Oxo-Biodegradable Plastics Association

A not-for-profit Association limited by Guarantee

EU Registration no: 370641927438- 79

OPA response to Scottish Government Consultation

on "Market Restrictions on Problematic Single-Use Plastic Items"

1. INTRODUCTION

1.1 Coronavirus has made everyone realise that single-use plastic is very useful to protect us from the spread of disease, and it is in use today for a wide variety of personal protective equipment and packaging. This is not a temporary phenomenon, because people are never going to forget the need to protect themselves and their food from microbial attack.

1.2 Plastic is one of the few materials in common use which can itself be made antimicrobial, and plastic made with antimicrobial technology has been tested according to ISO 21072 to destroy 99.9% of viruses within one hour of coming into contact with it. All single-use plastics should now be made with anti-microbial technology. (see https://www.symphonyenvironmental.com/wp-content/uploads/2020/09/Antimircobial-Optimised.pdf.pdf)

1.3 They should also be made with oxo-biodegradable technology because some of this plastic will get into the environment after its useful life. That is the reason for this consultation by the Scottish Government, as described by the Minister when she says "this consultation proposes the introduction of market restrictions – effectively a ban – on the single-use plastic items most commonly found littered on European beaches." This is reinforced by para. 1.1 of the consultation document. The problem with plastic is litter.

1.4 It was to address the problem of plastic litter that oxo-biodegradable plastic was invented forty years ago by the scientists who had themselves created plastics and who realised that the durability which they had achieved could be a problem. They therefore found a way to cause the molecular structure of the plastic to convert automatically by oxidation into low molecular-weight materials which are biodegradable. They called this process "oxo-biodegradation" and it occurs anywhere in the open environment where oxygen is present, without any need to take the plastic to a composting facility. Light and heat will accelerate the process, but they are not essential.

1.5 An OPA member, Symphony Environmental Technologies Plc received a letter on 29th October 2020 from the Rt. Hon. Theresa Villiers MP., the immediate past Secretary of State for the Environment in which she says "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.

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

1.7 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.

1.8 I am 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 plastics pollution because it enables everyday plastics to biodegrade safely and quickly if they get into the open environment."

2. A CIRCULAR ECONOMY FOR PLASTICS

2.1 The OPA would agree that plastic is a resource which should not be wasted, and that it should therefore be re-used and recycled where it makes economic and environmental sense to do so. Recycling makes more sense for some of types of plastic (eg PET) than for others (eg. PE and PP).

2.2 However, no government in the UK has a policy for dealing with plastic waste which has escaped into the open environment, from which it cannot be collected and disposed of in the right way, and cannot therefore fit into a conventional circular economy.

2.3 Their blind spot is that despite their best efforts a significant amount of plastic will continue to get into the open environment for the foreseeable future, which cannot be collected for recycling or anything else.

2.4 Oxo-biodegradable technology is specifically designed to deal with this problem, by causing the plastic to become biodegradable much more quickly if it gets into the open environment. It is not designed to biodegrade in landfill because biodegradation of anything in anaerobic conditions generates methane. Nor is it designed for composting, and European Standard EN13432 is not therefore relevant. It can be recycled if collected during its useful life.

2.4 The reason why single-use plastics have met so much opposition is because the plastics industry has failed to offer policymakers a way to deal with the single-use plastic products which get into the open environment all over the world, where they lie or float around for decades. It is the sight of animals and birds entangled with plastic which has generated monumental public concern and has created plastiphobia, leading to outright bans.

2.5 The plastics industry could have addressed this problem, to the great benefit of themselves and the environment, by making everyday plastic products with oxo-biodegradable technology so that they would become biodegradable much more quickly and would be recycled back into nature by bacteria and fungi. However, (probably because of their internal power-structure) Plastics Europe have dismissed this technology instead of engaging with the experts in the oxo-biodegradable plastics industry and seeking to understand it better and to explain it to their members and to the public.

2.6 They have concentrated instead on redesign and recycling, but it must be obvious to them that this cannot deal with the plastic which escapes into the open environment from which it cannot be collected. Nor can the so-called compostable plastics, which have to be collected and taken for composting. The OPA does not consider that there is in fact any useful role for plastics in the production of compost (see https://www.biodeg.org/subjects-of-interest/composting/).

2.7 The Scottish government now has an opportunity to adopt a policy for dealing with plastic which has escaped into the open environment, and especially the oceans, from which it cannot realistically be collected for recycling or anything else, and without banning items which are useful to citizens.

3. THE EU DIRECTIVE

3.1 Para. 1 of the Scottish consultation says that "This consultation is seeking views on the introduction of market restrictions – effectively a ban – for problematic single-use plastic (SUP) items *and all oxo-degradable products* in line with Article 5 of the EU Single-Use Plastics Directive (EU) 2019/904."

