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OPA Response to

'Biodegradability of Plastics in the Open Environment'
Report by Group of Chief Scientific Advisors (GCSA) European Commission, Directorate-General for Research and Innovation, dated 14th December 2020

and

'Biodegradability of Plastics in the Open Environment'
Report by Science Advice for Policy by European Academies (SAPEA). dated 14th December 2020

The Oxo-biodegradable Plastics Association

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EXECUTIVE SUMMARY

- The GCSA Report notes that *"global demand for very durable, lightweight and versatile materials, such as plastic materials, is growing and with it the amount of related plastic waste in the open environment is increasing, causing harm and pollution in land and marine ecosystems."* It is therefore no **longer acceptable to continue using ordinary plastic**, which fragments into microplastics and can lie or float around in the environment for decades.

- The report continues: *"Some plastic products, 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."***

- Fortunately the scientists who developed plastics had the foresight to identify the problem and provide us with a solution. They called it oxo-biodegradation, because they put a catalyst into ordinary plastic which accelerates oxidation so as to reduce the molecular weight to the point where it can be bioassimilated. This is not the same as oxo-degradable plastic.

- Oxo-biodegradable plastic is not designed to circumvent or replace current waste disposal practices, nor to prevent movement toward a circular economy. **It is not put forward as "a solution to littering."**

- Oxo-biodegradable plastic exists to deal with the *failure* of waste-management, by ensuring that plastic which has escaped into the open environment will biodegrade much more quickly and be **removed from the eco-system by naturally-occurring bacteria.**

- It is designed so that during its useful life it can be used, re-used, and recycled in the same way as ordinary plastic, and can itself be made from recyclate. It does not rule out more circular and useful end-of-life options if it does not escape into the open environment.

- The authors of the GCSA Report seem to be **searching for the holy grail, but they will never find it.** They are looking for a type of plastic whose timescale to complete biodegradation under any conditions in the open environment is very short and can be accurately predicted.

- When a plastic product is made, it is not known what the conditions will be at the time and in the place where it is discarded, nor will it be known into which category of open environment eg land or sea, temperate or tropical, it will be discarded. Therefore it is **impossible for the speed of degradation and biodegradation to be ascertained in advance**.

- *"Even when certified to biodegrade in a particular environment, seasonal and microbiological variations in nature mean that* ***we need to accept uncertainties around actual biodegradation rates."***

- The Report says that *the "timeframe needs to be a timescale short enough not to be as harmful to the environment as conventional plastics and not to lead to a harmful or lasting accumulation in the open environment."* **This is the timescale for which oxo-biodegradable plastic is designed.**

- The Report accepts that *"In the open environment the CO_2 release [which is the indicator of biodegradation] cannot be captured and measured."* For that reason controlled laboratory mineralization experiments such as ASTM D6954 have been devised by polymer scientists. Recommendation 2.2.2 in the Report is to require testing under laboratory and ***simulated*** **environmental conditions**.

- **Oxo-biodegradable mulch films** can be programmed at manufacture to degrade soon after the harvest. The degraded material can then be ploughed into the soil where it completes the bio-degradation process and becomes a source of carbon for next year's plants.

- Oxo-biodegradable plastics should not be confused with other technologies which claim biodegradability, including those which are mixed with starch so that the starch biodegrades, leaving the polyethylene or polypropylene behind. Nor should oxo-biodegradable plastics be confused with enzymatic plastics.

- There is nothing wrong with composting garden and kitchen waste, but no plastics of any kind should be introduced into the process. There are at least **21 reasons why plastic marketed as "compostable" is not useful**.

- **Plastics marketed as compostable are an irrelevance**, because the main problem facing governments today is plastic waste which has escaped into the open environment, from which it cannot realistically be collected and taken to a composting facility.

- Most consumers don't realise that "compostable" plastic **does not convert into compost,** and it is therefore **deceptive to market it as compostable**. It is required by EN13432 to convert rapidly into CO_2 gas. If you can collect a plastic product there are better things to do with it than turn it into CO_2. This is not consistent with a circular economy.

- The SAPEA report notes at 5.4.2 that *"If compostable plastics are introduced into the open environment, their certifications no longer apply."* **It is deceptive to market plastics designed to biodegrade in a composting facility as "biodegradable**."

- The EU has a well-established procedure, set out in the REACH Regulation 2006/1907, for determining whether substances should be banned. This procedure has not been complied with. The European Chemicals Agency is **not convinced that oxo-biodegradable plastic creates microplastics,** and the purported ban of oxo-degradable plastic is under **legal challenge in the courts of the EU.**

- **Oxo-biodegradable plastic has been well described by Intertek** (one of the world's largest inspection and certification companies) in their evidence to ECHA of 24th May 2018. They made the following points:

    - The material used for making plastics is an inevitable by-product of the process of making fuels, and the **same amount of oil would be extracted** from the ground if plastics did not exist.
    - Almost all the micro-plastics found in the oceans have **come from the fragmentation of conventional plastics**. The fragments remain for years at a molecular mass which is too high for biodegradation.

- The oceanic micro-plastic problem has arisen because the **dwell-time of conventional plastics is too long** compared to the rate of arrival of more plastics. Any shortening of the dwell-time must be useful.
- Whatever the speed of degradation of oxo-biodegradable plastic, it **is faster than that of conventional plastics.**
- Oxo-biodegradable plastics **do not encourage a throw-away society**.
- Oxo-biodegradable plastics are **not antagonistic to re-use and recycling**.
- **A ban does not seem to be logical or justified**.

"It is important to ensure that consumers are provided with clear and correct information." The OPA and its members agree with that, and are willing to work with governments to agree definitions and to devise advertising and labelling criteria.

1.0 INTRODUCTION

1.1 The GCSA report is entitled *Biodegradability of Plastics in the Open Environment*, but is mainly concerned with the few applications where biodegradability in the open environment is the intended disposal route. *"Plastics intended for composting under controlled conditions are … outside its scope."* The authors of the report do a disservice by focusing on plastics which are designed to biodegrade in a time frame of days or weeks. They are non-circular, they are designed for single-use, and cannot be recycled. They are designed to biodegrade in very specific environments and to convert into CO_2 in a few weeks.

1.2 The report notes[1] that *"global demand for very durable, lightweight and versatile materials, such as plastic materials, is growing and with it the amount of related plastic waste in the open environment is increasing, causing harm and pollution in land and marine ecosystems. For example, recent studies showed that the mass of plastic has reached 8 billion tonnes globally in 2020 and is now double that of living biomass."* It is therefore no longer acceptable to continue using ordinary plastic, which fragments into microplastics and can lie or float around in the environment for many decades.

1.3 The Report also notes that *"Some plastic products, 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."*

1.4 That is the reason why oxo-biodegradable plastic was invented.

2.0. OXO-BIODEGRADABLE PLASTIC

2.1 The problem of plastics in the environment is well known, but what is the solution? One solution is to reduce the use of plastics, and this is being done, but plastic is one of the best materials for protecting food and other products from damage and contamination. It can be made anti-microbial[2], and has a better LCA than the alternative materials.[3] However, even if the use of plastic is reduced, and even if waste-management systems are improved, it will not be possible for many years, if ever, to prevent the discharge of waste plastic into the open environment, including the oceans.

[1] 1.2

[2] www.d2p.net

[3] https://www.biodeg.org/subjects-of-interest/life-cycle-assessments/

2.2 It is important to be aware that oxo-biodegradable plastic is not a waste-management option. It is not designed to circumvent or replace current waste disposal practices, nor to prevent movement toward a circular economy, and it is not put forward as "a solution to littering." It exists to deal with the *failure* of waste-management, by ensuring that plastic which has escaped into the open environment will biodegrade much more quickly and be removed from the eco-system by naturally-occurring bacteria.

