Joint position paper

Bioplastics in a Circular Economy: The need to focus on waste reduction and prevention to avoid false solutions

In recent years, there has been an increasing trend towards replacing conventional fossil-based plastics with bioplastics i.e. plastics derived partly or fully from biomass or that are biodegradable. The bioplastics industry uses their green-sounding credentials to position themselves as helping to speed the reduction in fossil fuel use and solving the ever-growing plastic pollution and marine litter issues. However, there is clear evidence that bioplastics do not solve many of these problems and in fact may create new ones.

Bioplastics, due to their often complex design, create difficulties in collection and recycling processes - therefore, as with conventional plastics, they are likely to end up in landfills or incinerators or risk polluting the marine environment. On top of this, false assumptions on biodegradability may increase littering, contaminate recycling streams and increase biowaste management costs. Rapid growth in projected production capacity will also create increased pressure on land areas, particularly outside of Europe, triggering environmental and social impacts.

The political debate around rapidly replacing conventional plastics with bioplastics hides the real issue: the pressing need to reduce all plastic use and in particular excessive, unnecessary and single-use plastics. Our overconsuming, throwaway culture is tied to a linear buy-use-dispose economy, and will not be solved by relying on technological solutions. Instead, we need behavioural and production change and for government priorities to be on prevention and reuse. Indeed, bioplastics could potentially have a positive role to play in the transition to a true circular economy, but only if their development is based on consuming within the limits of the planet, ethical and local sourcing, resource efficiency, waste prevention, reuse and recycling.

The EU must ensure that all potential policies and initiatives relevant to plastics and bioplastics, particularly the EU Packaging and Packaging Waste Directive, the EU Strategy on Plastics and the review of the EU Bioeconomy Strategy promote true solutions that move us up the waste hierarchy, rather than down. Consumers must also be presented with unambiguous messages on the limits of bioplastics' biodegradability and recyclability, and sound incorporation into collection systems must be ensured.

What are bioplastics?

A single concrete definition of bioplastics currently does not exist. The term 'bioplastics' is often loosely used to refer to plastics that are bio-based, biodegradable, or both[1].

Bio-based plastics are plastics based partly or fully on biomass resources such as sugar, starch or lignocellulosic biomass. They can be designed to be recyclable or biodegradable with the right infrastructure in place, but are not necessarily so.

Biodegradable plastics are plastics that can, with the help of micro-organisms, break down into natural elements (e.g. water, carbon dioxide, biomass). They can be based on biomass resources and/or conventional petroleum sources and are typically compostable only under controlled conditions. No finished product has yet been approved as marine biodegradable and the generic European standard on composting of packaging (EN 13432), only guarantees the biodegradation of packaging under managed, industrial conditions.

Prioritising the reduction of plastic consumption

The production of plastics has increased 20-fold in the past half-century, surging from 15 million tonnes in 1964 to 322 million tonnes in 2015 and is expected to double in the next 20 years[2]. The necessity to move away from fossil fuels and reduce greenhouse gas emissions has led governments and industry to look for other sources of feedstock for plastics, beyond petroleum. Within the next three years, global production capacity of bioplastics is expected to more than triple, reaching a level of 7.85 million tonnes in 2019[3].

However, will simply replacing one feedstock with another solve the problems we are facing with plastic pollution and overconsumption of plastics? Industry representatives estimate that 70% of conventional plastics are landfilled or incinerated and just 30% recycled[4]. This low recycling rate is not likely to improve greatly given technical limitations and the prevalence of low quality single-use plastics. Yet substituting with bioplastics is also not likely to reduce the quantity landfilled and incinerated as shown in the sections below, and indeed they may bring in further complications to the recycling process.

Substitution also risks obscuring real solutions - primarily the reduction in overall use of plastics. This is key and would require a paradigm shift in the way we consume and produce with action from government, industry and citizens.

