Greenpeace Position on Single-Use Plastic Products and potential bio-based material substitutes

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Note: *This scope of this position paper is limited to bioplastics and paper/paperboard as the most commonly promoted material substitution alternatives to single-use fossil based plastic. It only deals with single-use PLASTIC products (not glass, steel, etc.) and bio-based material substitutes (not other material substitutes). It is not a Greenpeace position on the (over)consumption of plastics and paper based products in general.*

Context

Regardless of what we consume, the sheer scale of today's consumption of natural resources is overwhelming the planet's natural ecosystems. Whether it is the use of plastic, or paper-based packaging, the current consumption model in many places is driving an exceedance of the planetary boundaries 'safe operating space.[1]

To truly tackle the problems associated with overconsumption of single-use products and packaging[2], we need a systemic shift away from today's throwaway culture[3] that is still being promoted by many economic actors. Currently we are seeing a focus on material substitution of single-use plastics, in particular through bioplastics[4] and paper or paperboard, by a number of companies.[5] However, raw material substitution risks shifting the impacts from one area to another, for example from pollution in the oceans to unsustainable use of forests and agricultural lands.

Greenpeace believes there needs to be an urgent systemic shift away from throwaway dependent models and towards a new business model that prioritizes the reduction of raw material needs, through alternative product delivery designs and long-living and re-usable products. This could include refill and reuse systems, a combination of approaches or totally new delivery and provisioning systems.[6]
Companies need to fundamentally rethink the way that products are delivered to people, focusing on radical reduction of single-use products and packaging, and therefore the raw materials used. Reducing demand of single-use products will free up biomass feedstock resources for priority uses.
Collectively we need to go beyond single-use dependant habits and norms altogether if we want a pollution-free planet and an economy operating within planetary boundaries for natural resources and ecosystems.

The problem

Corporate creation of the throwaway culture as a business strategy and recycling as the primary approach to address the plastic pollution crisis.

In 2015 approximately 40 percent of plastic produced was used for packaging.[7] Since the 1950s corporations and their advertising have actively created, promoted and facilitated the throwaway culture and consumer desires that drive the need for this packaging.[8] Some of the companies whose business models depend on single-use plastics, such as the Fast Moving Consumer Goods companies, are focusing predominantly on 'recyclability' to mitigate this.[9]

However, since the 1950s only 9% of all the plastic waste generated has been recycled.[10] The World Economic Forum estimates that globally "*32% of plastic packaging* [by volume] *escapes collection systems".*[11] In developed countries the current recycling rate for plastics collected by households is often far less than 50%, with minimal amounts recycled back into packaging[12] and large amounts of plastics collected for recycling are routinely exported[13], with no way of knowing whether these materials are actually recycled, downcycled, disposed of, or leaked to the environment.

Marine impacts

Globally, the equivalent of a truckload of plastic waste enters the oceans every single minute.[14] These plastics can take centuries to break down and appear to be accumulating in the marine environment. Impacts on marine wildlife through ingestion and entanglement are widespread and can be severe. Of 135 species of seabird studied around the globe so far, 59% have already been reported to have ingested plastic and this is only projected to get worse over time.[15] Similar percentages have been reported for whale and dolphin species around the world, with indications that plastics may well be a significant threat to the conservation of some species.[16] If current production and waste management trends continue, an estimated 12 billion tonnes of plastic waste will be in landfills or polluting the natural environment by 2050.[17]

The impacts of paper production

Since 1961, the global production of wood-based pulp has nearly tripled and continues to rise, to a staggering 172 million tonnes per year in 2016.[18] Driven by a relentless growth in the use of paper and packaging based products (26% increase since the year 2000[19]) this already puts immense pressure on forest resources. While the demand for printing paper is on the decrease, the consumption of paper-based packaging and tissue products, both mainly for single-use, is greatly increasing.[20]

There is an urgent need to halt and reverse such trends in the consumption of single-use paper products. Much larger areas of forests need to be protected and restored, if we want to avoid catastrophic climate change, protect biodiversity and the rights of Indigenous Peoples and local communities.[21] This leaves no space for increased rates of logging at a global level, that would likely result from simply replacing single-use fossil-based plastics with paper alternatives. Besides its impact on limited forest resources, the pulp and paper

sector is also "a*mongst the top industrial energy consumers*"[22] worldwide, as well as one of largest consumers of water[23].