2.3 If there were no failure of waste management there would be no plastic litter, and oxo-biodegradable plastic would not be needed, but even in the developed world it will be many years, if ever, before this has been achieved – not least because much of it is accidentally discharged. The situation in the less-developed world is much worse. In the meantime while governments debate the matter time and time again, many thousands more tons of plastic are entering the environment every week, where it will lie or float around for decades, but if oxo-biodegradable technology were more widely employed it would be possible to shift the balance so that the rate of accumulation can be slowed and then reversed.

2.4 Fortunately the scientists who were developing plastics in the early days had the foresight to identify the problem more than 50 years ago and provide us with a solution. One of those scientists was Professor Gerald Scott, who was scientific adviser to the OPA until he died in 2013. We have been working with his technology for 20 years now, and one member company alone (Symphony Environmental) has sold enough masterbatch to make 1,747,900 tonnes of oxo-biodegradable plastic products worldwide.

2.5 The scientists called the process "oxo-biodegradation," because they included a catalyst in ordinary plastic which accelerates oxidation after the useful life of the product, so as to reduce the molecular weight to the point where it can be bioassimilated. The catalyst is introduced into the plastic as part of a masterbatch, which also includes stabilisers to give the product a useful service-life before it degrades.

2.6 Oxo-biodegradable plastic is designed so that during its useful life it can be used, re-used, and recycled in the same way as ordinary plastic, and can itself be made from recyclate. It therefore offers the benefits of biodegradability in a much shorter time frame but does not rule out more circular and useful end-of-life options if it does not escape into the open environment.

2.7 Oxo-biodegradable plastics are tested according to American (ASTM D6954); British (BS 8472) and other national standards to prove degradability, biodegradability, and non-toxicity. ASTM D6954 has been in use for nearly 20 years, and was revalidated in 2018, but it is dismissed in the SAPEA report in one paragraph.[4] As to this, see the evidence to the UK Government of Dr. Graham Swift,[5] one of the authors of D6954 and Vice-chairman of the relevant committee of ASTM.

2.8 The SAPEA report says[6] *"evidence in support of Step 1 for oxo-additive-containing-polymers often stems from experiments in which the activation of the additive is conducted at temperatures and light intensities that are higher than those found in the open environment. The accelerated weathering conditions during the tests are deliberately chosen to facilitate the additive-induced breakdown process and were justified by arguing that higher rates under accelerated weathering conditions can be used to extrapolate lower rates of the same process under open environment conditions at lower temperatures or light intensities."*

[4] 4.4.9

[5] https://www.biodeg.org/wp-content/uploads/2021/02/Swift-evidence-to-BEIS.pdf

[6] 2.6.1

2.9 As to this, see the evidence of Dr. Swift,[7] that *"Artificial ageing is done simply to reduce the time and cost of testing, and does not invalidate the results. If it did it would obviously not be used, and would not have been permitted by ASTM."*

2.10 The SAPEA Report says[8] "*In the scientific literature on degradable or environmentally degradable plastics, many claims of degradability have been made. However, merely reporting weight loss is not a proof of degradation."* It seems that the authors are confusing weight-loss with molecular-weight loss. Simple weight loss will show degradation, but the molecular weight may still be too high for biodegradation to occur. By contrast, molecular-weight loss (which is measured in Daltons and is required by ASTM D6954 to be reported) shows that the molecular structure is being dismantled, so that the material will be no longer a plastic and will be biodegradable.

2.11 It is easy to show by simple observation whether a piece of plastic has disintegrated, but this does not show that it has biodegraded. The GSCA Report accepts[9] that *"In the open environment the CO_2 release [which is the indicator of biodegradation] cannot be captured and measured, therefore, disintegration of the BDP could constitute a proxy measure for biodegradation in the open environment if biodegradation under laboratory and mesocosm conditions have been demonstrated."*

2.12 Controlled laboratory mineralization experiments such as ASTM D6954 have therefore been devised by polymer scientists. When used in combination with real-time natural oxidation experiments, laboratory experiments can confirm biodegradability with a high degree of confidence. Indeed Recommendation 2.2.2 in the GCSA Report is to require testing under *laboratory and simulated environmental conditions*.

2.13 The authors advance no reasons why, once commenced, biodegradation will not continue until it is complete. The evidence of Dr. Swift[10] is that *"Once abiotic degradation has commenced, there is no reason for it to stop save in the unlikely event that it is deprived of oxygen."* Similarly *"Once the material has become biodegradable, it can be expected to fully biodegrade, save in the unlikely event that it is deprived of bacteria."*

2.14 Unfortunately, the report simply dismisses oxo-*biodegradable* technology in one paragraph[11] on the ground that oxo-*degradable* plastic has been banned by EU Directive 2019/904 as from July 2021. As to this, see below. The dismissal is also based on some points raised in the SAPEA report, which are considered in this response.

2.15 The Rt. Hon. Theresa Villiers MP, former Secretary of State for the Environment of the United Kingdom said in a letter to Symphony Environmental Technologies Plc dated 29th October 2020:

"We are all aware that plastic which has escaped into the open environment as litter is causing a serious problem, and that governments are taking measures to reduce the amount. Nevertheless it is realistic to expect that despite those measures a significant amount of plastic will continue to get into the open environment from which it cannot easily be collected for recycling or anything else.

I gather that your company has sought to address this problem by developing a type of plastic known as "oxo-biodegradable," which converts into non-toxic biodegradable materials

[7] https://www.biodeg.org/wp-content/uploads/2021/02/Swift-evidence-to-BEIS.pdf
[8] 1.3
[9] 2.2.3
[10] https://www.biodeg.org/wp-content/uploads/2021/02/Swift-evidence-to-BEIS.pdf
[11] 1.3.5

if it gets into the open environment, without any need to collect it and take it to a composting facility.

I am also aware that by Directive 2019/904 the EU has banned "oxo-degradable" plastic as from July 2021 because they think it creates microplastics, but they have not distinguished oxo-degradable from oxo-BIOdegradable plastic. I am concerned that having commenced the process required by REACH before any substance can be banned, the EU did not complete the process and imposed the ban notwithstanding that their own scientific experts (ECHA) advised that they are not convinced that microplastics are formed.

I am therefore writing to say that as a former UK Secretary of State for the Environment I see no justification for banning oxo-BIOdegradable plastic. In fact I consider this technology can play a positive role in tackling plastic pollution because it enables everyday plastics to biodegrade safely and quickly if they get into the open environment."

2.16 Dr. Matthew Offord MP said[12] *"As a longstanding member of the Environmental Audit Committee and committed environmentalist, I certainly see no justification in the UK, now an independent nation, following Article 5 of the EU's Directive and banning oxo-biodegradable plastic. As my colleague and former Environment Secretary Theresa Villiers notes, this technology can play a positive role in tackling the scourge of plastic pollutants."*

2.17 Indeed, there are countries in the Middle East[13] who have carried out their own due-diligence, and have made it mandatory to use oxo-biodegradable technology for a wide range of everyday plastic products made in or imported into their territory.

