



Scientific Advice Mechanism Group of Chief Scientific Advisors

Scoping paper

Biodegradability of plastics in the open environment

11 December, 2019

1. Issues at stake

In today's linear plastics economy¹, omnipresent and persistent plastic pollution is a major problem that leads to degradation of the environment and economic costs for society. The 2018 EU Plastics Strategy² lays the foundation to a new circular plastics economy, where materials are kept in the loop for as long as possible, by promoting reuse and repair, remanufacturing, recycling and the prevention of plastic waste³. Therefore, whenever materials can be disposed of in a way that ensures a circular economy, there is no reason to justify alternative after-use options, i.e. options other than those that ensure a circular economy.

Some plastic products, however, may be either difficult or not possible to collect after their use, due to their nature or circumstances in which they are employed. As a result there is a high risk of these products ending up in the environment. In those specific cases, biodegradability could be investigated as a possible remediation measure.

Biodegradable polymers and additives have been proposed by some as part of the solution to the problem of plastic pollution. Others warn that biodegradable polymers may lead to higher energy or resource-consuming manufacturing routes, and the resulting materials may have unintended consequences.

To avoid any unintended consequences as a result of widely applied biodegradable plastics, further insights are needed including insights for the situation in developing countries, in order to inform society, consumers, businesses and policy makers of possible risks and ways to prevent them.

There are clear differences between biodegradation under:

- controlled conditions i.e. industrial composting;
- somewhat controlled conditions i.e. home composting;
- in uncontrolled conditions i.e. the open environment (land, fresh and brackish water, marine, deep sea).

The environmental impacts of biodegradable plastics under different conditions remain to be assessed, including uncontrolled environmental conditions. Biodegradability can contribute to the remediation of 'unavoidable' littering, but it does not solve the littering problem as such. According to some, it can even aggravate the problem, since labelling a product as 'biodegradable' might result in a greater inclination to litter by consumers

¹ By 'plastics', it should be intended a material consisting of a polymer as defined in point 5 of Article 3 of Regulation (EC) No 1907/2006, to which additives or other substances may have been added, and which can function as a main structural component of final products, with the exception of natural polymers that have not been chemically modified (see Article 3(1) of Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment. OJ L 155, 12.6.2019, p. 1–19.).

² <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN> See in particular section on "Establishing a clear regulatory framework for plastics with biodegradable properties".

³ This is in line with the waste hierarchy as defined in EU legislation and policy, in particular Article 4 of Directive (EU) 2008/98 of the European Parliament and of the Council of 19 November 2008 on waste (Framework Waste Directive). OJ L 312, 22.11.2008, p.3 <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN> - (a) prevention;(b) preparing for re-use;(c) recycling;(d) other recovery, e.g. energy recovery; and (e) disposal.

(consumer behaviour), possibly even more when there is no indication of the conditions nor the time under which it actually degrades⁴.

Whilst EU packaging standards for compostable packaging in industry (also applicable to plastic packaging) exist, there is no European standard covering home-compostable plastics. Similarly, there is no general standard for the biodegradability of plastics in the open environment. In some cases, this has led to some confusion. For instance, in some cases national legislation prohibits biodegradable packaging, but permits compostable packaging, including materials for home-composting by the consumer.

The correct disposal of plastics can cause confusion for consumers potentially causing cross-contamination of waste streams. Such cross-contamination can occur when biodegradable plastic, which typically is difficult to recycle⁵, is mixed with non-biodegradable and recyclable plastics. It is difficult if not impossible for the consumer to assess the type of plastic and therefore normal plastic can also end up in the bio-waste stream.

In light of the above, the role of biodegradable plastics within the portfolio of solutions must be considered application by application. For example, agricultural mulch films that would biodegrade in the soil, following a European Standard, because collection of recyclable plastic films is not possible nor affordable. In this case, soil quality as well as the potential wash-off of the biodegradable plastic into rivers by rain would need to be taken into account.

2. EU policy background

The 2018 EU Plastics Strategy⁶ sets out a cautious approach for the use of biodegradable plastics. While it acknowledges that targeted applications have shown positive results, it also identifies a number of challenges: *“It is important to ensure that consumers are provided with clear and correct information, and to make sure that biodegradable plastics are not put forward as a solution to littering”*. Further, *“Applications with clear environmental benefits (and criteria for such applications) should be identified, and in those cases the Commission will consider measures to stimulate innovation and drive market developments in the right direction”*.

The 2019 Report on the implementation of the Circular Economy Action Plan⁷ confirms such an approach. In particular, it recalls that *“the Commission committed to develop a framework on biodegradability of plastics to ensure that the development and use of such plastic products is only encouraged when it is beneficial to the environment and does not interfere with waste management systems nor compromise food safety”*.

The 2019 European Commission Report on “A Circular Economy for plastics”⁸ made the following policy recommendation:

⁴ See UNEP report and Commission’s Staff Working Document accompanying the EU Plastics Strategy (see footnote 2).

⁵ While there are polymers with inherent properties that make them both biodegradable and recyclable, real-life conditions and cost-effectiveness need to be taken into account.

⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN> See in particular section on “Establishing a clear regulatory framework for plastics with biodegradable properties”.

⁷ https://ec.europa.eu/commission/sites/beta-political/files/report_implementation_circular_economy_action_plan.pdf See in particular section on “A systemic approach: the EU Strategy for Plastics in a Circular Economy”.

⁸ <https://publications.europa.eu/en/publication-detail/-/publication/33251cf9-3b0b-11e9-8d04-01aa75ed71a1/language-en/format-PDF/source-87705298>

Develop a legal framework for communication about compostability and biodegradability, and provide clear information and business guidance on the different after-use pathways, and their complementarity.