Bioplastics can pollute too

With various new bioplastic polymers under development and expected to enter the market soon, the global production capacity of '*bioplastics*' was 2 million tonnes in 2017 and is increasing.[24,25] According to European Bioplastics, bio-based (or partly bio-based), non-biodegradable plastics represents 57% of current global '*bioplastic*' production capacity, whereas bio-based biodegradable plastics account for around 38% and biodegradable fossil-based plastics for around 5%. More than half of the '*bioplastics*' produced are used as packaging materials.[26]

Whilst often promoted as 'sustainable alternatives' to fossil-based plastics, bioplastics can pollute as much as their fossil-based equivalents do.[27] This is due to the fact that, although labelled as biodegradable, the complete biodegradation of bioplastic products requires controlled conditions of heat and humidity which allow the necessary microorganisms to flourish. These are rarely, if ever, met in the marine environment. In the case of most biodegradable plastics, therefore, those theoretical biodegradable properties will not reduce the quantity, or the risks, of physical or chemical impacts of these plastics once they reach the ocean.[28]

Other bioplastics are designed to be non-biodegradable, suitable for material recycling alongside conventional fossil-based plastics. Most biodegradable bioplastics cannot be recycled in the same way as non-biodegradable bioplastics. However biodegradable bioplastics can easily be confused with, and are difficult to separate from, non-biodegradable plastics and enter the current conventional plastic recycling processes where they can lower the quality of recycled materials. Many labelling, sorting, recycling and composting systems are not designed to separate and treat them adequately.[29] In addition, non-biodegradable bioplastics will likely require the addition of similar additive chemicals to those used in conventional plastics, in order to confer specific properties. Some of these additives are harmful to health.[30] We cannot simply assume that the additives used in bioplastics will be inherently less harmful, even if there is a trend towards the development of alternative plasticisers and other additives for bioplastic applications.[31]

Pressures on bio-based feedstocks

The growth of plastics production in the past 65 years has substantially outpaced any other manufactured material[32], with production volumes increasing 20 fold over the last 50 years[33]. Over 90% of plastics produced are currently derived from virgin fossil-based feedstocks.[34] The Ellen McArthur Foundation (EMF) estimates that this represents, for all plastics (not just packaging), about 6% of global fossil oil consumption[35], which is equivalent to the oil consumption of the global aviation sector.[36] Under business-as-usual scenarios, the EMF forecasts plastic production will almost quadruple by 2050 (from 311 million tonnes in 2014 to 1,124 million tonnes by 2050).[37]

Although new technologies and feedstocks (i.e. seaweeds, other algae, methane, organic waste, etc.) are under development, the major feedstock for bioplastic currently is still from agricultural products.[38] In 2018 over three quarters of global production of bioplastics was

expected to be taking place in Asia[39], where related production impacts include land degradation and a loss of natural habitats, reduced water quality, increased levels of pollution and land conflicts[40]. Thus, an accelerating market demand for bioplastics to substitute the forecasted increases for plastics used for packaging and other single-use applications would continue to contribute to these negative impacts. Some studies also estimate that increased bioplastic consumption leads to deforestation and greenhouse gas emissions from (mostly forestry related) land use changes on a global scale.[41]

As far as we are aware, so far no comprehensive certification for precautionary, ecological agriculture compatible, bioplastic feedstocks exist[42] and while using Forest Stewardship Council (FSC) certified materials for sourcing feedstocks from responsible forestry can be a useful tool, additional due diligence is often required.[43] In addition, the industrial production of feedstock for bioplastic risks creating socio-economic impacts in producing countries, by fuelling export led commodity crop economies that extract resources and make a few people richer and the majority poorer. This may create barriers for the surge of more localised food systems and systems where the power lies with farmers and people, not agribusiness and commodity traders.[44]

In short replacing the forecasted, 'business as usual' growth of fossil-based feedstocks for plastics with biomass feedstocks, would significantly increase the existing burden on our planet's ecosystems, in particular on forests and agricultural systems and communities.