2.18 The authors of the GCSA Report seem to be searching for the holy grail, but they will never find it. They are looking for a type of plastic whose timescale to complete biodegradation under any conditions in the open environment is very short and can be accurately predicted, but a plastic product has to be fit for purpose for a reasonable time, and the report itself makes the obvious point that conditions in the open environment are variable. It says[14] *"Unlike industrial composting facilities, where the biodegradation process is happening under controlled conditions, the open environment comprises a broad range of environments across soil and water (both sea and river), with very different conditions and substantial variations."*

2.19 When a plastic product is made, it is not known what the conditions will be at the time and in the place where it is discarded, nor will it be known into which category of open environment eg land or sea, temperate or tropical, it will be discarded. Therefore it is impossible for the speed of degradation and biodegradation to be ascertained in advance. The report says [15] that *the "timeframe needs to be a timescale short enough not to be as harmful to the environment as conventional plastics and not to lead to a harmful or lasting accumulation in the open environment."* This is the timescale for which oxo-biodegradable plastic is designed.

2.20 The SAPEA report at 5.6.2 says *"Even when certified to biodegrade in a particular environment, seasonal and microbiological variations in nature mean that* ***we need to accept uncertainties around actual biodegradation rates,*** *even if the receiving environment matches the certification."* The OPA agrees with this.

[12] Letter to Symphony Environmental 8th February 2021
[13] Saudi Arabia, the UAE, Bahrain and Jordan
[14] 1.4.5
[15] 1.4.3

2.21 As the report is about the biodegradability of plastics, it is important to note that none of the members of the Group of Scientific Advisers are polymer scientists. They include a political scientist, a sociologist, a nuclear physicist, an economist, an expert in electronics, and a professor of divinity.

2.22 It is perhaps understandable that the Group has failed to grasp some of the fundamental features of polymer degradation. For example, they fail to acknowledge the critical importance of abiotic degradation processes as a precursor to the ultimate biodegradation of polymers, and their proposed definitions at 1.4.3 of the GCSA Report are therefore too narrow. The authors are focused on plastics which can suffer direct microbial or enzymatic attack (such as bioplastics intended for composting – even though they are expressly excluded from the scope of the report).

2.23 Although the GCSA Report says that *"Plastics intended for composting under controlled conditions are … outside its scope"* we find in the list of "experts and stakeholder representatives consulted" in Annex 3, representatives of European Bioplastics, the BBIA, ASOBIOCOM, Assobioplastiche, PHA Platform, and OWS. These are all experts in plastics intended for composting under controlled conditions, and include well-known lobbyists against oxo-biodegradable plastic, which they see as a competitor.

2.24 The Oxo-biodegradable Plastics Association and its member companies and their scientists were not consulted, nor were they invited to the SAPEA Expert workshop; the Sounding Board Meeting; or the Stakeholders Meeting. We find this conduct unacceptable for a publicly-funded body.

2.25 The authors have not done any experimental work cited in the Reports, so the reports are no more than literature-reviews, and the list of references does not include any of the very many scientific studies on oxo-biodegradable plastic.[16] There are however several references to the Plymouth University report by Napper and Thompson, upon which the OPA has commented. [17]

2.26 The GCSA report notes that *"It is important to ensure that consumers are provided with clear and correct information."* The OPA and its members agree with that, and are willing to work with governments to agree definitions and to devise advertising and labelling criteria, but we have yet to receive an invitation.

3.0 EUROPEAN UNION

3.1 Directive 2019/904 purports to ban "oxo-degradable" plastic, but the Directive fails to make a clear distinction between oxo-*degradable* and oxo-*biodegradable* plastic[18], and it is under legal challenge in the EU courts.

3.2 The EU has a well-established procedure, set out in the REACH Regulation 2006/1907, for determining whether substances should be banned. In December 2017, in compliance with the procedure, the EU Commission requested the European Chemicals Agency ("ECHA") under Article 69 of REACH to investigate its concerns regarding microplastics. The

[16] See eg the references cited by Peter Susman QC in Annexe 1 at https://www.biodeg.org/wp-content/uploads/2020/05/qc-opinion.pdf See also https://www.biodeg.org/very-important-study-on-biodegradable-plastic/ and https://www.biodeg.org/all-news/new-french-study-confirms-d2w-oxo-biodegradable-plastic-will-biodegrade-in-seawater/

[17] https://www.biodeg.org/wp-content/uploads/2020/05/opa-comments-on-plymouth-10.pdf

[18] Defined in CEN TR15351

OPA submitted scientific evidence to ECHA on oxo-BIOdegradable plastic, and ECHA advised the OPA[19] that they were not convinced that it created microplastics.

3.3 The Commission then made the extraordinary decision to terminate ECHA's investigation, and the EU proceeded to impose a ban effective from 3 July 2021, citing microplastics as a principal reason.

3.4 Only if ECHA had recommended a restriction, supported by the detailed dossier prescribed by Annex XV of REACH, the recommendation would have had to be considered by two committees under Articles 70 and 71 of REACH, and also by a stakeholder consultation under Article 71(1), before any restriction could be imposed. None of these procedures prescribed by EU law have been complied with.

3.5 Accordingly, OPA member, Symphony Environmental (www.d2w.net) has commenced a legal action against the Commission, the Parliament, and the Council of the European Union, claiming damages which could amount to tens of millions of Euros.

4.0 PLASTICS IN THE ENVIRONMENT

4.1 The GCSA report says at 1.4.4.1 *"The carbon-carbon covalent bond is the strongest chemical bond known. Carbon-carbon bonds cannot easily be broken, neither abiotically nor enzymatically. Therefore, polymers with only carbon-carbon backbone bond will undergo the breakdown process extremely slowly in the open environment, thus hindering the conversion to CO2, CH4 and new microbial biomass."* The SAPEA report says[20] "*polyolefins consist of a carbon chain with covalent carbon-carbon bonds, which no natural enzyme can cut directly."*

4.2 This is why plastic litter has such longevity in the open environment. This is in turn why there is so much public opposition to plastic, and its longevity is what oxo-biodegradable technology is designed to overcome.

4.3 Oxo-biodegradable masterbatches remove the dependence on sunlight, so that degradation will continue if the plastic becomes occluded from light. Whilst sunlight and heat will accelerate the process, they are not essential. The same stabilizers used in conventional plastic will protect oxo biodegradable plastic from premature degradation for as long as they are in storage, use and reuse.

4.4 There is a lot of evidence cited in the report of the creation of microplastics by the fragmentation of conventional plastics, and their harmful effects on human health and the environment. The overwhelming majority of microplastics come from ordinary plastics. It is for this reason that oxo-biodegradable plastics are needed, for the longer plastics and their fragments remain in the environment the greater the harm. Oxo-biodegradability provides a mechanism for cleaning them out of the eco-system by a natural process of bioassimilation by micro-organisms commonly found on land and sea.

4.5 Professor Ignacy Jakubowicz of Sweden, one of the world's leading polymer scientists, explained the process as follows[21] *"The degradation process is not only a fragmentation, but is an entire change of the material from a high molecular weight polymer, to monomeric and*

[19] Email 30th October 2018
[20] 1.3
[21] Letter to Ellen MacArthur Foundation https://www.biodeg.org/wp-content/uploads/2020/05/Reply-to-Ellen-MacArthur-Foundation-from-Prof-Ignacy-Jakubowicz-21-8-17.pdf

oligomeric fragments, and from hydrocarbon molecules to oxygen-containing molecules which can be bioassimilated."

4.6 The SAPEA report[22] cites the 2017 report of the Ellen Macarthur Foundation in support of the proposition that oxo-additives do not render polymers biodegradable, but there is no mention of the 2019 report. In the 2017 report they said that oxo-bio plastic simply fragmented, but having met with an OPA scientist they no longer say that. They admit in their 2019 report that "oxo-degradable" plastics (they mean oxo-biodegradable plastics) are manufactured so that they can degrade faster than conventional plastics and that they do become biodegradable.[23]

4.7 As mentioned above, when the European Chemicals Agency were asked to consider the matter, they were not convinced that microplastics were formed by oxo-biodegradable plastics.

