

FRAUNHOFER UMSICHT TAKES POSITION TOPIC: PLASTIC BAGS



Fraunhofer UMSICHT takes position

Within the series of position papers »Fraunhofer UMSICHT takes position« we cover issues which currently attract the attention of society, science and economy. In addition to our research activities, we would like to take a position and make a contribution towards greater objectivity in emotional debates. At the same time we would like to show whether and how we can help to solve societal challenges.

Our statements are developed within the staff of Fraunhofer UMSICHT. Each position paper is the result of an opinion-forming process throughout the institute; in this case driven by the Working Group Microplastics which was supported by the Sustainability Group. In controversial issues, the staff of our institute often displays the diversity of opinions within the society. We openly present the variety of opinions in our position papers if we cannot come to one single position concerning the subject in question.

Please contact us:

For questions regarding
the position paper about plastic bags

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Picture credit: © Fraunhofer UMSICHT, This plastic bag was found during the campaign »Super-Sauber-Oberhausen« by our employees close to the institute and was disposed together with other collected litter.

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Position of Fraunhofer UMSICHT on the problem of microplastics

Background

What do lettuce from the weekly market, a pack of headache pills, a DVD, a teddy bear and jeans have in common? At first glance, you would think: nothing. But a second look reveals: often when you buy them, all these items are put in a disposable polymer bag, better known as »plastic bag«.

Statistically, 45 plastic bags per capita were used in Germany in 2016 [GVM-2017]. In a city like Oberhausen with 210 000 citizens this amounts to a total of almost 10 million bags per year. While some of the plastic bags are reused several times after their initial use, for example as a means of transport or as a garbage bag, most of them directly end up in the mixed waste bin or, as it should be, are fed into recycling via the »yellow bin«, the German lightweight packaging collecting system. Especially so called »hygiene bags« with a wall thickness of less than 15 µm (0.015 mm), often used for fruit and vegetables bought at markets and grocery stores, are just used once.

The amount of plastic litter in the oceans is still increasing – in total it is estimated to be 27-66,7 million tonnes [Eunomia-2016] – and more and more pictures of starved birds and beached whales with their stomachs full of plastics fragments and bags instead of food are going around the world [Spiegel-2017]. That is why plastics, especially in the form of plastic bags and packaging, are increasingly becoming a subject of harsh criticism. For many years, plastic bags have been one of the top 10 litter items found during beach clean-ups [OC-2016]. Several initiatives, like plastic-free shops [Utopia-2016] or plastic-free cities [Billerbeck-2015], aim at completely abandoning these products. In April 2016 the Federal Ministry for the Environment, Nature conservation, Construction and Nuclear Safety (BMUB) and the Trade Association of Germany (HDE) signed a voluntary agreement to reduce the use of plastic bags by half in the next ten years. Therein, the participating companies commit themselves to charge their customers a reasonable fee for plastic bags from 1 July 2016 at the latest. Exceptions are only made for very light carrier bags with a wall thickness below 15 µm (i. e. hygiene bags) and freezer and long-life carrier bags with a wall thickness of more than 50 µm. The latter types had already mostly been charged for anyway.

Many retailers have reacted and do not offer free bags anymore but charge a fee for plastic bags instead. Some even go a step further. The food retailer REWE, for example, has completely stopped the sale of plastic bags since 1 June 2016 and nowadays offers alternatives made from cotton, jute or paper as well as reusable bags from recycled materials or cardboard boxes [SZ-2016b]. In September 2016 the discounter Lidl also announced not to offer standard plastic bags any more starting in 2017 [Presseportal-2016]. Today, one can find long-life carrier bags, cotton and paper bags as eco-friendly alternatives in their stores [LIDL-2017].

But how should the subject be evaluated from a scientific perspective? Experts from Fraunhofer UMSICHT have compiled the following facts and assessments.

