ECOS and the Rethink Plastic alliance position paper on bio-based plastics

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Policy context

The European Union (EU) is simultaneously revising the Packaging and Packaging Waste Directive, preparing new frameworks to make sustainable products the norm (the Sustainable Products Policy Initiative) and empower consumers in the green transition by tackling misleading green claims. At the same time, the European Commission is exploring policy measures to promote 'sustainable' bio-based plastics (BBPs) in an ongoing study.

This paper expresses ECOS' and the Rethink Plastic Alliance's views on the environmental sustainability of bio-based plastics and in particular in response to the ongoing impact assessment conducted by the consortium led by Wood plc. We strongly believe that BBPs should be placed on a level-playing field with other materials, and that they should insert within the various sustainability principles developed under the abovementioned policy frameworks and in the spirit of the EU Green Deal. At present, the impact assessment study has not presented sufficient safeguards to ensure that only the sustainable sourcing of bio-based plastics is enshrined in new legislation.

Summary of key issues

- **BBPs cannot be considered as inherently circular and sustainable, and therefore should not be used as a substitute for fossil-based plastics in common single-use applications.** The plastic pollution crisis must be solved via an absolute reduction in the global production of plastics, as well as waste prevention, particularly from single-use plastics. BBPs can only contribute to these objectives if they are designed to be circular (long-lasting, reusable and fully recyclable).
- **BBPs cover a broad range of materials and feedstocks, with wide variations in terms of their environmental impacts**. They include some potentially innovative and promising processes from an economic and environmental standpoint, for example in the case of BBPs made from biogenic waste. However, the vast majority of BBPs today are produced from virgin raw materials, increasing pressures on land particularly where their production is supported by intensive and fossil-fuelled agriculture, and do not by default perform any better than their fossil-based counterpart from an environmental and circularity perspective. What is more, products claiming to contain BBP can also be mixed with fossil-based plastics, sometimes present in greater shares.
- **ECOS and the Rethink Plastic alliance would favour the implementation of a performance-based framework that would allow to comparatively assess the environmental performance of materials in specific applications**, so that the highest performers are identified and adequately incentivised. BBPs should be placed on a level playing field with other materials to allow for unbiased comparison.
- **There is still much confusion about the relative advantages of BBPs over fossil-based plastics, in particular for consumers, who may mistake them as biodegradable or compostable**, **which is not necessarily the case**. The risk of confusion must be minimised via harmonised terminology and clearer labelling regarding end-of-life and in order to prevent inappropriate disposal in the open environment and contaminated waste streams.

- **Some BBPs offer specific characteristics, in particular compostability and biodegradability, which can be an advantage, but only when used in niche applications.**[1] These characteristics are currently often used to greenwash single-use items, and they give consumers a false sense of confidence that these plastics have no impact on the environment and therefore constitute a sustainable alternative to conventional plastics.

Environmental issues with bio-based plastics

It is crucial to differentiate bio-based, biodegradable, and compostable plastics. These three types of plastics are often confused by consumers - particularly when grouped under the term 'bioplastics'. Consumers can be attracted to BBPs thinking they will biodegrade in the open environment, or that they can be composted at home or in municipal composting facilities. However, BBPs are generally not biodegradable, and will therefore persist for long periods of time when littered in the open environment.

Confusion can further be exacerbated when similar products are recyclable but not biodegradable, leading to contamination of waste streams and of the environment when they are wrongly disposed of.[2] This creates unnecessary costs to society and taxpayers, as recycling and composting facility operators must then remove and handle products inadequately disposed of.

In 2020, around 40% of all bio-based plastics produced were in fact *not* biodegradable.[3] Polymers produced from biomass can be just as difficult to break down and are often mixed with the same additives, if not worse, that pose risks to health and the environment as their fossil-based counterparts. Biobased plastics are also not necessarily compostable, and even when they are, this does not mean that they will biodegrade well in the natural environment.[4]

BBPs encompass a range of materials, feedstocks and production processes, whose lifecycle impacts compared to fossil-based plastics are still not sufficiently well known to draw general conclusions about sustainability. The environmental performance from the many different and sometimes novel (e.g. plastic made from algae) production processes should be assessed using comprehensive methods which take into account relevant impacts of BBPs during production and end-of-life compared with fossil equivalents, and these assessments should be third-party verified and publicly disclosed. Until then, and until such a time where potential environmental benefits are empirically identified, we strongly advise against attributing incentives to bio-based plastic products and processes. Lifecycle assessments (LCAs) best practice for BBPs must become more transparent and robust, and allow comparisons with fossil-based plastics as this has been identified as an issue in previous research.[5] The lag in widely accessible environmental performance tools must not, however, delay measures to minimise the impacts of these new products.