3.2 However, this Directive no longer applies to the UK, and on 21st December 2020 an OPA member, Symphony Environmental Technologies Plc commenced a legal action against the Commission, Parliament, and Council of the European Union in relation to their decision to adopt Article 5 of the Directive. Symphony has been advised by three Barristers, all experts in EU law, that this part of the Directive is confusing and illegal, and substantial damages are being claimed.

3.3 Symphony and the OPA have explained to EU officials the difference between oxo-degradable and oxo-BIOdegradable plastic but the Directive has not made this clear. The Directive has not used the standard definitions set out by the European Standards organisation CEN in TR15351 – see below.

3.4 "Oxo-degradable" plastic breaks up into fragments which can lie or float around in the environment for decades, but "oxo-biodegradable" technology causes ordinary plastic to degrade if it gets into the open environment and to biodegrade in the same way as nature's wastes, being recycled back into nature.

3.5 The main purpose of the Directive is to ban single-use plastics most often found on the beaches, but in addition to the specified items it includes all items made with "oxo-degradable plastic."

There is no evidence that any items made with oxo-BIOdegradable plastic have been found on the beaches or anywhere else.

3.6 The EU fails to acknowledge that the billions of persistent microplastics in the open environment, including the oceans, are actually coming from the fragmentation of ordinary and bio-based plastics which have not been upgraded with oxo-BIOdegradable technology.

4. ILLEGALITY

4.1 In addition to causing confusion, Symphony has been advised that the ban is actually illegal because there has been a failure to accord due process, and because it is disproportionate and discriminatory. Any purported ban in the UK would face a similar legal challenge if it were not made clear that it does not apply to oxo-biodegradable plastic.

4.2 The EU has a well-established procedure, set out in the REACH Regulation 2006/1907, for determining whether substances should be banned. This procedure was designed to avoid the kind of arbitrary action which has occurred in this case.

4.3 Neither the Commission's report dated January 2018, nor the Eunomia Report of August 2016 recommend a ban on oxo-biodegradable plastic, but the 2018 report said that "a process to restrict the use of oxo-plastics in the EU will be started."

4.4 Accordingly, and in compliance with the REACH procedure, the EU Commission requested the European Chemicals Agency ("ECHA") under Article 69 of REACH to investigate its concerns regarding microplastics. The OPA submitted scientific evidence to ECHA on oxo-BIOdegradable plastic and on 30 October 2018 ECHA said that they were not convinced that it created microplastics.

4.5 The Commission then made the extraordinary decision on 8 May 2019 to terminate ECHA's investigation and to slip a few words into the draft Directive to impose a ban as from 3 July 2021, citing microplastics as a reason. The Commission's proposal to the Parliament had not mentioned a ban on oxo-degradable plastic, and the amendment seems to have been the work of lobbyists acting for rival commercial interests. Never before has an ECHA investigation been circumvented by legislation.

4.6 Only if ECHA had recommended a restriction, supported by the detailed dossier prescribed by Annex XV of REACH, their 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 proposed under Article 73. None of these procedures prescribed by EU law have been complied with.

4.7 Symphony is represented in this case by Josh Holmes QC and Jack Williams, Barristers of Monckton Chambers, Grays Inn, London - the UK's leading experts in EU law, and by Keystone Law, Solicitors of Chancery Lane, London. Symphony has also been advised by Professor Sir Alan Dashwood QC, the author of "Wyatt & Dashwood's European Union Law."

5. THE SCOTTISH CONSULTATION

5.1 The consultation paper seems to be influenced by the EU Directive (which is no longer applicable in the UK) and offers only three paragraphs in support of its draconian proposal for a complete ban of oxo-degradable plastics, whether single-use plastics or not, and whether commonly found on beaches or not.

5.2 Oxo-degradable and oxo-biodegradable plastics are not distinguished from each other in the consultation, and are not mentioned at all in the Scottish EPECOM Report of September 2020 "Ending the Throwaway Culture: Five Principles for Tackling Single-use Items."

5.3 The consultation paper cites the Eunomia Report of August 2016, which does not recommend a ban. It also cites "Moving away from single-use - Guide for national decision makers to implement the single-use plastics directive" published on 10th October 2019 by "Rethink Plastic Alliance" but this document does not attempt to provide any scientific justification for why oxo-biodegradable plastics should be banned.

5.4 The Scottish consultation paper says on page 12 that "a significant body of evidence suggests that, in reality, oxo-degradable plastics simply break down into small fragments" but as mentioned above this is the very issue on which ECHA were consulted, and were not convinced. No scientific authority for this suggestion is cited in the consultation, and in fact the Eunomia report says that "The debate around the biodegradability of PAC plastic is not finalised, but should move forward from the assertion that PAC plastics merely fragment…"

5.5 The suggestion in the consultation paper that oxo-degradable plastics simply break down into small fragments is true of oxo-degradable, but not of oxo-biodegradable, plastics, and it seems to have been taken from the Ellen MacArthur Foundation report of November 2017. However, after listening to evidence from the OPA's scientists about oxo-biodegradable plastics EMF now admit in their May 2019 report that these plastics are manufactured so that they can degrade faster than conventional plastics and that they do become biodegradable.

