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## Position on Bioplastics

Publications of the German Environment Agency:

- BIOMASS CASCADES Increasing resource efficiency by cascading use of biomass – from theory to practice (2017)  
<https://www.umweltbundesamt.de/publikationen/biomass-ekaskaden-mehr-ressourceneffizienz-durch;>
- Study of the Environmental Impacts of Packagings Made of Biodegradable Plastics (2012)  
<https://www.umweltbundesamt.de/publikationen/study-of-environmental-impacts-of-packagings-made;>
- Biologisch abbaubare Kunststoffe (2009)  
[https://www.umweltbundesamt.de/publikationen/biologisch-abbaubare-kunststoffe.](https://www.umweltbundesamt.de/publikationen/biologisch-abbaubare-kunststoffe)

### Current situation

The current discussions evolving around bioplastics receive a lot of public attention due to the prefix „bio“, which seems to suggest an environmental advantage compared to conventional plastics. Apparently, a number of actors are attracted by the opportunities bioplastics seem to offer: the possibility to comply with environmentally responsible actions by a mere substitution of materials, to counteract increasing environmental pollution as well as the possibility to pursue new ways of recycling.

On the one hand, to many, this seems to be a promising alternative to existing concepts of prevention and orderly recycling of wastes. On the other hand, these discussions lead to confusion among consumers about the ecologically advantageous treatment of waste. In search for guidance and advice, some consumers turn to scientific agencies, while others hope to be able to legitimize the careless treatment of waste. The latter is an entirely counterproductive development for the efficient and effective treatment of waste. The references on bioplastics made in the roadmap of the EU Plastics Strategy and the accompanying debates have rekindled the debate around the use of so-called bioplastics.

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## Position of the German Environment Agency

The German Environment Agency assesses the possibilities of biomaterials critically and makes a clear distinction between bio-based and biodegradable materials.

### *Bio-based materials*

Bio-based plastics are polymers produced from renewable raw materials. These are starch- as well as cellulose- based raw materials (corn, sugar cane, sugar beet etc.), as well as raw materials based on oil seeds (rape, sunflower oil, palm oil, etc.). It should be noted that bio-based plastics, which are partly identical from a material perspective with plastics produced of fossil raw materials (so-called drop-ins), are not per se biologically degradable.

According to DIN-Certco, there is a certification according to CEN/TS 16137, ISO 16620 or EN 167851, which, however, have no legal relevance. This certification describes a bio-based share of at least 20%, 50% or 85%. Accordingly, not all bio-based materials are of renewable origin to 100%. Additional polymers, such as polyurethane, contain parts of renewable raw materials without being certified as biomaterial. The substance and the ecological validity of the label “biobased” should therefore be assessed as limited, as different renewable raw materials are not distinguished and no quantitative statement on the demand for raw materials can be made.

Concerning the assessment of the ecological advantageousness, the whole life cycle from production to disposal has to be taken into account with its various possible effects. This includes questions of the extraction of raw materials as well as concepts on recycling, recyclability and state-of-the-art recycling technology for the respective kinds of plastics. The environmental pros and cons of these plastics are of different nature and do not allow a final and general conclusion. This is all the more true as the current data base is limited.

It should be highlighted that a switch to renewable resources with raw materials to be used for recycling or energy recovery could lead to intensified agriculture – either for Europe, or outside Europe, should crops be cultivated there. The effects could be an increased use of fertilizers, pesticides, fuels for agricultural machineries, as well as competition for land with production of food crops. Moreover, intensified farming could lead to land changes, soil compaction and loss of biodiversity. The ecological effects of the demand for raw materials are therefore rather shifted, instead of mitigated.

In addition, the sustainability of bio-based plastics is dependent on the crop and the land used. On the one hand, undemanding plants and such

grown on land unsuitable for the production of food crops could be an alternative to fossil sources. On the other hand, materials on the basis of sugar cane, for example, would constitute a direct conflict of use with food crop production. Comparative life cycle assessments of selected bio-based and fossil plastics come to the conclusion that the production of plastics from fossil raw materials usually produces more CO<sub>2</sub>; however, renewable raw materials bear a high eutrophication potential. The few comparing studies the two models directly suggest that the ecological effects may shift, but no clear ecological advantageousness can be assessed.

### *Biodegradable materials*

One characteristic of biologically degradable plastics is that they can be degraded under specific environmental condition. On their way to complete degradation, they first disassemble in small particles. One consequence of this disintegration can be inputs of plastic particles into the environment and microplastic inputs into soil and waters. The further degradation of these particles can take up long time, depending on the environmental conditions (temperature, moisture, acidity, exposure to sunlight etc.). Overall, duration and intensity of these degradation processes strongly depend on the respective material.

Biodegradable plastics can lead to problems in the recycling process. It should be noted that existing recycling facilities are not aimed at high-quality recycling of biologically degradable plastics. This lack could be solved via additional investments in sorting technologies. However, it has been noticed that a number of biologically degradable plastics do not sustain the established washing procedures and transform to a gooey material, which negatively influences the recycling of recyclable plastics. In addition, biologically degradable plastics are often per se only recyclable to a limited extend.

Disposing biologically recyclable plastics via bio waste collection is not reasonable from an environmental perspective and does not constitute high-quality recycling. The material characteristics of plastics are not used in bio waste utilization and the degraded material does not have any positive effects on the compost derived. In addition, the danger to mistake biodegradable plastics with conventional plastics exist on the consumer side.

In general, the German Environment Agency perceives concepts promoting biologically degradable plastics critically. Exceptions are niche applications such as mulch foils, which remain on land used for agriculture, or applications in the medical sector. The German Environment Agency especially advises against concepts which foresee a disposal of biodegradable plastics into the environment in competition with ordered collection, capture and recycling of waste. The problem of littering cannot be solved

through biodegradable plastics. To the contrary, the characteristics of biodegradability can be misunderstood by the consumer and encourage littering, which would lead to increased environmental pollution through waste.