Position of Fraunhofer UMSICHT

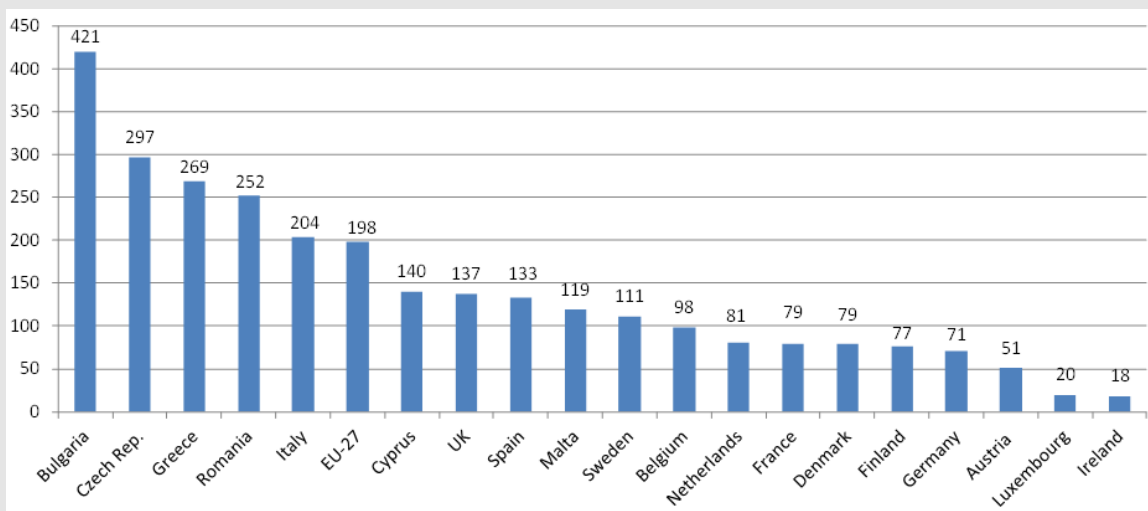
1. Similar to the criticized material polyvinyl chloride (PVC) the »plastic bag« has become a highly symbolic icon in environmental debates. It has been singled out from a variety of plastic products which have quite a similar relevance from an environmental perspective. Its importance regarding the quantitative environmental impact is frequently overrated and the complexity of the overall problem with polymers in the environment tends to be oversimplified. This makes an unbiased discussion based on facts difficult.
2. The mass fraction of plastic bags accounts for less than one percent of the total consumption of plastics. With 45 per capita and year the consumption of plastic bags in Germany is well below the EU average of 198 bags per capita and year. Nevertheless, there are countries such as Luxembourg and Ireland which show a significantly lower consumption [GVM-2017], [Zeit-2013].
3. Life cycle assessments (LCA) do not show specific advantages of paper and cotton bags over bags made from conventional plastics or bio-plastics. A multiple use of bags has positive effects on LCA results [EA-2011]. However, LCAs are quite limited in their informative value. For example, long term necessary paradigm shifts (from fossil to renewable sources), the technical level of development of materials or products (learning curve of efficiency) or the impact of litter – including microplastics – in the environment are not or not sufficiently considered yet.
4. The utilization of biodegradable materials as alternative sources for plastic bags needs further investigation. It is known that not all biodegradable plastics degrade as quickly in different environmental compartments (e.g. on and in the soil, in fresh and sea water) as it is proven in standard laboratory tests. However,, even a slower degradation – albeit lasting several years – would already improve the situation compared to the extremely long lasting standard plastics bags (mostly made out of the polyolefines PE or PP). Closer examinations of degradation mechanisms and kinetics in the environment as well as sociological studies dealing with the suspected rebound effect of increased littering of biodegradable bags into the environment are yet to be carried out.
5. Plastic bags made of polyethylene (PE) with catalytic additives which enhance oxidative fragmentation (so called »oxo-degradables«) are to be strictly rejected. They purposefully produce microplastics which can have severe consequences in the low trophic levels (plankton, bivalves, worms etc.) of the food chain (please see our position paper on microplastics for further information) [Feuilloley-2005], [Thomas-2012], [UMSICHT-2015].
6. Bio-based polymers are an important strategic route since a path change away from fossil raw materials to renewable sources will be unavoidable in the long term. Regardless of biodegradation this route should be followed in any case. Another long-term option could be the material use of carbon dioxide using regenerative energies for its extraction.
7. Multiple uses and improved end-of-life management are necessary for all types of shopping bags.
8. A general ban on plastic bags is rather to be rejected. Instead, strategies should be pursued promoting careful and responsible use. These include, for example, measures of environmental education, deposit systems or fees for plastic bags in shops. The latter has already been implemented successfully in Germany following the voluntary agreement of the Federal Ministry for the Environment and the Trade Association of Germany (HDE).

9. Furthermore, any means that facilitate plastic recycling, such as collecting systems, which facilitates an efficient separate collection, or an abandoning of multi-material systems, should be reasonably accompanied by political and regulatory measures.

These facts and recommendations form the basis for technical and social innovations which are developed by Fraunhofer UMSICHT.

Infobox plastic bag consumption – examples from around the world

The per capita consumption of plastic bags varies from country to country. In 2010 Bulgaria led the EU member states with 421 bags, followed by the Czech Republic (297), Greece (269), Romania (252) and Italy (204). Germany already was at the lower end of the range with 71 bags per capita in 2010. According to most recent figures, it has reduced its consumption further down to 45 bags per capita per year [GVM-2017]. Less plastic bags were only used in Luxemburg (20) and Ireland (18) – see the following figure. The low value for Ireland can be explained by a former introduction of a fee for plastic bags.



Number of plastic bags used per capita in 2010 in the EU [EC-2011]

Some non-European countries have already imposed complete bans. In Bangladesh plastic bags were first banned in the capital city of Dhaka in 2001 and subsequently prohibited throughout the country. The reason was that they were partly made responsible for blocking wastewater systems leading to floodings in 1988 and 1998. In Morocco, plastic bags have been banned completely since 1 July 2016. The country previously ranked second behind the USA with an annual consumption of 900 bags per capita and 26 billion in total.

Ultrathin plastic bags are prohibited in China, Kenya, Rwanda and South Africa. In the city of San Francisco plastic bags also got banned. Furthermore, in China plastic bags are charged for, as well as in Washington D. C. and Los Angeles. Some further countries also consider implementing laws because farm animals have increasingly started to feed on plastic bags and as a consequence have suffered from health problems.

Sources: [UBA-2013], [Doyle-2013], [SZ-2016a], [DLF-2016], [EPI-2014], [GVM-2017].

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