4.8 There is also a problem caused by large pieces of plastic (macro-plastics), which oxo-biodegradable technology is also designed to address. The SAPEA report says (5.5.4) *"while persisting in the environment, large items of biodegradable plastics pose a risk of entanglement and ingestion by terrestrial and aquatic wildlife and smothering of habitats by acting as physical barriers, in the same manner as conventional plastics."* Oxo-biodegradable technology will significantly reduce this problem.

5.0 INTERTEK REPORT

5.1 Oxo-biodegradable plastic has been well described by Intertek (one of the world's largest inspection and certification companies) in their evidence to ECHA dated 24th May 2018[24] as follows:

1. Intertek has carried out a wide range of work on polymers, including various life Cycle Assessments (LCAs) and other environmental studies. Intertek produced two LCAs on plastic bags and oxobiodegradable plastics.[25] The second one, carried out in 2012, included an assessment of oxobiodegradable plastics and included the litter metric.

2. Oxo-degradable plastics are conventional plastics which degrade by oxidation but do not become biodegradable for a long period of time. By contrast, oxo-biodegradable plastics are plastics which are designed to become biodegradable in a shorter time. Oxo-biodegradation is defined in CEN/TR 15351 as "degradation identified as resulting from oxidative and cell-mediated phenomena, either simultaneously or successively." It is not clear whether the reference to ECHA includes oxobiodegradable plastics, but this document is concerned with oxo-biodegradable plastics.

3. Oxo-biodegradable plastics are conventional plastics that contain a metal-based catalyst or catalysts that are designed to speed up the breakdown of polymer molecules until they are reduced to a size that is able to be biodegraded. Polymers

[22] 2.6.1

[23] For OPA comment on this report, see https://www.biodeg.org/wp-content/uploads/2020/05/emf-report-3.pdf See also OPA comment on the Selke report also cited by SAPEA https://www.biodeg.org/wp-content/uploads/2020/05/response-to-msu.pdf

[24] https://www.biodeg.org/wp-content/uploads/2021/01/Intertek-Report-to-ECHA-24.5.18.pdf

[25] https://www.biodeg.org/subjects-of-interest/life-cycle-assessments/

comprise long molecular chains in the region of 250,000 Daltons in mass (one Dalton is the mass of one hydrogen atom). Polymers need to be broken down into the region of 5,000 Daltons before organisms can feed on them and achieve biodegradation. Conventional plastics eventually break down to this size, but oxo-biodegradable plastics are designed to achieve it much faster.

Conventional plastics and oxo-biodegradable plastics are the same (apart from the addition of a small amount of catalyst in the case of oxo-biodegradable plastics), and the mechanisms of biodegradation are the same; oxo-biodegradable plastics are simply designed to achieve biodegradability sooner. Conventional plastics may take up to a century to be reduced in size to 5,000 Daltons (the rate is highly variable depending on environmental conditions and other factors), whereas oxo-biodegradable plastics are likely to reach 5,000 Daltons significantly sooner (again, the rate is variable, but is designed to be faster than conventional plastics).

4. Oxo-biodegradable plastics are made with a plastic masterbatch containing a catalyst that promotes degradation by oxidation in the presence of oxygen, and which reduces molecular weight to the point where biodegradation can occur. The masterbatch typically makes up 1% of the plastic it is used in. The masterbatch is itself mostly polymer, with the catalyst (or catalysts) making up only a small portion of the 1%. Therefore, the amount of catalyst in the plastic product is low -typically lower than other additives in conventional plastic such as colourants, UV inhibitors, stabilisers,-extenders and so on.

5. The catalysts used in oxo-biodegradable plastics are metallic catalysts, often based on manganese, iron or cobalt, that are considered safe. **They are not on any known toxic lists**; for example, they are not among the hazardous substances listed in Art 11 of the Packaging Waste Directive 94/62/EC. Also, oxo-biodegradable plastics are tested according to the same eco-toxicity tests prescribed by EN13432 Annex E for plastics intended for composting (even though oxo-biodegradable plastics are not intended for composting). They are shown to be non-toxic by OECD standard testing. Plastics (whether oxo-biodegradable or not) may contain other less desirable substances- for which there may be evidence of harm, such as Bisphenol A - and authorities are taking appropriate steps to restrict the use of these substances.

6. Various stakeholders offer differing opinions about how much faster degradation of oxo-biodegradable plastics occurs compared to conventional plastics. The somewhat limited research that has been carried out to date shows that the speed range of degradation may be from marginally faster than normal plastics, to very significantly faster, depending on such factors as the formulation of the masterbatch and the extent to which the plastic is exposed to UV light and heat.

   "Polyethylenes containing pro-oxidant substances degrade by exposure to the environment, resulting in decreased molar mass and incorporated oxygen in the chain in the form of carboxylic groups. This exposure to natural weathering for a period of 3-4 months decreased the mechanical properties of polyethylene (containing about 80 mg kg-1 of cobalt), causing disintegration of the material. Saturated humidity increased abiotic oxidative degradation and biodegradation, as compared to natural humidity. The polyethylene bags mineralized about 12% of the original carbon in compost at 58 degrees C for three months after being exposed for one year to natural weathering. Exposure periods longer than three months and environmental moisture exert little influence on the degradability of cobalt-activated PE. There was low biodegradation of conventional PE films exposed to natural weathering for one month or longer, and fungi belonging to the genera Aspergillus

and Penicillium grew on oxo-biodegradable PE films in environments with saturated humidity." [26]

".....Oxo-biodegradable plastics are conventional plastics, such as High Density Polyethylene (HDPE), commonly used in carrier bags, which also include additives which are designed to promote the oxidation of the material to the point where it embrittles and fragments. This may then be followed by biodegradation by bacteria and fungi at varying rates depending upon the environment." [27]

"Extrapolations from a laboratory study on a particular LDPE film engineered with a short service life suggest that almost complete degradation in soil can be achieved within two years." [28]

"The debate around the biodegradability of PAC plastic is not finalised, but should move forward from the assertion that PAC plastics merely fragment, towards confirming whether the timeframes observed for total biodegradation are acceptable from an environmental point of view and whether this is likely to take place in natural environments." [29]

"From the information studied, the authors of this Report can believe that it is possible for an OBP plastic to fully mineralise in an open environment, with the prodegradant additives encouraging this action, and thus the polymers and entrained substances can be assimilated into the natural environment."[30]

7. In ideal conditions for degradation, such as where the plastic has been exposed to UV light, heat, humidity, and mechanical stress, there is no doubt that the rate of degradation is significantly faster than that of conventional plastics. *"While all biomaterials, including plastics, will invariably biodegrade in the marine environment, the rate of this process, even in the benthic sediment, is several orders of magnitude slower compared to light-induced oxidative degradation of plastics."* [31]

8. In non-ideal conditions, the degradation rate may be only marginally faster than that of normal plastics. (Oxo-biodegradable plastics are designed this way, so that they do not degrade in storage or use, - only after use.) This is why the research shows a wide range of degradation rates. The key point is that the rate is faster. How much faster, and under what scenarios, is a matter of debate.

9. Oceans have high humidity and high UV levels in the surface layers where oxo-biodegradable plastics are likely to be found if they are in the ocean (since they tend to float). This would suggest that the speed of conversion to biodegradable materials may be in the upper part of the speed range. There has not been extensive research on this aspect, and as other reports have pointed out, further research needs to be undertaken. However, the research that does exist appears to show significant degradation for oxo-biodegradab1e plastics. The crucial timescale is the time it takes for the molecular weight of the polymer to reduce from circa 250,000 Daltons to 5,000

[26] Ojeda "Abiotic & biotic degradation of oxo-biodegradable Polyethylenes" – 2009 Polymer Degradation & Stability 965-970.