5.6 The Scottish consultation paper also asserts that they "negatively affect the recycling of conventional plastic" but there is no attempt to ban "compostable" plastics, which will certainly contaminate the recycling of conventional plastic. In fact oxo-biodegradable plastic is compatible with recycling (see https://www.biodeg.org/subjects-of-interest/recycling-2/) and no court would accept that it posed for that reason a threat to human health or the environment sufficient to justify a ban.

5.7 The consultation paper also gives as a reason "the difficulty for the consumer to identify the material" but there is no reason why consumers would need to identify the material. It is used to make short-life items, and should be treated exactly like ordinary plastic, for it is only if it escapes collection and ends up in

the open environment that its performance is any different. Contrast plastic intended for composting, which *would* need to be identified to consumers. In any event the Scottish government may require whatever labelling it pleases.

5.8 There is mention of Wales on page 13 of the consultation paper. The OPA has responded to the Welsh consultation paper at https://www.biodeg.org/wp-content/uploads/2020/10/opa-response-to-wales-19.10.201.pdf

5.9 None of the papers cited in the Scottish consultation document on this issue were written by polymer scientists, and none of them were peer-reviewed.

6. OXO-BIODEGRADABLE PLASTIC

6.1 It is essential to distinguish between oxo-degradable and oxo-biodegradable plastics.

"Oxo-degradation" is defined by CEN in TR15351 as "degradation identified as resulting from oxidative cleavage of macromolecules." This describes ordinary plastics, which degrade by oxidation under the influence of light and heat in the open environment and create microplastics, but do not become biodegradable except over a very long period of time. Oxo-degradable (as distinct from oxo-biodegradable) plastic has been banned for good reason in Saudi Arabia, the UAE, and elsewhere for a wide range of everyday plastic products, and it should also be banned in Scotland.

6.2 Nobody makes plastic and sells it as "oxo-degradable" but this terminology is used by the EU Commission, and others who are reluctant to acknowledge the difference between oxo-degradable and oxo-biodegradable plastic.

6.2 "Oxo-biodegradation" is defined by CEN as "degradation resulting from oxidative and cell-mediated phenomena, either simultaneously or successively". This means that the plastic degrades by oxidation until its molecular weight is low enough to be accessible to bacteria and fungi, who then recycle it back into nature by cell-mediated phenomena. It does not create microplastics.

6.4 Oxo-biodegradable plastics are tested according to ASTM D6954; BS 8472, and similar Standards, which prescribe tests for biodegradation as well as for abiotic degradation. They also include tests to ensure that there is no toxicity and no prohibited metals or gel content above the prescribed level. Plastic should NOT therefore be banned if it is proved to be oxo-biodegradable by tests performed according to these Standards. Recent tests for OPA members by Eurofins Laboratories show 88.9% biodegradation within 121 days.

6.5 It is possible for enforcement authorities to ascertain quickly, using a portable xrf device, whether a product sold as oxo-biodegradable is actually oxo-biodegradable, but this cannot be done with other forms of biodegradable or "compostable" plastic.

6.6 Microplastics are seen today as the main problem with plastics. They are tiny pieces of plastic, which are being found on land, in the sea, and now even in the air we breathe. Most of them are created by the fragmentation of ordinary plastics caused by the effects of uv light and mechanical stress. The problem is that although these plastics are fragmenting, their molecular-weight remains too high for biodegradation, so they persist in the environment, getting smaller and smaller over a period of many decades.

6.7 However, if plastic products are made with oxo-biodegradable technology, and get into the open environment intentionally or by accident, the molecular-weight of the plastic will reduce much more quickly and it will cease to be plastic. It will then have become a source of nutrition for naturally-occurring micro-organisms. This technology is suitable for almost all products made with polyethylene or polypropylene, but is not used for Polyethylene Terephthalate (PET) or Polyvinylchloride (PVC).

6.8 Because conditions in the open environment are variable a broad indication only can be given as to timescale. It is however possible to say with certainty that at any given time and place in the open

environment an oxo-biodegradable plastic item will become biodegradable significantly more quickly than an ordinary plastic item.

6.9 It is not important how long a specific piece of plastic in a particular place will take to biodegrade – the importance of oxo-biodegradable technology is that it will reduce the dwell-time and therefore the overall burden of plastic in the environment much more quickly than would otherwise be the case. Of course, we don't want plastic in the environment at all, but that is not the present reality.

6.10 There is resistance to this technology from some large companies who make "bio-based plastics" and from other large companies who will not spend an extra 1% on oxo-biodegradable technology to protect the environment from their products, which everyone can see with their name on them, littered all over the globe.