Limited availability of biomass feedstock

It is predicted that as a result of the rise in global production capacity of bio-based plastics, around 1.4 million hectares of land for feedstock will be required by 2019, more than the size of Belgium, the Netherlands and Denmark combined[5]. Only 5% of global production is expected to take place in Europe, with 81% taking place in Asia[6], where related production impacts include land degradation and a loss of natural habitats, reduced water quality, increased levels of pollution and land conflicts[7]. Thus, the accelerating European market demand for bioplastics will continue to contribute to these negative externalities.

To reduce the area of virgin land used to produce bio-based plastics, the use of waste feedstock is being promoted by some stakeholders. This is of concern, as it exerts pressure on residual waste streams, thus incentivising and creating markets around them, when in fact waste needs to be reduced in the first place- abiding by the EU waste hierarchy. Relying on a steady stream of residual, and avoidable, waste to maintain the business case for bio-based plastics is a potential threat to waste prevention.

End-of-life challenges

Bio-based and biodegradable plastics may cause distortion to established collection and recycling processes. Bioplastics are not all designed to be recyclable in the same way as conventional plastics, but often still enter the current technical plastic recycling process. Concern about this has been expressed by the plastic converters industry[8]. The difficulty and expense that comes with sorting between recyclable and non-recyclable plastics, bio-based and petroleum-based plastics, and mixed-source plastics brings challenges that can impact on collection and recycled material quality, worsening the already low level of plastics recycling.

Furthermore, in landfills, bioplastics often degrade without oxygen, releasing methane, a greenhouse gas 23 times more polluting than carbon dioxide, or are at risk of being blown away, contributing to land and marine litter pollution. In incinerators, the combustion of bioplastics results in greenhouse gas emissions (fossil and/or biogenic). Current official carbon accounting methods may not reflect the true climate impact of incinerator emissions but research shows that they have a significant impact on global warming[9].

Indeed, biodegradable plastics can be industrially composted, but with the absence of widespread biowaste separate collection and industrial composting facilities in Europe, they are most often sent to landfills or incinerators. An important note on scaling up these facilities is that increasing the quantity of biodegradable plastics entering the biowaste separate collection stream would increase its collection costs. This is because the difference in density between general biowaste and biodegradable plastics would require expensive adjustments in waste collection.

Finally, due to the slow degradation process of biodegradable plastics in landfills or littered in the environment, toxic residues can be potentially released directly into soils, freshwater or the marine environment. Once there, these residues can easily enter the food chain and have adverse consequences on terrestrial and marine life and habitats.

Designing for biodegradability not a solution

At the global level, it is estimated that 15-51 trillion plastic particles are floating on the surface of oceans. In a business-as-usual scenario, recent research estimates that the ocean will contain 1 tonne of plastic for every 3 tonnes of fish by 2025 and by 2050 more plastic than fish (by weight)[10]. The marine litter issue is gaining increasing public and political attention. In parallel, bioplastics, in particular biodegradable plastics, are often marketed as sustainable alternatives with the potential of reducing the amount of litter that ends up in the environment, and particularly in our seas.

It is clear that biodegradable bioplastics are no solution to land or marine litter. International, American and European standards exist to determine the biodegradability of plastic materials under managed end-of-life conditions (e.g. industrial composting or anaerobic digestion) and in different types of environment (e.g. soil, freshwater and marine environment)[11]. Only the generic European standard EN 13432 on composting of packaging is referred to in EU law (i.e. as harmonised technical specification)[12]. The use of all other voluntary standards cannot be adequately monitored nor enforced, which means standards can be easily misused, if used at all. Standard specifications for compostable packaging oblige that they degrade in industrial environment and under specific, controlled conditions[13]. Under different conditions, such as the marine environment, full and rapid biodegradability cannot be guaranteed[14].