Greenpeace's Position

Greenpeace believes the following areas should be prioritised to start addressing the issues related to single-use plastics identified above.

1) **REDUCE: Massively reduce the production of single-use plastic products and packaging**

Given the predicted business-as-usual growth in plastics and the limitations of recycling to mitigate this, **priority should be given to reduce the production of single-use plastic products and packaging, and not simply substitute one material with another**.

Current business strategies need to fundamentally shift away from creating a global plastic pollution crisis by promoting and producing single-use disposable products and only offering recycling as a primary solution. **Solving the plastic crisis will require fundamental changes in company business models, going beyond immediate reductions through elimination of the most problematic and unnecessary single-use plastics, to shifts to reusables and refillables and totally new delivery and provisioning systems.**[45] Ultimately business models need to aim to produce less, and for non-packaging products in particular provide services to upgrade and repair.

Governments and regulators will have a key role to play in demanding, incentivising and regulating a transition of business models. Communities need to continue supporting this transition, demanding[46] and creating solutions that enable new lifestyles and new ways of doing business[47].

Recycling has a role to play in the overall reduction in the use of raw materials and the creation of circular economies for durable and long-lasting products, preventing further waste accumulation in the environment. However, while meeting reuse and recycling targets should be a regulatory and mandatory responsibility of companies who put products on the market, recycling needs to be regarded as an important supplementary strategy and not a substitute for the overall reduction in the dependance on single-use products.

2) RE-THINK: Greater innovation in how goods and services are provided to institutions, communities and individuals

The increase in use of single-use plastic items by consumers are a consequence of decades of marketing efforts that shifted social norms and desires and created the consumer habits[48] and culture[49] of today.

To get out of single-use based systems, we believe we need

- a shift in consumer culture, through campaigns, to change social norms[50] and consumption environments[51] ;
- innovation in how goods and services are provided to people, as well as more durable and/or reusable products and packaging that will support such a shift.[52]

How this will be achieved in each location and system will vary greatly depending on the cultural and technological context and the products available on the market but corporate responsibility will need to include the development, and marketing, of such innovations.

3) RE-PRIORITISE: Apply a strict precautionary approach to ensure demand for biomass feedstocks does not intensify competition for forest and agriculture land resources

Agricultural crops (or their residues) should first be utilised for food production, for maintaining and enhancing soil fertility and for carbon storage.

Forest biomass should primarily be used in the manufacture of long-lasting products supporting the long-term storage of carbon, thus helping to reduce the increase in greenhouse gas emissions in the atmosphere. Forestry residues (eg branches) should primarily be used for maintaining soil fertility and biodiversity.

When not conflicting with above priorities, and not promoting the throwaway culture, a very limited (and preferably local) amount of forest biomass or agriculture crops and their residues could be used to produce essential single-use products. This should be the exception, rather than the norm, assessed on a case by case basis.

Sourcing of virgin raw materials used in the manufacture of such essential single-use products must ensure:

- Any agriculture crops and residues for bioplastics should be produced following the principles of ecological farming;
- Any wood raw materials should be sourced from responsible forest management[53], certified under the Forest Stewardship Council (FSC) scheme, with additional due-diligence for any high-risk sources. See Greenpeace's statement on the FSC for further guidance;
- For all biomass feedstocks the principles in Greenpeace's position on bioenergy should be applied.