6.11 There has however been aggressive lobbying of governments and international institutions, coming especially from Germany and Italy. One of their lobbying organisations, the BBIA has recently lobbied the UK government in a letter which contains many misleading allegations see https://bioplasticsnews.com/2020/06/04/battle-biodegradable-oxo-compostable-industry/

7. THE SCIENCE

7.1 Policymakers know that thousands of tons of plastic are getting into the open environment every day, and that we may soon have more plastic in the ocean than fish, but what are they doing about it? They are trying to reduce the amount of plastic we use, and to recycle as much of it as possible, but they know that some of it will still get into the open environment.

7.2 Foremost among the scientists who invented oxo-biodegradable plastics was Professor Gerald Scott, who was Professor of Chemistry at Aston University, and was in later years the Chief Scientific Adviser to the OPA. He published the results of his work in many scientific publications including "Polymers and the Environment" - Royal Society of Chemistry 1999 and "Degradable Polymers: Principles and Applications"- Kluwer Academic Publishers 2002. He was also the holder of several patents for the technology. All of Professor Scott's published work, and that of many other scientists on this subject, both published and unpublished, can be made available to the Scottish Government on request.

7.3 In these publications the polymer scientists have made it clear that oxo-biodegradable plastic will degrade and then biodegrade in the open environment very much more quickly than ordinary plastic, leaving no persistent fragments and no toxicity. Polymer scientists were the authors of the standards for oxo-biodegradable plastics (ASTM D6954 and BS 8472) and it is not therefore correct for anyone to say that there is insufficient evidence, or that there are no relevant standards.

7.4 Oxo-biodegradable plastic will prevent plastic lying or floating around for decades, and it has been used successfully around the world for more than 20 years. It has been used by the largest bakery in the western world for more than 10 years with no problems relating to the environment or to recycling, and a few forward-looking governments in the Middle East have actually made it compulsory.

7.5 In 2018 the scientific evidence was reviewed by a distinguished former deputy judge of the High Court in England. https://www.biodeg.org/uk-judge-find-the-case-for-oxo-biodegradable-plastic-proven/ This has been confirmed by later research published by Queen Mary University London in February 2020. https://www.biodeg.org/wp-content/uploads/2020/05/published-report-11.2.20-1.pdf Para. 2.3 of this report shows that the biodegradation of oxo-LDPE was 90-fold greater than that of LDPE.

7.6 Most recently, on 4th September 2020 scientists at the Laboratoire d'Océanographie Microbienne (LOMIC) reported on a four-year study funded by the French government, of oxo-biodegradable plastics in the marine environment. See below under "Marine Environment."

7.7 Life-cycle analyses have been done, which show that oxo-biodegradable plastics have good environmental credentials. See below.

7.8 So why are all governments not making oxo-biodegradable plastic mandatory, and instead trying to ban it and allowing ordinary plastic (which they know causes microplastics) to continue in use? In some cases because they are under inappropriate pressure from multinational commercial interests, and in others because they see no complete consensus among the scientists. There is however sufficient consensus to enable a decision to be made. There is consensus on the following points:

- Ordinary plastics fragment into microplastics under the influence of weathering, but for many decades their molecular-weight remains too high to allow biodegradation.
- Adding a pro-degradant catalyst at manufacture reduces the molecular-weight much more quickly if the plastic escapes into the open environment.
- The only environmental conditions necessary for oxo-biodegradation are oxygen and bacteria, both of which are ubiquitous in the open environment. No special conditions are necessary.
- Bacteria found on land and sea are able to consume the low molecular-weight residues of plastic.
- These residues are not toxic
- There are already Standards in place which are suitable for testing oxo-biodegradable plastic.

Disagreement remains about:

7.9 *RATE*: How long it takes before the plastic becomes biodegradable. Timescale depends on the composition of the plastic, how old it is when it gets out into the environment, and the environmental conditions to which it is exposed. Sunlight and heat are not essential, but they will accelerate the process, and it is most unlikely that a piece of plastic litter will not be exposed to one or both of these.

7.10 Plastic litter tends to blow around on the surface of land or float on the surface of water, where oxygen and light are abundant but if exceptionally it gets quickly into cold, dark, conditions it will degrade more slowly but still more quickly than conventional plastic. The abiotic process of degradation is unstoppable unless the plastic is completely deprived of oxygen, which will not occur in the open environment. If of course the plastic is collected and taken to landfill or incinerated, it has been responsibly disposed of and is no longer a problem.

7.11 It is known that conventional plastic fragments do not become biodegradable for many decades, but it is possible to say with certainty that at any given time and place in the open environment an oxo-biodegradable plastic item will become biodegradable significantly more quickly than an ordinary plastic item. That is the point. - Do we want ordinary plastic which can lie or float around for decades, or oxo-biodegradable plastic which will be recycled back into nature much more quickly?