[27] Eunomia, "The impact on the use of "oxo-degradable" plastic on the environment," Report on project conducted for the European Commission DG Environment, 2016

[28] ibid

[29] ibid

[30] ibid

[31] A. L. Andrady, "Wavelength sensitivity of enhanced photodegradable polyethylenes, eco and LDPE/MX," Camile Dreyfus Laboratory, 2011.

Daltons or less. After the material has reduced to 5,000 Daltons or less, it is available for biodegradation, and biodegrades in much the same timescale as other biodegradable material, having regard to environmental conditions. The effectiveness of oxo-biodegradable plastics in oceans has been studied at Bandol in France [32] where oxo-biodegradable plastic was aged in seawater, where it successfully degraded to circa 5,000 Daltons in mass.

"The weathering test on sea water surface, performed to point out the behaviour of samples containing pro-degradant d2w additive in wet environments (films and bags accidentally released in oceans or lakes), points out very promising behaviours. Assuming that there is correlation between oxidation rate and elongation at break, film FA6224 A would present a 50% loss of mechanical properties in three weeks, and a total loss in three months, when exposed in summer period in Mediterranean climate." [33]

To demonstrate that this material was biodegradable, the residues were exposed at Queen Mary University London to A. borkumensis (a bacterium commonly found in oceans) and were seen to be consumed by the bacteria as a food source, indicating biodegradability. *"Our results show that oxo-biodegradable plastic is biodegradable by bacteria commonly found in the open environment both on land and in the oceans, after the molecular weight of the plastic has been reduced by oxidation promoted by the pro-degradant additive."* [34]

10. **Perhaps the most important point is this: whatever the speed of degradation, it is faster than that of conventional plastics**. The different opinions of various stakeholders concerning the speed of degradation, and the different findings of the limited research that has been carried out to date, are simply a matter of degree.

11. The faster degradation and subsequent biodegradation of oxo-biodegradable plastics means that they enter the eco-system as waste plastic in the same way as conventional plastic, but they degrade, and then ultimately biodegrade to natural materials and are recycled back into nature, in less time than conventional plastics. This means that oxo-biodegradable plastics have a shorter dwell-time in the ecosystem. In the case of micro-plastics in oceans,[35] a shorter dwell time means a net reduction in the overall amount of micro-plastics in the oceans. **The oceanic micro-plastic problem has arisen because the dwell-time of conventional plastics is too long compared to the rate of arrival of more plastics.** If the dwell-time were shorter (i.e. conventional plastics degraded faster) and/or the incoming flow was less, the ocean would be able to handle a certain amount of plastics. The plastic contamination would disappear from the system (through biodegradation) faster than it would arise in the system (through waste plastic reaching the ocean) and there would be no build up. It is simple, undeniable physics, little different from the physics of flow of liquids through pipes. Oxo-biodegradable plastics, through biodegrading faster, and thus having

[32] M. Beraud, "Outdoor and accelerated ageing tests on polymers and other materials," Station d'Essais de Vieillissement Naturel de Bandol, 2015.

[33] ibid

[34] K. Richardson, "An investigation into the biodegradation of plastics by alcanivorax borkumensis and phodococcus rhodochorous," Queen Mary University London, School of Biological and Chemical Sciences, 2017.

35 J. Verschoor, "Towards a definition of microplastics: considerations for the specification of physic o- chemical properties," Netherlands Institute for Public Health & the Environment, p. 116, 2015.

a shorter dwell-time in the system, have the potential to aid the problem rather than worsen it.

12. Research could be carried out to demonstrate this, but none has been carried out to date, as far as is known. Ideally, research would be designed to arrive at an approximate value for what dwell-time or biodegradation rate would result in micro-plastics declining rather than building up in oceans. There would be many challenges to determining such a rate. For example, the rate of arrival of plastics into the oceans appears to be continuing to rise in some parts of the world. This is largely a result of rising consumption and continuing inappropriate waste management in growing economies. Therefore, any figure would have to take account of future trends of inputs of plastics into the marine environment, and such forecasting is bound to have errors.

What can be said now, even ahead of such research, *is that* ***any shortening of the dwell-time must be useful.*** *Any improvement in the speed of degradation must be useful*. Considering very approximate order of magnitude figures, if conventional plastics were considered to take say 20 to 200 years to biodegrade in the oceans, and oxo-biodegradable plastics take say 1 to 10 years to biodegrade, already the oxo-biodegradable plastics are showing potential to make a positive, rather than negative, contribution to the issue.

13. Some commentators have suggested that an acceptable biodegradation rate should be faster than this - such as 60 days. Certainly, such fast biodegradation would be ideal once the micro-plastics were in the oceans. However, slower rates would still be fast enough to reduce the micro-plastics population in the oceans (subject to research). The issue with very fast biodegradation rates is that these rates risk compromising the purpose of the plastics. A plastic product that fails in use is a waste of resources. **Plastics need to fulfil their function before biodegrading.** Therefore a 60-day rate, while perhaps theoretically commendable, is unlikely to ever be viable or even desirable for the majority of plastics.

14. The amount of oxo-biodegradable plastics in the ocean is currently tiny compared to all plastics. **Almost all the micro-plastics found in the oceans have come from the fragmentation of conventional plastics**. Although conventional plastics can fragment quite quickly on exposure to sunlight and mechanical stress, **the fragments remain for years at a molecular mass which is too high for biodegradation.** This means that conventional plastics can persist in the ocean for decades before they become biodegradable. This is why the micro-plastics tonnage in the oceans has built up: the inflow and dwell-time exceeds the outflow (outflow being disappearance due to biodegradation). If the dwell-time were shorter, and/or the inflow lower, build up would not occur and the micro-plastics problem would not exist.

15. Various stakeholders have offered various opinions on oxo-biodegradable plastics, including raising doubts about their efficacy and even doubting the point of them. Oxo-biodegradable plastics have been criticised for:

(a) **Increasing the amount of plastics - which is obviously illogical**. The presence or not of an oxo-biodegradable additive in a plastic does not change the amount of plastic.

(b) **Encouraging a throw-away society, which of course they do not**. The littering and inappropriate waste management that leads to the oceanic micro-plastic problem occurs irrespective of any additives in the

plastics. Much of the littering is accidental, and the kind of people who deliberately throw litter do not care whether the plastic may be a type of biodegradable plastic.[36]
(c) Being less desirable for re-use and recycling. **Oxo-biodegradable plastics are not antagonistic to re-use and recycling.** As has been demonstrated by the technical reports, and in practice over years of recycling, the tiny amounts of oxo-biodegradable additive in the system make no difference to recycling or re-use.
(d) Not being supportive of the circular economy. There is a clear theoretical benefit to a circular economy. However, that is a different issue from the current harsh reality of micro-plastic pollution. If society wished to eliminate anything that is not supportive of the circular economy, it should first stop burning oil, which is a non-circular threat to sustainability that is orders of magnitude greater than the amount of oil going into making useful products such as plastics. **The material used to make plastics is in any event an inevitable by-product of the process of making fuels, and the same amount of oil would be extracted from the ground if plastics did not exist.**
(e) **Increasing micro-plastics. That would be alchemy**: the amount of micro-plastics is obviously the same, it is simply that they appear faster and then disappear faster than conventional plastics.