References

[1] Steffen et al (2015). Planetary boundaries: Guiding human development on a changing planet. Science Vol. 347, Issue 6223, https://doi.org/10.1126/science.1259855

[2] Single-use products and packaging in the context of this position paper means any product or packaging that is intended or designed for one-time use, regardless of the recyclability of any component materials. Reusable products and packaging are those constructed of durable materials and designed to achieve multiple uses in its existing form without any physical or chemical modification. To qualify as reusable, there needs to be a reuse system in place that ensures it is reused where the item is placed on the market, and is able to prove a significant actual reuse rate.

[3] Hellmann et al (2018). The Throwaway Society: a Look in the Back Mirror, Journal of Consumer Policy Vol 41, Issue 1, pp 83–8741: 83. https://doi.org/10.1007/s10603-018-9371-6

[4] The term bioplastic or bio-based plastic refers to plastics based on biomass resources, such as sugar, starch, vegetable oils or lignocellulosic biomass. In this paper we use the term bio-based and bioplastics strictly on the basis of composition and origin of source materials only, referring to 100% biomass based materials and products. We do not define bioplastics on the basis of their biodegradability. bio-based plastics can be both biodegradable and non-biodegradable.

[5] For example, the use of bioplastics in beverage bottles as used by Coca-cola, the shift to paper-based straws used by McDonalds, a shift to paper-based food trays by Iceland.

[6] Delivery and provisioning systems are systems that supply and provide goods and services. For example the packaging of food, goods, etc.

[7] Table S3 2002-2014 in: Geyer et al (2017) Production, use, and fate of all plastics ever made, Supplementary Materials, Science Advances, Vol. 3, no. 7, July 19, 2017 http://advances.sciencemag.org/content/advances/suppl/2017/07/17/3.7.e1700782.DC1/1700782_SM.pdf

[8] Media Education Foundation (2017) Advertising at the edge of Apocalypse http://www.mediaed.org/transcripts/Advertising-at-the-Edge-of-the-Apocalypse-Transcript.pdf

[9] Greenpeace (2018) A Crisis of Convenience: The corporations behind the plastics pollution pandemic, Greenpeace International, 2018 https://www.greenpeace.org/international/publication/19007/a-crisis-of-convenience-the-corporations-behind-the-plastics-pollution-pandemic/

[10] Geyer et al (2017) Production, use, and fate of all plastics ever made, Supplementary Materials, Science Advances, Vol. 3, no. 7, July 19, 2017

[11] WEF (2016) The New Plastics Economy: Rethinking the future of plastics, World Economic Forum, January 2016. http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf

[12] Geyer et al (2017) Production, use, and fate of all plastics ever made, Science Advances, 19 July 2017, Vol. 3, no. 7 http://advances.sciencemag.org/content/3/7/e1700782.full; Less than 6% of discarded PET bottles, the most recyclable plastic, is recycled back into packaging in the US. Napcor (2017) Report on postconsumer PET container recycling activity in 2016, National Association for PET Container Resources, 2017 https://napcor.com/wp-content/uploads/2017/10/NAPCOR-APR_2016RateReport_FINAL.pdf

[13] Brooks et al (2018) The Chinese import ban and its impact on global plastic waste trade http://advances.sciencemag.org/content/4/6/eaat0131.full

[14] WEF (2016) op.cit.

[15] Wilcox, et al (2015) Threat of plastic pollution to seabirds is global, pervasive, and increasing. PNAS 112 (38): 11899-11904

[16] Baulch, S. & Perry, C. (2014) Evaluating the impacts of marine debris on cetaceans. Marine Pollution Bulletin 80 (1-2): 210-221

[17] Geyer et al (2017), Production, use, and fate of all plastics ever made, Science Advances, 19 July 2017, Vol. 3, no. 7 http://advances.sciencemag.org/content/3/7/e1700782.full

[18] FAO (2017). Forestry Production and Trade. Food And Agriculture Organization of the United Nations, Rome, 20 December 2017

[19] FAO (2017) Forestry Production and Trade. op.cit.. Figure refers to the period 2000-2016

[20] FAO (2017) Forestry Production and Trade. op.cit.