7.12 *EXTENT:* Will it fully biodegrade? It is well known that plastic whose molecular weight has been significantly reduced is biodegradable, and we have heard no reasons from any scientist why, once the process has commenced, it should not continue until biodegradation is complete.

7.13 *CONSENSUS*: In summary therefore, there is sufficient consensus to enable decision-makers to conclude that oxo-biodegradable plastic is better for the environment than ordinary plastic, and to decide to stop plastic accumulating in the environment, by requiring it to be oxo-biodegradable. Delay about this is no longer an option, because thousands of tons of plastic are getting into the open environment every day where they will lie or float around for decades.

8. RE-USABLE BAGS AS AN ALTERNATIVE?

8.1 It is obvious that a new single-use bag or package is much less likely to spread disease than one which has been re-used a dozen times.

8.2 Re-usable bags are rarely, if ever, washed, and are often stored in a cupboard or boot of the car where germs can multiply. Deadly micro-organisms such as Coronavirus, E.coli and Campylobacter can be transferred to food inside the bag.

8.3 On 18th August 2020 The Daily Telegraph wrote "The bag for life is not a synthetic comrade with you until your last breath, it turns out - more an acquaintance briefly entertained before being roundly ditched. Or so say Morrison's, who have begun phasing out their plastic offerings in favour of reusable paper ones over concerns that a bag for life had in fact become a 'bag for a week' habit among British shoppers."

8.4 With regard to their environmental credentials, scientists at RMIT University, Melbourne found that reusable shopping bags are only beneficial to the environment if they are used at least 104 times. This is because thicker plastic bags require more plastic and more energy to produce than lightweight bags. Also, they will create greater plastic pollution, including microplastics, if they escape at the end of useful life, unless they are made with oxo-biodegradable technology, which can be programmed to start degrading in whatever timescale is required.

8.5 There is therefore a solution for those who still prefer re-usable bags. They can be made with both oxo-biodegradable and anti-microbial technology which can be incorporated into the polymer used for making the bags, and can also be incorporated into the laminate coating inside jute or cloth bags.

9. PAPER AS AN ALTERNATIVE?

Isn't it better to use paper instead of plastic?

9.1 Some supermarkets (most recently Morrisons and Waitrose) have shifted to single-use paper bags, but this is a worrying trend, as paper bags can have much higher environmental impacts. A 2011 study for the Northern Ireland Assembly found that paper bags generally require four times as much energy to manufacture as plastic bags, and cause 70% more atmospheric pollution. The process uses huge amounts of water and creates unpleasant organic waste. Recycling of paper is often uneconomic and uses toxic chemicals. When it degrades, paper will emit methane in anaerobic conditions. Manufacturing paper requires trees to be cut down, but plastic is made from a by-product of oil refining, which will be available until the day when all engines are driven by electricity .

9.2 A stack of 1,000 new plastic carrier bags would be around 2 inches high, but a stack of 1,000 new paper grocery bags could be around 2 feet high. It would take at least seven times the number of trucks to deliver the same number of bags, creating seven times more pollution and road congestion.

9.3 Also, because paper bags are not as strong as plastic, people may use two or three bags inside each other. Paper bags are not normally re-used, and are useless if they get wet.

9.4 A February 2018, Life cycle assessment of carrier bags in Denmark concluded that "When factors like ozone depletion, human and ecosystem toxicity and water and air pollution are accounted for, paper bags would need to be reused 43 times to have a lower impact than the average plastic bag." They are not of course durable enough to do this.

9.5 "There have been unforeseen consequences in the Irish Experience [taxing plastic bags] resulting in an increase in the use of paper bags which are actually worse for the environment …" … (Ben Bradshaw, UK Environment Minister, 4 August 2006).

9.6 plastic straws are a much better alternative to paper, provided that they are made oxo-biodegradable.

10. REFILLABLES?

10.1 Concern with the in-store refill model is the reduction in shelf-life for some products. Some fresh drinks would last just two days if poured into a customer's own bottle, compared to 20 to 30 days in a factory-sealed container.

11. LIFE CYCLE ASSESSMENTS

11.1 Plastic is actually the best material for a wide range of everyday uses. Not only is it much the best for protecting our food from contamination and preventing food-waste and disease, but it also has a much lower global-warming potential than other materials used for packaging, according to LCA's performed by Intertek. https://www.biodeg.org/subjects-of-interest/life-cycle-assessments/

11.2 Plastic is made from a by-product of refining oil, which is extracted to make fuels, and these fuels would be made whether plastic existed or not, so plastic is not itself causing any depletion of fossil-resources. When the plastic becomes waste, its calorific value can be used to generate heat and electricity if, instead of being sent to landfill or if unsuitable for recycling, it is sent to modern, non-polluting, thermal-recycling units.

11.3 A Life-cycle Assessment by Intertek shows that when the litter metric is included, OBP is the best material for making carrier bags. See https://www.biodeg.org/wp-content/uploads/2020/09/intertek-final-report-15.5.121.pdf This is referred to at footnotes 45 and 50 in the Environmental Assessment for the Scottish consultation.