16. Some of the opinions voiced by some parties have led some stakeholders to consider a potential ban on oxo biodegradable additives. This seems unjustified, unnecessary, and also counterproductive. For the foreseeable future, conventional plastics will continue to be used all over the world, in increasing amounts due to global development, despite the efforts of environmentalists and governments in some countries. Even if oxo-biodegradable technology was no longer available on the European market, large quantities of conventional plastics will continue to enter the ecosystem and will remain there as a problem for future generations. Therefore, a ban would be ineffective because it would have no perceivable impact on the problem.

17. A ban of any product would normally be justified only where there existed proof of significant harm. In the case of oxo-biodegradable plastics, the worst possible case (based on the views of the most sceptical stakeholders) could be that oxo-biodegradable plastics are little different from conventional plastics in terms of environmental impact. The best possible case is that they would be beneficial in relation to the micro-plastics issue. The point is that the range is neutral-to-good, not harmful. **Therefore, a ban does not seem to be logical or justified**.

See also other scientific evidence submitted to ECHA[37]

6.0 AGRICULTURE

6.1 The SAPEA Report says *"Agricultural plastic mulch films are widely used to increase crop yields. This process has been used since the late 1930s and can bring clear societal benefit in terms of food production and food security*[38] However, *"In specific applications, where plastics are used directly in the open environment, these can present a source of*

[36] See also para. 11.25 below
[37] https://www.biodeg.org/scientific-evidence-to-echa/
[38] 3.3.1

contamination if collection (e.g. for reuse, recycling or other forms of managed disposal) is either not cost-effective (e.g. agricultural mulch films), incomplete or not possible. In such applications, ***biodegradable plastics*** *could convey benefits over conventional polymers if they reach an open environment in which they are able to biodegrade adequately within appropriate timescales, as confirmed by suitable testing."* The key question is whether they should be oxo-biodegradable or hydro-biodegradable.

6.2 *"Mulch film is difficult to recycle when it is contaminated with soil, vegetation and chemicals, and poses risks to the environment if landfilled or left on the field."*[39] *Biodegradable mulch films are promising alternatives to PE films as they offer the same qualities and purpose, while their biodegradability in soil suggests reduced concern of accumulation.*

6.3 *The application of biodegradable mulch offers the possibility of ploughing them into the soil after use. By this practice, biodegradable mulch may influence the soil in two ways; firstly, as a physical barrier affecting soil microclimate and atmosphere (similar to conventional mulch film); and secondly, by adding carbon, additives and adherent chemicals and microorganisms to the soil."*

6.4 *"Mulches made from conventional plastics present challenges once they have reached the end of their life. The cost of removal and disposal is high and for thin (<20µm) films this is not feasible. Hence, end-of-life films can accumulate in the environment, compromising gas exchange and water infiltration. In addition, plastic mulches can fragment into microplastics, leading to reduced soil functioning."*

6.5 *"In this application, biodegradable plastics may offer advantages over conventional plastic because there is a high likelihood that end-of-life products will reach a receiving environment where they are designed to biodegrade, hence there are potential advantages over conventional plastics."*

6.6 After the crop has been harvested many square kilometres of contaminated conventional plastic have to be removed and disposed of from each farm. This is a very expensive process, and creates huge quantities of contaminated waste, which cannot easily and safely be burned or recycled into useful products, and cannot transported on country roads easily or safely.

6.7 This is why oxo-biodegradable mulch films have been invented. They have been successfully used in farm trials in Wales[40] where different formulations were tried in order to demonstrate that the degradation time can be controlled according to the farmer's requirements.

6.8 The SAPEA Report at 6.2.3 says "*Farmers have positive views of biodegradable plastic mulch films, exhibit a great willingness to learn more about the material, and recognise the benefits of reduced pollution and the convenience of not having to remove or dispose of the materials."* Also, "*Farmers need to maintain the functionality of their soils, hence the potential for product information to be followed is relatively high."*[41]

6.9 Oxo-biodegradable plastic sheets can be programmed at manufacture to degrade soon after the harvest. The degraded material can then be ploughed into the soil where it completes the bio-degradation process and becomes a source of carbon for next year's

[39] 6.2.3

[40] https://www.biodeg.org/wp-content/uploads/2020/08/Pembroke-Mulch-Film-Trial-Report-30.09.13V1.pdf

[41] SAPEA 3.3.1

plants. It should be noted that sunlight is not necessary for the continued degradation of this material.

6.10 Oxo-biodegradable plastics have been used in agriculture in many countries (including USA, China, Japan, Israel, and the EU).

6.11 It is suggested in the Report[42] that whilst the main body of an oxo-biodegradable mulch film might degrade and biodegrade as intended, the edges of the film which are buried to anchor the film in the field would not biodegrade. However, the edges of the film can be differently formulated so that they will biodegrade at much the same rate, but it is in any event much easier for the farmer to collect and dispose of strips two or three inches wide than to collect and dispose of many square kilometres of plastic sheet.

6.12 The SAPEA report at 6.4.3 says that "*there is great interest in biodegradable plastic materials from the agricultural sector, yet it is not clear whether farmers are aware that some products labelled as biodegradable may only degrade fully under conditions of industrial composting and that their usage may lead to unintended environmental consequences.*"

6.13 The advantage of oxo-biodegradable over hydro-biodegradable (bio-based) plastics is that they do not need conditions of industrial composting, and also that by adjusting the formulation of the masterbatch it is possible to control the rate of degradation so as to accord with the timescale required for the particular crop.

6.14 SAPEA 6.4.2 notes that lower price points are needed for a transition to biodegradable plastic mulch films. This is another advantage of oxo-biodegradable plastic, as its price is much lower than bio-based film. It does not need subsidy from taxpayers' money.

7.0 OTHER TECHNOLOGIES

7.1 Oxo-biodegradable technology makes plastics which are functional and stable for reuse and recycling – but if they escape into the environment degradation proceeds more rapidly. For each application we must choose whether to prioritize use, reuse and recovery – (but mitigate the decades-long effect in the event of littering, by including a prodegradant catalyst and facilitating degradation leading to simultaneous biodegradation which is completed in a matter of years or even months); or chose "compostable" materials which are designed to be taken to a composting facility and wasted after one use.

7.2 Oxo-biodegradable plastics should not be confused with other technologies which claim biodegradability, including those which are mixed with starch so that the starch biodegrades, leaving the polyethylene or polypropylene behind.

7.3 Nor should oxo-biodegradable plastics be confused with enzymatic plastics. As the SAPEA Report notes at p. 21 *"polyolefins consist of a carbon chain with covalent carbon-carbon bonds, which no natural enzyme can cut directly."* The molecular weight must first be reduced.

8.00 COMPOSTING OF PLASTICS

8.1 There is nothing wrong with composting garden and kitchen waste, but no plastics of any kind should be introduced into the process. **There are at least 21 reasons why "Compostable" plastic is not useful[43]**

42

43 21 reasons why 22-1-20 by anna v3 (biodeg.org)

8.2 Plastics marketed as "Compostable" are really an irrelevance, because the main problem facing governments today is plastic waste which has escaped into the open environment, from which it cannot realistically be collected and taken to a composting facility. The SAPEA report notes at 5.4.2 that *"If compostable plastics are introduced into the open environment, their certifications no longer apply."*

8.3 A "Grocer" magazine survey of more than 1,000 individuals in 2019 found that *"consumers think that plant-based compostable plastics are the most environmentally friendly packaging materials,"* but most consumers don't realise that "compostable" plastic **does not convert into compost**, and there should be an immediate ban on marketing such plastic as compostable. It is required by ASTM D6400 and EN13432 to convert rapidly into CO_2 gas, and the last thing the planet needs is more CO_2. If you can collect a plastic product there are better things to do with it than turn it into CO_2. This is not circular.