Claims of a product being biodegradable can be misused, as they do not specify whether something is fully biodegradable within a given timeframe or only partly, and which specific environment they are intended for. Therefore, according to the same report, *claims should be made sufficiently specific e.g. including a reference to the specific environmental habitat, and based on the appropriate information validated by a third party i.e. certification.* In summary, biodegradability alone is not sufficient as a solution, and should always be linked to overall environmental safety.

It should be noted also that the Directive on single use plastics and fishing gear ('SUP Directive')⁹ does not make a distinction between conventional, non-biodegradable plastics and biodegradable plastics nor does other relevant legislation, such as the 'Plastic Bags' Directive¹⁰ amending the Packaging and Packaging Waste Directive¹¹. The bans on certain single-use plastic products apply irrespective of the plastic characteristics. The evaluation of the SUP Directive (to be carried out by 2027) will include *"an assessment of the scientific and technical progress concerning criteria or a standard for biodegradability in the marine environment applicable to single-use plastic products within the scope of this Directive and their single-use substitutes which ensure full decomposition into carbon dioxide (CO₂), biomass and water within a timescale short enough for the plastics not to be harmful to marine life and not to lead to an accumulation of plastics in the environment"*. The SUP Directive does also ban all oxo-degradable plastics¹².

The Packaging and Packaging Waste Directive requires the adoption of an implementing act on marking of compostable and biodegradable plastic carrier bags, to provide consumers with the correct information. Related to that, a separate standard for home-compostable plastic carrier bags is envisaged.

The updated Bio-economy Strategy¹³ promotes Research & Innovation, and a specific action is dedicated to the development of substitutes to fossil-based plastics that are bio-based, recyclable and marine biodegradable. It supports activities contributing to the elaboration of CEN¹⁴ standards for biodegradability in the marine environment.

Concerning microplastics, at the request of the Commission, ECHA published its REACH restriction dossier on 30 January 2019¹⁵ stating that the health and environmental risks posed by intentionally added microplastics justify an EU-wide restriction. ECHA's Scientific Committees will now review the dossier; if agreed, an EU-wide restriction could be in place by mid-2021. Where available, biodegradable alternatives would be exempted by the

⁹ Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment. OJ L 155, 12.6.2019, p. 1–19.

¹⁰ Directive (EU) 2015/720 of the European Parliament and of the Council of 29 April 2015 amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags (Text with EEA relevance). OJ L 115, 6.5.2015, p. 11–15.

¹¹ Directive 94/62/EC of the European Parliament and Council of 20 December 1994 on packaging and packaging waste. OJ L 365 31.12.1994, p. 10.

¹² See the Report from the Commission to the European Parliament and to the Council on the impact of the use of oxo-degradable plastic, including oxo-degradable plastic carrier bags, on the environment, of 16.1.2018 COM(2018) 35 final.

¹³ https://ec.europa.eu/knowledge4policy/publication/updated-bioeconomy-strategy-2018_en

¹⁴ European Committee for Standardization (CEN, French: Comité Européen de Normalisation)

¹⁵ <https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/0b0236e18244cd73>

restriction¹⁶. Therefore, with the file already in progress, such microplastics intentionally added to products are out of the scope of this present request. However, the microplastics from unintentional sources (e.g. abrasion of tyres, textiles) are within the scope of this request, as well as those resulting from the fragmentation of macroplastics.

3. Request to the EC Group of Chief Scientific Advisors

In this context, the European Commission's Group of Chief Scientific Advisors is asked to provide by end October 2020 a scientific opinion to support the preparation of a framework i.e. set of general rules for biodegradability of plastics.

In the open environment, the objective is to determine for which applications, if any, biodegradable plastics can be beneficial to the environment, compared to non-biodegradable plastics and considering the waste hierarchy¹⁷ and circular economy approach. By 'beneficial to the environment' it should be intended that the material fully decomposes into carbon dioxide (CO₂), biomass and water within a timescale short enough not to be harmful to the environment and not to lead to an accumulation of (micro) plastics in the environment¹⁸.

With no prejudice to the work of the Chief Scientific Advisors, beneficial applications could include products that, due to their nature (litter prone), or specific use scenario (e.g. agricultural mulch films), might be hard to collect at their end of life. This would lead to a high risk of them ending up in the environment, therefore suggesting a focus on biodegradability in the open environment as a remediation measure.

Yet, even when applications are identified and criteria for such applications are developed, the use of biodegradable plastics in real-life conditions remains challenging, because real-life conditions significantly vary from one habitat to another (e.g. for marine biodegradability, Baltic vs Mediterranean Sea, or beach vs surface vs deep water vs sea floor).

Home composting, which is not standardised to the same degree as industrial composting and presents real life environmental conditions closer to the open environment, should be included in the analysis. Industrial composting does not fall under the scope of the present analysis.

Consequently, the main question to be answered by the Group of Chief Scientific Advisors is:

From a scientific point-of-view and an end-of-life perspective, and applying to plastics that biodegrade either in the terrestrial, riverine or marine environments, and considering the waste hierarchy and circular economy approach:

What are the criteria and corresponding applications of such plastics that are beneficial to the environment, compared with non-biodegradable plastics?

¹⁶ <https://echa.europa.eu/documents/10162/0724031f-e356-ed1d-2c7c-346ab7adb59b> . The biodegradability criteria are discussed in paragraph 2.2.1.6 of the Annex XV dossier for restriction.

¹⁷ See footnote 3

¹⁸ Article 15 of Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment (see footnote 9).