[21] Griscom et al (2017) Natural Climate Solutions. PNAS 114, 11645–11650 https://doi.org/10.1073/pnas.1710465114

[22] IEA (2017) Tracking Clean Energy Progress 2017. International Energy Agency. June 6 2017

[23] See e.g.: Statistics Sweden (2016) Water use in the industry sector. Statistiska Centralbyrån. 19 Sep 2016 http://www.scb.se/en_/finding-statistics/statistics-by-subject-area/environment/water-use/industrial-water-use-in-sweden/aktuell-pong/38898/behallare-for-press/409004/ (accessed 16 July 2018)

[24] European Bioplastics (2018) Bioplastics, facts and figures, 2018 http://docs.european-bioplastics.org/publications/EUBP_Facts_and_figures.pdf

[25] Please note that the figures and facts sourced from European Bioplastics are based on a definition and therefore scope that includes both bio-based bioplastics (biodegradable and non biodegradable) and fossil-based biodegradable so called 'bioplastics' and therefore are not strictly equivalent to bio-based bio plastics as we define them in this paper. Their figures can however be used to give a rough idea of scale and trends. Whenever figures refer to this 'mixed' definition of bioplastics we will use italicised form: *'bioplastics'*.

[26] European Bioplastics (2018) op. cit.

[27] For example, fragments of the biodegradable fossil-based polyester polycaprolactone have been found among more conventional plastics in surface water samples collected offshore in the Mediterranean Sea. Source: Suaria et al (2016) The Mediterranean Plastic Soup: Synthetic polymers in Mediterranean surface waters. Scientific Reports. 6. 37551. 10.1038/srep37551, November 2016 https://www.researchgate.net/publication/310791676_The_Mediterranean_Plastic_Soup_Synthetic_polymers_in_Mediterranean_surface_waters

[28] UNEP (2015) Biodegradable Plastics and Marine Litter, United Nations Environmental Programme, 2015

[29] EPR (2010) How to increase the mechanical recycling of post-consumer plastic, European Plastics Recyclers, February 2010 https://www.plasticsrecyclers.eu/sites/default/files/2018-05/PRE%20Strategy%20Paper%202012.pdf; PlastEurope.com (2013) EuPC calls on legislator to support separate collection of degradable plastic materials and ban oxo fragmentable plastics, 13 September 2013 https://www.plasteurope.com/news/PLASTICS_AND_ENVIRONMENT_t226315

[30] ECHA (undated) Chemicals in plastic products, European Chemicals Agency https://chemicalsinourlife.echa.europa.eu/chemicals-in-plastic-products (accessed 12 December 2018)

[31] Vieira et al (2011) Natural-based plasticizers and biopolymer films: A review. European Polymer Journal 47, 254–263. https://doi.org/10.1016/j.eurpolymj.2010.12.011

[32] Geyer et al (2017) Production, use, and fate of all plastics ever made. Science Advances, Vol 3, No. 7, 5 July 2017 https://doi.org/10.1126/sciadv.170078

[33] Ellen McArthur Foundation (2016) The New Plastics Economy: Rethinking the future of plastics. 19 January 2016 https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics

[34] European Bioplastics (2018) op cit : "Currently, bioplastics still only represent well under one per cent of the about 320 million tonnes of plastic produced annually"; The Ellen McArthur Foundation in its report The New Plastics Economy: Rethinking the future of plastics. 19 January 2016 https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics states "over 90%".

[35] Includes not just feedstock fossil oil use but also fossil oil used as production process fuel

[36] Ellen McArthur Foundation (2016) op.cit.

[37] Ellen McArthur Foundation (2016) op.cit.