8.4 Also, many consumers do not know that "compostable" plastic is tested to biodegrade in an industrial composting facility – not in the open environment. In November 2019 the Danish courts ruled in Ellepot v Sungrow that "compostable" PLA plastics **must not be described as biodegradable** – because they are not proved to be biodegradable except in the special conditions found in an industrial composting facility.

8.5 Further, plastics marketed as compostable are far too expensive for everyday use, and there are very few industrial composting facilities available. For this reason the German courts in Güthoff v Deutsche Umwelthilfe (2014) held that it is **deceptive to market plastic as "compostable."**

8.6 Also these plastics are often deceptively marketed as "renewable," but this ignores the fossil fuels consumed in the agricultural production process by the machines which clear the land, plough the land, bring the seeds to the farm and sow them, harrow the land, bring the fertilisers and pesticides to the farm and spread them, harvest the crop and transport it to the factory, and by the machines which polymerise the raw material.

8.7 It also ignores the land and water resources devoted to producing the raw materials, which should be used for growing food. EASAC (March 2020 report) says that *"replacing PE by a bio-PE would require almost all (93.5%) of global wheat production."* This is of course unsustainable.

8.8 Although these plastics are marketed as "bio-based" this is also deceptive, because they can contain up to 60% oil-based material. This is not usually mentioned in the advertising. Also, conversion of organic materials to CO_2 at a rapid rate is not "recovery" or "recycling." Nature's lignocellulosic wastes do not behave in that way, and if they did the products would have little value as soil improvers, having lost most of their substance and their carbon.

8.9 On 11th September 2003 a Report to the Australian Government by the Nolan-ITU Consultancy concluded as follows in relation to hydro-biodegradable polyesters (eg starch-based) "At the end of the commercial composting process, all of the carbon has been converted to CO_2 so there is a contribution to greenhouse gas levels but not to the value of the compost."

8.10 The same Report concluded that "degradable polymers manufactured from renewable resources (e.g., crops) have greater impacts upon eutrophication due to the application of fertilizers to land."

8.11 On 15th July 2020 a report appeared in "Waste Management" Vol. 113, Pages 312-318. The conclusions were:

- In many cases, plastic bags are being replaced with compostable plastic bags.
- Industrial composting processes do not completely remove film fragments.
- Compost is thus a potential source of fragments from compostable plastic bags.
- Compostable plastic fragments are then deteriorated in soil to microplastics.
- Compostable microplastic results in an increase number of aflatoxigenic fungi.

8.12 The SAPEA Report itself notes at 5.4.2 that *"Because of their potential for widespread environmental distribution, the ecological risks of micro- and nano-sized biodegradable plastics should be subjected to special consideration. Compost is one source of compostable and biodegradable micro- and nanoplastics that is expected to increase with increased application of compostable and biodegradable plastic products in the future."* And at 5.5.3 *"Some biodegradable plastics intended for biodegradation by composting (e.g. PLA) may contribute to microplastic debris if not fully biodegraded in environmental conditions. This concern also applies to microplastic residues in compost used for soil fertilisation and amendment."*

8.13 There is also concern about toxicity. At 5.5.2 the SAPEA Report says *"In the most recent study, six out of ten samples of the biodegradable polymer PLA, as well as pellets of one type of the biodegradable polymer PHA, induced baseline toxicity, while one PLA product also showed a potent effect on oxidative stress."*

9.0 USERS REJECT "COMPOSTABLE" PLASTIC

9.1 Even industrial composters and local authorities do not want "compostable" plastics.

9.2 For example, the website of Epsom & Ewell Borough Council in the UK says[44]

"We used to ask you to use bio-liners to line your food waste caddy, but the food waste recycling companies found that bio-liners compost down much more slowly than the food. That slowed the recycling process and made it much more expensive. They tried dredging the bio-liners out of the food waste, but the sticky bio-liners got tangled around the dredging equipment. Cleaning them off was very expensive. So they found that using [ordinary] plastic bags was, overall, much more cost-effective. They're not recycled but good stuff still happens to them. And you can use old bags like bread-bags or carrier bags if you like."

- The City of Exeter UK has also rejected it[45]
- And the City of Toronto, Canada[46]
- In January 2020, the industrial composters of Oregon gave 9 reasons why they did not want it[47]
- Then the SUEZ waste-management company[48]

[44] https://www.epsom-ewell.gov.uk/why-it-ok-put-plastic-bags-food-waste-not-green-recycling-bin
[45] Rejects 'compostable' plastic and paper - Biodeg
[46] https://www.cbc.ca/news/technology/plastic-packaging-compostable-plastic-marketplace-1.5487617

[47] https://bioplasticsnews.com/wp-content/uploads/2019/04/Oregon-composters-dont-want-Compostable-Packagine.pdf
[48] https://www.usinenouvelle.com/article/sacs-plastiques-compostables-le-grand-malentendu.N926789

- Then a devastating exposé on Netherlands television[49]

- And another TV exposé in Canada about how compostable plastics are not being composted but instead sent to landfill or incineration.[50]

9.3 Many areas do not have industrial composting plants, and the Welsh Government has refused to invest in them.[51] Plant-based compostable plastics are going to landfill rather than recycling because so many local authorities are unable to deal with them.

9.4 "Compostable" resins are worse than conventional or oxo-biodegradable plastics when it comes to oxygen transmission-rate or moisture vapour transmission-rate. These resins are also water sensitive, and their physical, optical, mechanical, and chemical properties are inferior.

9.5 SAPEA 6.3.3 *"Bio-based plastics that use first-generation feedstock (i.e. crops suitable for human or animal consumption) do not necessarily present a more sustainable alternative to fossil-based plastics particularly when the environmental impacts of land use changes are accounted for."*

9.6 SAPEA 6.6 "One of the key challenges is to ensure that plastics that only biodegrade in industrial facilities do not end up in the open environment."

9.7 One of the objectives of the European Strategy for Plastics in a Circular Economy is to reduce dependence on imported fossil fuels. We agree with this, but it cannot be done by encouraging bio-based plastics. Farmers do not use horses any more, and large amounts of fossil-fuels are consumed and pollutants emitted in the agricultural production and polymerisation processes.

9.8 By contrast, oxo-biodegradable (and conventional) plastic is made from a by-product of oil-refining, which would arise whether plastics were made or not. This resource will be available so long as petroleum is needed for fuel and lubrication, and we should not waste it. In addition, dependence on imported fossil fuels should be reduced by capturing the calorific value in waste plastic in a modern non-polluting waste-to-energy process, instead of sending it to landfill.

10.00 HOME COMPOSTING

10.1 Why would anyone want to buy an expensive plastic bag to transport kitchen waste to a home compost when he could use a bucket?

10.2 A study for the French government at [52]says that *"composting management must be in line with good practices recommended by ADEME (weekly brews for one month and then every 1 to 2 months, humidity control), – the average ambient temperature over the first three months of composting must be close to that of the standard: outside temperature of 25°C – 5°C. It is unlikely that all of these conditions will be met by individuals."*

[49] The Composting Fairy Tale – Bioplastics News
[50] https://www.cbc.ca/news/technology/plastic-packaging-compostable-plastic-marketplace-1.5487617
[51] https://www.bbc.co.uk/news/uk-wales-47238220
[52] https://www.ademe.fr/sites/default/files/assets/documents/compostage-domestique-industriel-sacs-plastiques-papier_2019.pdf

10.3 Home composting of plastic is therefore dangerous and should not be encouraged. This is because the plastic may have been contaminated by pathogens from putrefying food, and the temperature in a home compost may not be high enough to kill those pathogens.