Consumer confusion over bioplastics' green claims

The labelling and marketing of bioplastics as "eco", "green" or "bio" sends out a misleading message to consumers, who are likely to perceive them as more environmentally friendly and harm-free than conventional plastics. According to recent research carried out in Germany[15], 57% of people have never heard of bioplastics. Of the 7% who claim to "know exactly what they are", 39% are convinced that the raw materials as bioplastics' resource basis are organically cultivated and 70% believe all bioplastics are biodegradable. Further studies show that people are more likely to discard bioplastics in the belief that they will biodegrade readily, which could lead to an increase in littering[16].

On the issue of carbon-neutrality, currently all bio-based plastics rely to a variable extent on fossil fuels through the application of fertilizers and pesticides, and the fuel used in farming, processing, transport and distribution. Indirect land use change to grow biomass for such non-food consumption can lead to significant carbon emissions, as seen from the biofuels debate[17]. Emissions of greenhouse gases also occur at the end-of-life phase if bio-based plastics are incinerated or landfilled, as most of them are today. Even when composted, the material value and the embodied energy of bio-based plastics can be lost, leaving an unchanged and unsustainable demand for virgin material.

It is also worth noting that a claim that a material is biodegradable or bio-based says nothing about the potential use of hazardous substances. Essentially any chemical - such as the well-known endocrine disruptor Bisphenol A (used to make polycarbonate plastics) - could be produced from bio-based feedstock. In addition, a range of other chemicals of concern may be used as additives, coatings, inks, glues etc. As such, labelling bioplastics as an environmentally friendly material that can be used with no potential adverse effects would be a misleading claim.

Policy recommendations

It is clear that bioplastics are no magic bullet to solve the problem of pollution and overconsumption of plastics, and they even create new issues. Bioplastics can indeed play a positive role, but governments, industry and citizens must remain focused on the need to reduce all plastic use and on prioritise the EU waste hierarchy – i.e. putting waste prevention first.

We call on the EU to act on the following in relation to bioplastics across all relevant policy frameworks:

1. **Prioritise plastic prevention and overall reduction:** substantially reduce the use of excessive, unnecessary and throwaway plastics by systematically directing all relevant policies towards waste prevention and the reduction on overall plastic use, including developing reduction targets, phasing out single-use items and

disincentivising the use of non-durable plastics, independent of their feedstock or biodegradability claims.

2. **Design for recycling:** design bioplastics to be compatible with collection and recycling systems, and to avoid dangerous chemicals and substances.
3. **Assess impacts of bioplastics:** carry out a scenario analysis and impact assessment on the potential impacts, quantitative and qualitative, which the substitution of plastic feedstock from fossil to biomass sources would have on the environment and society throughout the full life-cycle.
4. **Consider relevant standards and monitor their use:** in the absence of legislation, consider and improve relevant standards for terminology, test methods and labelling of plastics across Europe. This could contribute to harmonising definitions, biodegradability specifications, and to clarifying communication to consumers. Standards should be used to support legislation, and not substitute or replace the development of appropriately ambitious legislation and policy on plastics.
5. **Marketing of bioplastics:** impose strict legislation regarding the marketing of bioplastics to consumers, including that biodegradable plastics should never be advertised as "biodegradable in the environment" to prevent littering.
6. **Establish sustainability criteria:** establish legally binding sustainability criteria for the production of bioplastics to ensure sustainable consumption levels and practices, minimising negative environmental and social impacts[18]
7. **Ensure policy coherence:** any policy or initiative developed in relation to bioplastics, including requirements under the EU Packaging and Packaging Waste Directive, the EU Strategy on Plastics and the review of the EU Bioeconomy Strategy, must be coherent with and bring closer together existing policies and agendas such as the 2030 agenda for Sustainable Development and the EU Birds and Habitats Directives.

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[10] Ellen MacArthur Foundation, 2016.

[11] See e.g. international standards (ISO 17088, ISO 14851, ISO 14852, ISO 14853, ISO 14855, ISO 17556, ISO 15985) and European standards EN (EN 14987; EN 14995, EN 14047, EN 14048;).
[12] Under Directive 94/62/EC on Packaging and Packaging Waste
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