11.4 The only problem with plastics is the length of time they can lie or float around if they escape into the open environment, but this problem can now be solved as explained above.

12. "COMPOSTABLE" PLASTIC AS AN ALTERNATIVE?

12.1 "Compostable" plastics are not relevant to the main problem facing governments today – ie plastic waste which has escaped into the open environment, from which it cannot realistically be collected and taken to a composting facility.

12.2 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. It is required by ASTM D6400 and EN13432 to convert rapidly into CO2 gas, and the last thing the planet needs is more CO2. Further, if you can collect a piece of plastic there are better things to do with it than waste it by turning it into CO2.

12.3 The German courts in Güthoff v Deutsche Umwelthilfe (2014) decided that it is deceptive to market plastic as "compostable."

12.4 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 a Danish court ruled in Ellepot v Sungrow that "compostable" PLA plastic plant pots must not be described as biodegradable.

12.5 These plastics are often marketed as renewable, but this ignores the fossil fuels used 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.

12.6 This marketing claim also ignores the land and water resources devoted to producing the raw materials, which could 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" which would of course be completely unsustainable.

12.7 Although these plastics are marketed as "bio-based" they can contain up to 60% oil-based material, but this is hardly ever mentioned in the marketing material.

12.8 As mentioned above, conversion of organic materials to CO2 at a rapid rate during industrial composting does not create compost, and is not "recovery." Nature's lignocellulosic wastes do not behave

in this way, and if they did they would have little value as soil improvers and fertilisers, having lost most of their substance and their carbon.

Another problem with polymers manufactured from crops, is that they not only use scarce land and water resources, but they have significant impacts upon eutrophication due to the application of fertilizers to land.

12.9 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.

12.10 Moreover, plastics marketed as compostable are far too expensive for everyday use, and there are few industrial composting facilities available. In any event the industrial composters do not want plastic of any kind.

12.11 In January 2020, the industrial composters of Oregon gave 9 reasons why they did not want it: https://bioplasticsnews.com/wp-content/uploads/2019/04/Oregon-composters-dont-want-Compostable-Packagine.pdf

12.12 Then the City of Exeter UK rejected it. https://www.biodeg.org/rejects-compostable-plastic-and-paper/

12.13 Then the City of Toronto, Canada https://www.cbc.ca/news/technology/plastic-packaging-compostable-plastic-marketplace-1.5487617

12.14 Then the SUEZ waste-management company https://www.usinenouvelle.com/article/sacs-plastiques-compostables-le-grand-malentendu.N926789

12.15 Then a devastating exposé on Netherlands television https://bioplasticsnews.com/2020/02/17/the-composting-fairy-tale/

12.16 And another TV exposé in Canada about how compostable plastics are typically not being composted but instead sent to landfill or incineration. https://www.cbc.ca/news/technology/plastic-packaging-compostable-plastic-marketplace-1.5487617

12.17 Many areas do not have industrial composting plants, and the Welsh Government has refused to invest in them. https://www.bbc.co.uk/news/uk-wales-47238220

12.18 Plant-based compostable plastics are going to landfill rather than recycling because so many local authorities are unable to deal with them.

12.19 "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.

12.20 There are at least 21 reasons why "Compostable" plastic is not useful https://www.biodeg.org/wp-content/uploads/2020/05/21-reasons-why-1.pdf

13. HOME COMPOSTING

13.1 Home composting of plastic is dangerous and should not be encouraged. This is because householders are unlikely to be aware of any Standard for home-composting, and would probably not understand it anyway. Home composting is not therefore likely to be conducted by a process appropriate for plastic.

13.2 A study for the French government at https://www.ademe.fr/sites/default/files/assets/documents/compostage-domestique-industriel-sacs-plastiques-papier_2019.pdf 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 25oC - 50oC. It is unlikely that all of these conditions will be met by individuals."

13.3 The 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."

13.4 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."

13.5 Worse still, there is a danger that the plastic may have been contaminated by pathogens e.g. from putrifying food, and that the temperature in a home compost may not be high enough to kill those pathogens.

14. RECYCLING

14.1 Users of any plastic recyclate cannot assume that the recyclate does not contain pro-oxidants.

14.2 Conventional plastics may contain pro-oxidant additives that were added for different intended functionalities. Moura et al. (1997) described that colorants in general can act as pro-oxidants. If they partake in the creation of radicals or reactive oxygen species, such as singlet oxygen (1Δg), they can trigger photo-degradation of the polymer matrix." "Conventional plastic products (n = 23) were found to regularly contain Fe, Ba, Ti, Zn, Cu and V. Some individual conventional plastic bag samples also contained Cr and Pb" "Thus, a potentially much higher number of plastics on the market may match the current legal definition of oxo-degradable plastics without being advertised or intended as such, i.e. unintentional ODP."