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[1] Science Advice for Policy by European Academies. (2020). *Biodegradability of plastics in the open environment*. Evidence Review report No. 8. https://doi.org/10.26356/biodegradabilityplastics

[2] Alaerts, L., Augustinus, M., & Van Acker, K. (2018). Impact of bio-based plastics on current recycling of plastics. *Sustainability (Switzerland)*, *10*(5), 1487. https://doi.org/10.3390/su10051487

[3] European Bioplastics, nova-Institute. (2020).

[4] Science Advice for Policy by European Academies. (2020). *Biodegradability of plastics in the open environment*. Evidence Review report No. 8. https://doi.org/10.26356/biodegradabilityplastics

[5] Spierling, S., Knüpffer, E., Behnsen, H., Mudersbach, M., Krieg, H., Springer, S., Albrecht, S., Herrmann, C., & Endres, H. J. (2018). Bio-based plastics - A review of environmental, social and economic impact assessments. *Journal of Cleaner Production*, *185*, 476–491. https://doi.org/10.1016/j.jclepro.2018.03.014

The use of biomass from agriculture potentially leads to issues with tenure, land rights and land-use change. This includes inducing greenhouse gas emissions from loss of forests, wetlands and peatlands, as well as competing with local food production and causing a host of other environmental issues (water and soil pollution and biodiversity loss, among others). Indirect land-use change can outstrip the climate mitigation benefits from replacing fossil-based plastics with BBPs. In comparison, BBPs produced from waste constitute a better option; however, this is not how they are usually produced in the EU due to very low biogenic waste collection rates.

BBPs, as other plastics and materials, must be designed and produced with material efficiency, safety and circularity in mind. Contrary to common misconceptions, BBPs are not inherently sustainable or circular unless they are specifically designed to be toxic-free, reusable, and fully recyclable (or fully compostable where it facilitates biogenic waste collection and in the absence of reusable solutions). However, while biogenic polyethylene terephthalate (bio-PET) and biogenic polyethylene (bio-PE) are recyclable together with their fossil counterpart, the recyclability of other major BBP types is very limited (such as polylactic acid, or PLA) as they cannot be mixed together with other plastic waste for proper recycling. The latter are usually not recycled at all due to their rarity in current waste streams, yet they pose significant challenges to the recycling of other plastics.[6]

What is more, in spite of their 'natural' origin, BBPs (including biodegradable and compostable BBPs) have been proven to contain the same, if not more, hazardous additives and present comparable health and environmental risks due to their chemical composition.[7] The use of BBPs instead of fossil-based plastics therefore does not provide any assurance of reduced toxicity compared to conventional plastics, and persistent substances released by their degradation in the open environment will linger on and generate negative impacts even if the polymers have degraded.

In addition, the production of BBPs is not inherently a circular process. Renewability is often confused with circularity, although renewable resources such as the biomass used for BBPs can be depleted just as fossil-resources can, if not properly managed. To be fully circular, the time and resources needed for regenerating the resources used for BBPs must be fully accounted for. The scaling-up potential for the BBPs market is limited by natural cycles and the availability of technologies to sustainably harvest biomass, as well as by economic competition for resources. For agriculturally produced BBPs, constraints relate to availability and negative externalities on land, biodiversity, biomass resources, and necessary production inputs (water, fertilisers, pesticides, etc.).

Consequently, BBPs must be designed for circularity like any other material, in order to control demand for virgin biomass and the related environmental impacts from production and end-of-life.[8] The objective for BBPs should not be the indiscriminate substitution of fossil-based plastics, and *especially not* in single-use applications. BBPs should be designed for reuse applications, they should be toxic-free, recyclable, or compostable in the limited applications where this offers co-benefits, such as in the case of compostable BBPs used as biogenic waste carriers.

BBPs must be addressed in the wider context of the use of land and natural resources, which have multiple objectives: production of biomass for food, feed, and biomaterials (such as timber, BBPs, pharmaceuticals, textiles), urban development, biodiversity, ecosystem services, etc. Biomass production is a known cause for land-use change leading to dramatic unintended environmental impacts, greenhouse gas emissions, biodiversity loss and land grabbing. For this reason, EU policy-makers should make sure to integrate BBPs into a cascading use of biomass as described below.

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[6] Alaerts, L., Augustinus, M., & Van Acker, K. (2018). Impact of bio-based plastics on current recycling of plastics. Sustainability (Switzerland), 10(5), 1487. https://doi.org/10.3390/su10051487

[7] Zimmermann, L., Dombrowski, A., Völker, C., & Wagner, M. (2020). Are bioplastics and plant-based materials safer than conventional plastics? In vitro toxicity and chemical composition. Environment International, 145, 106066. https://doi.org/10.1016/j.envint.2020.106066

[8] Venkatachalam, V., Spierling, S., Horn, R., & Endres, H. J. (2018). LCA and Eco-design: Consequential and Attributional Approaches for Bio-based Plastics. *Procedia CIRP*, *69*, 579–584. https://doi.org/10.1016/j.procir.2017.11.086

The cascading use principle establishes a hierarchy of uses for bio-based feedstock, which ensures it is prioritised for high-value added applications such as long-lasting products, which store CO_2, reduce material demand from short-lived applications, or contribute to important societal functions such as food and feed, before being used for high-impact applications like biomass burning for energy production.