[38] European Bioplastics (2018) op. cit.; IfBB (2017) Biopolymers, facts and statistics, Edition 4, Institute for Bioplastics and Biocomposites, 2017 https://www.ifbb-hannover.de/files/IfBB/downloads/faltblaetter_broschueren/Biopolymers-Facts-Statistics_2017.pdf

[39] Nova-Institute (2015) Bio-based Building Blocks and Polymers in the World, 5 nova-Institut GmbH, 2015 http://www.bio-based.eu/market_study/media/files/15-05-13_Bio-based_Polymers_and_Building_Blocks_in_the_World-nova_Booklet.pdf

[40] FoEE (2016) Land Under Pressure: global impacts of the EU bioeconomy, Friends of the Earth Europe, 2016 http://www.foeeurope.org/sites/default/files/resource_use/2016/land-under-pressure-report-global-impacts-eu-bioeconomy.pdf

[41] Escobar et al (2018). Land use mediated GHG emissions and spillovers from increased consumption of bioplastics. Environ. Res. Lett., accepted manuscript, 24 October 2018 https://doi.org/10.1088/1748-9326/aaeafb

[42] Even the Bioplastics Feedstock Alliance criteria, which is not a certification but a set of criteria for comparing different feedstocks, while covering some of the key principles of ecological agriculture, does not address some of them comprehensively enough e.g. on food sovereignty, local needs versus global commodification and local nutrient cycles.

[43] GPI (2018) Statement on Forest Certification and Guidance for Companies and Consumers, Greenpeace International, March 2018 https://storage.googleapis.com/planet4-international-stateless/2018/03/6b3d1c70-greenpeace-statement-on-forest-certification-and-guidance-for-companies-and-consumers_final.pdf

[44] FoEE (2016) op. cit

[45] For example shorter supply chains. Shorter supply chains can be defined those with short distance or few intermediaries between producers and consumers. In the food sector, examples are farmers markets or farm shops selling locally grown produce and community supported agriculture systems.

[46] BAN List 2.0 (2018) An analysis and call-to-action to phase out the most polluting plastic products used in the United States, Better Alternatives Now, May 2018 (see table on page 7) https://www.breakfreefromplastic.org/wp-content/uploads/2018/05/5Gyres_BANlist2.pdf

[47] For example plastic free stores https://www.eco-business.com/news/plastic-free-stores-mushroom-in-malaysia/ and https://zerowastemap.org/

[48] For example - Tea is part of the social fabric of Taiwan, there are an estimated 50,000 tea-shops around Taiwan serving up a total of 1.5 billion cups of bubble tea or similar tea drinks each year. https://taiwantoday.tw/news.php?unit=8,8,29,32,32,45&post=14053(accessed 10 December 2018). Bubble tea is dominantly a street food served in a plastic container and with an extra thick plastic straw. The proposed ban on straws by the Taiwanese government has lead to a major dispute with consumers over convenience. http://www.asahi.com/ajw/articles/AJ201807260001.html (accessed 20 November 2018)

[49] Culture can be generally defined as an interrelated set of values, tools, and practices that is shared among a group of people who possess a common social identity. More simply, culture is the sum total of our worldviews [mindsets] or of our ways of living [lifestyles]. Source: https://psychology.iresearchnet.com/social-psychology/cultural-psychology/culture/

[50] '*Social norms are informal understandings that govern the behavior of members of a society* [or group] … *Norms are regarded as collective representations of acceptable group conduct as well as individual perceptions of particular group conduct.They can be viewed as cultural products (including values, customs, and traditions) which represent individuals' basic knowledge of what others do and think that they should do*.'
Source: https://en.wikipedia.org/wiki/Social_norm

[51] The consumption environment is everything that makes the consumption of good or bad products easier or harder. This includes public and corporate policies, nudging, point of sale infrastructures, shelf placement etc.

[52] Some of these concepts exist already and need to be promoted (e.g. reusable cups and straws, refill systems, reusable transport packaging in retail, reusable cutlery and catering products etc), in other areas we need to see strong innovation efforts to come up with solutions (alternatives to plastic food labelling, alternatives to small dose-sachets, alternatives to vacuum wrap for perishables, shortening supply chains, increasing the repairability and upgradability of products etc).

[53] aiming to enhance ecological integrity including the protection of biodiversity, water, soils and carbon, socially responsible including respecting indigenous peoples' and worker rights, transparent and independently verified