14.3 Further, the Austrian specialist laboratory TCKT said in para. 1 of its March 2016 report. https://www.biodeg.org/wp-content/uploads/2020/06/TCKT-Report-17.3.161.pdf that "long-life films should be made with virgin polymer, or be stabilized to deal with loss of properties caused by the recycling process, whether or not any pro-degradant additive is present. Such stabilization would effectively neutralize the effect of any pro-degradant additive."

14.4 Although oxo-biodegradable plastic is used for low-value items which are not worth recycling, the experts in Austria (TCKT Report para. 4) and South Africa (Roediger Report May 2012 page 3 https://www.biodeg.org/wp-content/uploads/2020/12/ROEDIGER-REPORT-21-May-2012.pdf have confirmed that if anyone wished to recycle them, they may be recycled without any significant detriment to the newly formed recycled product.

14.5 This accords with the experience of OPA members who have recycled many thousands of tons of oxo-biodegradable plastic over the past 20 years without any adverse effects.

14.6 The experts also found that "compostable" plastics are not recyclable in a conventional plastic waste-stream. This is well known, but is seldom heard as an objection to that type of plastic.

14.7 Having considered all the issues mentioned above policymakers have to decide whether recycling is any sufficient reason to object to oxo-biodegradable technology and continue to allow ordinary plastic to be used for short-life packaging, which could get into the open environment and lie or float around for many decades. In our view it is not.

15. STANDARDS

15.1 We sometime hear it said that there are no robust standards for testing oxo-biodegradable plastics.

15.2 The main Standards for testing oxo-biodegradable plastic are ASTM D6954 (USA); BS8472 (UK); AFNOR AC T51-808 (France); and SPCR 141 (Sweden). Variants of these standards have also been adopted in other countries, such as SASO 2879 in Saudi Arabia, and 5009/2009 in the UAE

15.3 ASTM D6954 contains six pass/fail criteria. 1. For the abiotic phase of the test (6.3 - 5% e-o-b and 5,000DA) 2. The tests for metal content and other elements (6.9.6), 3. Gel content (6.6.1), 4. Ecotoxicity (6.9.6 -6.9.10), 5. PH value (6.9.6) and 6. For the biodegradation phase (for unless at least 60% of the organic carbon is converted to carbon dioxide the test cannot be considered completed).

15.4 It is for customers and governments to decide what timescales are acceptable to them.

15.5 European standard EN 13432 and ASTM D6400 apply to biodegradation of plastic packaging under industrial composting conditions, but they are not appropriate for testing oxo-biodegradable plastics because they require the emission of CO_2 (a greenhouse gas) at a very high rate.

15.6 If a leaf were subjected to the CO_2 emission tests included in these Standards it would not be considered biodegradable or compostable.

15.7 EN 13432 does not apply at all to applications other than composting of packaging, and para. 1 makes it clear that it does not apply to packaging waste which may end up in the environment through uncontrolled means, i.e. as litter.

16. NON-TOXICITY

16.1 The Oxo-biodegradable industry is as much concerned as anyone that its products should not introduce toxicity into the environment, and for this reason the Standards for oxo-bio require testing to confirm that the residues are harmless. They have to pass the same tests as "compostable" plastic to ensure that there is no toxicity and no metals exceeding the prescribed limits.

17. THE MARINE ENVIRONMENT

17.1 On 4th September 2020 scientists at the Laboratoire d'Océanographie Microbienne (LOMIC) reported on a four-year study funded by the French government, of oxo-biodegradable plastics in the marine environment, citing six earlier scientific reports.

17.2 The purpose of the ANR-OXOMAR project is to investigate whether oxo-biodegradable plastics will fully biodegrade in a reasonable time in the marine environment, and to investigate whether oxo-biodegradable plastic or its by-products create any toxicity in the marine environment. It involves the complementary expertise of four independent laboratories (CNEP, LOMIC, ICCF, and IFREMER).

A summary of the results says:

17.3 "We have obtained congruent results from our multidisciplinary approach that clearly shows that Oxo-biodegradable plastics biodegrade in seawater and do so with a significantly higher efficiency than conventional plastics. The oxidation level obtained due to the d2w prodegradant catalyst was found to be of crucial importance in the degradation process. Out of the six-formulations tested, the Mn/Fe pro-oxidant was the most efficient, with no toxic effects under our experimental conditions. Biodegradability was

demonstrated either by using the culture bacteria Rhodococcus rhodochrous or by a complex natural marine community of microorganisms."

17.4 According to Dr. Jean-François Ghiglione, one of the LOMIC scientists "Oxo-bio plastic will float and be at almost all times subjected to UV light, which accelerates the abiotic phase of degradation. This is not always the case on land, where plastic pieces are often covered by soil, leaves etc. and are less exposed to UV light." He points out that "there are specific bacteria living in the "sea-surface microlayer" (the top millimetre of the ocean surface), where bacteria are different from those further below the surface. The bacteria in the sea-surface microlayer are particularly adapted to a hydrophobic environment (e.g. where oil materials are floating) and these bacteria are known to present a high capability for hydrocarbon degradation."