In the pressing need for decarbonising the EU industry, increasing expectations and pressures are placed on biomass resources to contribute to this decarbonisation, including industrial processes such as manufacture of commodities. **This is truly worrying, as the planet will not be able to sustain the production of food, feed and biomaterials were all mineral-based materials to be replaced by biomaterials.**

Finally, another concerning issue is that BBPs are often used in combination with fossil-based plastics in products which are then labelled as "bio-based", although the "bio-based" component is only present in small amounts which are not even disclosed to the users as a specified percentage. Products containing BBPs almost never accurately state the actual share of plastic which is bio-based versus fossil-based. While it is usually feasible to accurately test the presence of biogenic carbon vs. fossil carbon in a product using radiocarbon analysis, it is currently too easy to make claims of 100% bio-based content when using *attributed bio-based content* methodologies, under a mass balance approach.

Policy recommendations

1. **Put all materials on a level playing field to enable the most sustainable products to stand out and the least sustainable products to be excluded, using performance-based approaches:**

- BBPs encompass an extremely broad suite of materials. Blanket incentives should not under any circumstances be applied to all BBPs: only those that pass robust environmental assessments should benefit from policy support.
- Develop robust and ambitious sustainability criteria for all plastics, including for BBPs, harmonised at EU level. Sustainability criteria must consider the full lifecycle impacts, and cover the most important environmental risks(such as indirect land-use change in the case of BBPs). Performance should be assessed using a credible LCA methodology and be verifiable. LCA must be used to compare BBPs with any other material typically used in an application and its alternatives, in order to minimise the risk of burden shifting. LCAs should not assume that bio-based materials are carbon-neutral as there are necessarily emissions from the industrial production, processing and transport of materials. BBP should also not be assumed to be material-neutral or pollution-free, as they require material/chemical inputs for their production, with unavoidable waste streams.
- Due diligence should be mandatory on BBPs to ensure sustainability, e.g. to ensure no land-use change. All products on the EU market should fulfil the due diligence assessment.
- Develop a clear terminology for BBPs if manufacturers want to claim bio-based content, preventing the use of vague terms such as 'bioplastics' or claims suggesting the absence of plastic. Products containing only a share of BBP should not be labelled as such, unless the minimum content share is indicated as clearly as the 'bio-based' mention.
- Adopt robust bio-based content accounting methods and standards to support clear and reliable labelling and certification of bio-based content, based on the minimum share of content.
- Require the use of a reliable and transparent chain of custody for BBPs – with actual physical traceability and not through the use of 'bio-attributed' content.

2. **Establish a sound hierarchy for the cascading use of biomass, including BBPs:**

- Establish a hierarchy for the cascading use of biomass, enabling performance-based assessments to freely identify the most environmentally-friendly use of bio-based resources for each type application in order to phase out unsustainable applications.
- Establish a clear hierarchy and policy for the use of BBPs:
    - sustainably sourced bio-based recyclable and non-biodegradable plastics can be used to replace virgin fossil-based plastics (for durable and reusable applications),
    - compostable BBPs that are sustainably sourced can be used as carriers for biogenic waste collection where reusable alternatives do not exist,
    - biodegradable BBPs that are sustainably sourced can be used as 100% of the product's component material in applications where products are likely to lead to material release into the environment, such as for textiles in order to mitigate the persistence of synthetic microfibers.

3. **Enforce circularity principles for all materials, including BBPs:**

- Guarantee and control that the Single Use Plastics Directive is applied to BBPs across the EU and in line with the Directive, as bio-based polymers behave and impact similarly to their fossil counterparts when disposed of in the open environment.
- Do not incentivise BBPs for their renewable nature, as 'renewable' does not mean 'unlimited'. The biomaterial should be in use for at least as long as it takes for it to be grown and harvested in order to be truly sustainable.
- Incentivise reuse under the Packaging and Packaging Waste Directive, enabling sustainable BBPs to play a part in replacing fossil-based plastics in reuse applications.
- Incentivise the use of recycled plastic content both from fossil and bio-based sources. Recycling should prevail over the use of virgin BBPs.
- Recycled and bio-based content should be incentivised in priority when it comes to sectors other than packaging, where alarmingly high production volumes call for a strict elimination of unnecessary packaging and application of reusable solutions.
- Set requirements for the recyclability of BBPs, and continue to encourage the development and progress of mechanical recycling, including for the recycling of BBPs, via deposit-return systems and extended producer responsibility schemes with eco-modulation of fees.

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