10.4 The French study also shows that *"plastic bags are poorly disintegrated and biodegraded if good domestic composting practices are not applied."* It also shows that, *"even when good practices are followed, there are still a few pieces of plastic bags of micrometric or even millimetre size in composts beyond the standard year of home composting."*

10.5 In addition, the study says *"it appears that the biodegradation of plastic bags suitable for domestic composting makes little or no contribution to the formation of humus because, in accordance with the biodegradation tests of these materials according to the NF T 51-800 standard, at least 90% of the carbon organic dioxide is converted into carbon dioxide."*

11.00 THE GCSA RECOMMENDATIONS[53]

11.1 *Adopt a definition of biodegradability as a system property which takes into account material properties and specific environmental conditions ……..whether or not a plastic item biodegrades depends not only on the properties of the material itself, but also on the specific conditions of the receiving environment in which biodegradation takes place.*

11.2 We would agree with the general proposition, but oxo-biodegradable plastics do not need specific environmental conditions. They are designed to biodegrade anywhere that oxygen and bacteria are available.

11.3 Consumers will think that a product sold as biodegradable will biodegrade in the open environment, so plastic products which are designed to biodegrade in special conditions eg in an industrial composting facility, should not be described as biodegradable. An immediate ban should be placed on that practice.

11.4 Prioritize *reduction, reuse and recycling of plastics before considering biodegradation*

Yes and no.

(a) Reduction must bear in mind that plastic is the best material for protecting ourselves and our food from contamination. It can be made anti-microbial, and it has a better LCA than alternative materials used for packaging. Switching to other forms of packaging could increase risks to climate-change and health.

(b) If you want to use a plastic item many times, and recycle it, and you can be confident that it will not escape into the open environment, the best option is conventional plastic. You cannot however be confident, and must therefore consider the need for biodegradation. Oxo-biodegradable plastic can be re-used and recycled and can be made from recyclate, but "compostable" plastic cannot.

(c) Even if plastic packaging gets collected, separation of this type of plastic from other waste presents a challenge, and recycling of low-value polyethylene and polypropylene packaging is often not feasible in economic or environmental terms. It is not therefore important whether oxo-biodegradable PE and PP plastic packaging is recyclable or not – although it is.[54]

11.5 *Limit the use of Biodegradable Plastics (BDPs) in the open environment to specific applications for which reduction, reuse, and recycling are not feasible.*

[53] GCSA Report Page 21

[54] https://www.biodeg.org/subjects-of-interest/recycling-2/ .

11.6 The GCSA Report says "*We recommend that BDPs are only considered for a narrow range of specific applications for which the potential environmental benefits are clear. These include applications for which collection from the environment is challenging and applications where separation of the plastic from other waste presents a challenge."*

11.7 Collection from the environment is very challenging for plastic packaging which has escaped as litter and may be spread over a wide area on land or sea. This is the specific application for which oxo-biodegradable plastic is designed, and where the environmental benefits are clear. It will biodegrade significantly more quickly than ordinary plastic under the same conditions.

11.8 Do *not consider BDPs as a solution for inappropriate waste management or littering*

11.9 Then what is the solution for inappropriate waste management or littering? We would all agree that waste management should be appropriate and that littering should not occur. However, the authors cannot close their eyes to the failures of waste-management, even in the developed world, and to the fact that accidental and deliberate littering does occur – whether we like it or not.

11.10 Support *the development of testing and certification schemes evaluating actual biodegradation of BDP in the context of their application in a specific receiving open environment*

11.11 We agree with this, and are ready to cooperate. The OPA already offers a testing and certification service,[55] but this is not mentioned in section 4.5.2 of the SAPEA report *"Available certification programmes, including for the open environment."*

11.12 For the reasons mentioned above the open environment on land and sea is a receiving environment which has to be considered, and in which the conditions at the time and place of disposal cannot be known in advance. The Report says *"If products can be disposed of whilst ensuring a circular economy, alternative after-use options such as biodegradation in the open environment, should not be considered as the primary option."* We agree with this. Biodegradation is not the primary purpose of oxo-biodegradable plastics. Biodegradability is there to deal with the *failure* of waste management.

11.13 The Report says *"before considering BDPs for certain applications, it is important to consider whether the application should exist in the first place, or if alternative materials could be employed instead."* Plastic is one of the few materials in common use which can be made antimicrobial[56] and Life-cycle Assessments[57] show that is the best material for packaging.

11.14 Require *testing of biodegradation of BDP applications under laboratory and simulated environmental conditions.*

11.15 We agree with this.

[55] https://www.biodeg.org/about/certification-specification-for-oxo-biodegradable-plastics/
[56] www.d2p.net
[57] https://www.biodeg.org/subjects-of-interest/life-cycle-assessments/

11.16 *Require assessment of biodegradation and environmental risk of BDP under the conditions of specific open environments.*

11.17 There is no such thing as a specific open environment. The conditions in the open environment are almost infinitely variable. It might be possible to regard agricultural applications as a specific open environment, but even there the conditions are widely variable.

11.18 Support *the development of a materials catalogue and their relative biodegradation rates in a range of environments*

11.19 We agree with this, subject to 11.17 above

11.20 *Initiate and support information campaigns to address current misconceptions and confusion related to bio-based, compostable and biodegradable plastics.*

11.21 We have made this a principal objective of the Oxo-biodegradable Plastics Association, and the Association does not condone anyone who makes false claims of biodegradability. We are critical of the failure – even in official documents – to distinguish between oxo-degradable and oxo-biodegradable, plastic. The SAPEA report itself causes confusion by failing to do this, and by using the term "Biodegradable plastic" without making it clear whether they are referring to oxo-biodegradable or hydro-biodegradable plastic.

11.22 The SAPEA Report says, at 6.2.1 *"Given that most of the currently available biodegradable polymers decompose in a timely manner only in industrial facilities under controlled conditions, and bio-based plastics degrade over long periods just like their fossil-based counterparts, it is perhaps not surprising that there is considerable confusion and scepticism among consumers about products that combine the terms 'bio' and 'plastics.'* The term 'bioplastic' is a source of confusion, because it is used to refer to both bio-based and biodegradable polymers in instances where it is not clear what type of bioplastic it refers to.

11.23 *Many consumers understand the term 'biodegradable' as something that will break down 'naturally' in the open environment in the same way as something that is considered 'compostable'. While biodegradability and compostability have distinct technical definitions, they are often conflated and used as synonyms by consumers.*[58]

11.24 The GCSA report is correct[59] that *"biodegradation is a different process than biodeterioration. Biodeterioration refers more broadly to the impact of microorganisms on the properties of plastic, without the chemical transformation of the carbon-containing compounds in the plastic as per definition of biodegradation."* Biodeterioration is what happens to ordinary plastic in the open environment – Biodegradation is what happens to oxo-biodegradable plastic.

11.25 SAPEA 6.4.3 *WRAP found that a majority of British consumers never looked at packaging labels for disposal information*.

11.26 *Support the development of standards for clear, effective European labelling for a) end-users and consumers to ensure proper use and disposal of BDP applications in the open environment; and b) manufacturers and vendors to ensure accurate information transfer along the value chain*

[58] SAPEA 6.2.1

[59] 1.4.3

11.27 We agree with this. The SAPEA report says, at 5.5.3 *"a significant reduction in the biodegradation rate of compostable plastics such as PLA is expected in environmental conditions, as compared to composting conditions. Therefore, labelling of plastic items intended for industrial composting should not include 'biodegradable', but only 'compostable' so not to confuse public waste handling."*