17.5 "Some marine bacteria, such as Alcanivorax borkumensis and R. rhodochorous are noted for their ability to biodegrade hydrocarbons and they are ubiquitous in the oceans. They occur in low concentrations in unpolluted seas but are observed to accumulate in waters polluted by oil spills. When presented with a source of carbon which is recognisable to the microorganisms as food, it seems therefore that they will respond with increased populations. The relatively low concentrations of microorganisms found in unpolluted oceans is not therefore a reason for expecting slow biodegradation."

17.6 Evidence is available - from tests done in real time at the Bandol research station on the coast of France that oxo-bio plastic will degrade to low molecular-weight materials under natural conditions in water, and samples aged under those conditions were studied at Queen Mary University London where the abiotically degraded plastic was presented as the only source of carbon available to the bacteria.

The samples were proved to be biodegraded by bacteria commonly found in the oceans, and separate samples were biodegraded by bacteria commonly found on land. The degraded plastic was also proved to be non-toxic to those bacteria.

17.7 " For the OPA response to the Plymouth report see https://www.biodeg.org/wp-content/uploads/2020/05/opa-comments-on-plymouth-10.pdf

18. AGRICULTURE

18.1 Oxo-biodegradable plastic mulching films have been successfully trialled in Wales. For the report see https://www.biodeg.org/wp-content/uploads/2020/09/Pembroke-Mulch-Film-Trial-Report-30.09.13V1.pdf

18.2 The commercial benefit of using oxo-biodegradable plastic film is that the farmer will no longer have to pay to have acres of contaminated plastic removed from his farm. The environmental benefit is that heavy vehicles will no longer have to drive around the country lanes collecting contaminated plastic, consuming fossil fuels, emitting pollutants, and occupying road space.

19. PROPENSITY TO LITTER?

19.1 It is sometimes claimed that biodegradable plastics are likely to encourage littering, but if true, this also applies to bio-based plastics.

19.2 However, even if there were a label describing a product as biodegradable, it is unlikely that the people who deliberately cause litter will look for the label before deciding to throw a plastic item out of a car window. Further, even if it were true that biodegradability encourages littering, and supposing for the sake of argument that there would be 10% more litter - is it preferable to have 110 plastic items in the environment which will degrade and biodegrade in a few years or even months, or 100 plastic items which will lie or float around for many decades?

19.3 It is not acceptable to continue debating this speculative proposition any longer, while thousands of tonnes of conventional plastic are getting into the environment every day, which will accumulate and pollute the environment for decades into the future.

20. GENERAL ISSUES

20.1 For the reasons given above, the OPA would not wish it to be thought that we agree with the general proposition that single-use plastics should be banned. However, we do consider that they should no longer be made with conventional plastic.

20.2 In January 2020 a report was published by the Green Alliance https://www.green-alliance.org.uk/plastic_promises who had interviewed representatives from five of the UK's major supermarkets as well as from major consumer goods and beverage companies. One of them had received complaints saying that "plastic is evil and has no place, regardless of any positives it might have in addressing food waste and what not… the complaints have been ferocious."

20.3 However, the report finds that "Worryingly, the brands report that decisions to switch away from plastic are often made without considering the environmental impact of the substitute materials chosen." Multiple interviewees indicated the desire to avoid "kneejerk reactions" and another noted: "there's a lot of pressure to move to alternatives, which aren't necessarily better from an environmental and climate-impact point of view."

20.4 The Report says that some decisions have been taken knowing it could actually increase environmental burdens. One supermarket representative was frank: "We are aware that [by switching from plastic to other materials] we may, in some cases, be increasing our carbon footprint" and a brand representative bluntly complained about misinformation being spread about the environmental credentials of non-plastic single use packaging formats:

"The past year has really annoyed me with companies coming out and boasting about not using plastic, even when they're in single use glass, and their carbon emissions are going to be off the scale."

21. CORONAVIRUS

21.1 The virus has shown that it can defeat the human immune system, so it is essential to destroy it before it gets into the human body. The pandemic has made everyone realise that single-use plastic is essential to protect us from the spread of disease, and plastic can be given anti-microbial properties.

21.2 The most effective way to protect against microbes is not by spraying or wiping, but by making surfaces in contact with microbes permanently lethal to bacteria and viruses. This can be done simply and at reasonable cost with plastic, but not with any of the alternative materials such as paper, carboard, cloth, jute, glass, or metal (except silver, which is too expensive).

21.3 To see how it can be done with plastic see https://bioplasticsnews.com/2020/07/23/symphony-environmental-first-plastic-stop-corona-virus/

London 31st December 2020