not visible in its original shape, but nevertheless the plastic is still present, in the form of very tiny particles, so-called nanoplastic.

A greater amount of the plastic is moved to one of the five great gyres in the ocean. Here the bigger pieces and as especially the microplastics that are dissolved in the water collect. During its stay at sea plastic is turned into smaller particles, microplastic and then to nanoplastic by UV-light, salt water and additional environmental influences, thus losing its ability to float and therefore starts to sink. The particles in the "Garbage patches" are not only at the surface but also form a mighty, light-absorbing plastic soup. Microplastic and also larger pieces are absorbed by sea creatures and sink with them, after their death to the sea floor. It is quite likely that there are huge amounts of a kind of toxic, viscous "plastic mud" at the seabed.

### 3<sup>rd</sup> Problem: Chemicals

Nearly every kind of plastic is toxic. Polyvinylchloride (PVC) and polyurethane (PU) consist of toxic substances and a high portion of highly toxic chlorine. Hardening or softening agents, flame retardants or stabilizers are not only critical during their production but also in their usage. Due to use, abrasion or exposure to heat the toxic substances separate from the plastic and then leach into in our bodies and the environment. The hardening agent bisphenol A (BPA) in polycarbonate (PC), is for example, a hormonally active substance functioning in the human body as a synthetic oestrogen with a feminizing effect. Such substances disrupting the hormone system are associated with premature puberty in girls, obesity in adults and youths, type 2 diabetes, an increase of prostate and breast cancer, lower sperm count, and malformation of sexual organs in men and the new-born. BPA is contained in drinking bottles, dummies, microwave dishes and the interior coating of beverage and food cans.

*Plastic parts in the ocean not only release toxins but also function as a magnet to other toxins. On the surface of the plastic part the concentration of toxins can be a million times higher than in the surrounding sea.*

Investigations have shown that the extremely toxic compounds accumulate in microplastic like the insecticide DDT and carcinogenic PCBs. Fish and birds confuse the micro-organism plastic parts with food. The sea creatures not only absorb the micro- and nano particles as what they think is nutrition, but also through breathing it in. In oysters, after just one month, you can find 70,000 times increased pollutant concentration. Of course, the concentration of toxins and microplastic is rising up the food chain. The concentration of the environmental toxin PCB (polychlorinated biphenyls), for example, is 80 million times as higher in marine mammals with 160 mg per kilogram of fat as in seawater at 0.000002 mg/L. The toxins can cause inflammation, nerve damage and reduced fertility.

#### 4<sup>th</sup> Problem: Micro- and Nanoplastic

Micro- (0,1µm-5mm) and nanoplastic (0,001-0,1µm) are problems recognized only in recent years. It is not only through plastic turning into smaller particles, but also ready made plastic particles that through domestic wastewater get into the seas. **Cosmetic products such as exfoliants and tooth paste contain microscopic plastic microbeads. Synthetic fibres, for example in fleece tops; with every single wash, a fleece top loses 2.000 tiny fibres – microplastic that ends up in the waters.** These textiles, accompanied by the rubber from car tyres, are the biggest group of primary micro plastics that directly enter into the environment. So-called nurdles, lentil-size plastic pellets, needed for plastic production also end up in the seas through accidents, losses on land and sea and inappropriate industrial handling. Especially after storms they are washed ashore in huge quantities – as happened in Hong Kong Bay during the typhoon season in the summer of 2012.

*Tiny plastic particles make up between 15 and 31 per cent of the entire plastic garbage landing in the ocean every year.*

#### I want to become active! What can I do?

In order for our vision of the oceans to become reality and coasts to be free from marine debris and intact, it takes us all:

- Remember that land and sea wherever you live, are always connected with one another.
- Get informed and educate yourself. Share what you know with others.
- Invite people to come to information booths, movie nights or discussion groups, help to bring forth a change in values and consciousness.
- Work together with like-minded people. Participate in local clean-up days where you live.
- Support people in politics, science and industry who take responsibility for the protection of nature and the oceans and want to explore new ways by developing materials based on nature, where each element serves the next. In accordance with the Cradle to Cradle-principle, pollutant-free material

can, after its disposal, serve another part of life, or respectively without loss of value and waste again be reused for the production of new material.

- Reduce the amount of rubbish you produce.
- Reduce disposable products. Whenever possible, reuse things again. Use durable items, that are re-usable, repairable and refillable.
- Buy consciously. Prefer natural fabrics and ingredients, especially with textiles, detergents and cosmetic products.
- Recycle as often as possible. Bottles, tins, mobile phones, ink cartridges and many more things are recyclable.
- Start a sewing studio together with friends and create cloth bags. Distribute them among interested people in front of your shopping mall and explain to them why you are doing this. As an example: sea turtles can have a stomach filled with pieces of plastic bags, because they confuse the plastic bags with their favourite food, jellyfish.
- Tell the people about the advantages of glass bottles (e.g. [www.friendsofglass.com](http://www.friendsofglass.com)) – and the dangers of PET-bottles which contain endocrine disrupters. See for example the study by University of Michigan, 2012, 10.1001/archpediatrics.2012.241
- Do you have any ideas of your own? Please get in touch with us and visit our events. We are looking forward to sharing ideas with you.

*We are always happy to answer more questions!*

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## Plastic LETHAL THREAT IN THE OCEAN

