Newsletter 04_2021

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Welcome to the 4th issue of the Newsletter BIO-PLASTICS EUROPE

This 4th issue of BIO-PLASTICS EUROPE's Newsletter marks the mid-point of our project. Despite difficult working conditions under pandemic restrictions, the project has been progressing well over the past two years, with two more to go.

We felt that it was time to share the results of our efforts on topics that are of interest to the general population. Our intention is not only to inform the public on those specific topics, but also to show how science-based work is developed and how we all can make better, informed choices based on research that is being undertaken in world-class institutions.

To those who have been in touch with our project and to the newcomers, we wish you all a great read!

THIS ISSUE

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Face masks – safe, but not sustainable

By Maren Fendt, Hamburg University of Applied Sciences, Germany

BIO-PLASTICS EUROPE is not only working in the lab, but also dedicated to raising awareness of waste management strategies of various plastic products – such as face masks. Looking back at that start, it is difficult to believe that the worldwide use of face masks started only one and a half years ago: In April 2020 - at the very start of the COVID-19 pandemic - the World Health Organization (WHO) recommended only certain groups to use professional face masks: health care professionals, people experiencing symptoms and people taking care of sick individuals. Healthy individuals were only advised to perform hand hygiene and apply social and physical distancing. The reasoning behind this decision was mainly a shortage of professional equipment as well as the risk of mask-misuse. In the following weeks, this recommendation was highly debated by national health authorities. The crucial point of those debates was the protective effect (effectiveness) of masks against the SARS-CoV-2 virus, even though there was not much evidence available yet. Against the recommendation of the WHO, many countries made it compulsory for the general population to wear masks in public spaces by May 2020. Today, there is enough evidence to confirm that community-wide use of masks can have a measurable impact on SARS-CoV-2 transmission rates.

At the same time, however, it is also well documented that the amount of waste associated with the use of masks, and in particular improper disposal, will have a long-term negative impact on the environment. Studies suggest that approximately 75% of the COVID-19 related waste will end up in landfills and in the ocean. More precisely, it is estimated that 1.5 million face masks may enter the ocean within a year. The environmental harm related to the incorrect disposal of face masks is far-reaching – it may take 450 years for a medical mask to fully biodegrade under natural conditions. Those masks will slowly degrade into microplastics which will not only damage flora and fauna, but also affect human health.

Image 1: Improper disposal of face mask. Photo by Brian Yurasits on Unplash

In view of these consequences, the choice of face mask should be influenced not only by the degree of effectiveness, but also by the degree of sustainability, particularly regarding their biodegradability dimension. Therefore, BIO-PLASTICS EUROPE provided easy-to-understand information featuring both aspects. We

have developed two Facebook and Instagram filter effects which have just been released on our social media channels. These filters illustrate the effectiveness and biodegradability of different types of masks, according to scientific literature, but in an entertaining way. With this innovative outreach, we hope to support people reflect on their daily mask choice as well as the correct way of disposal.

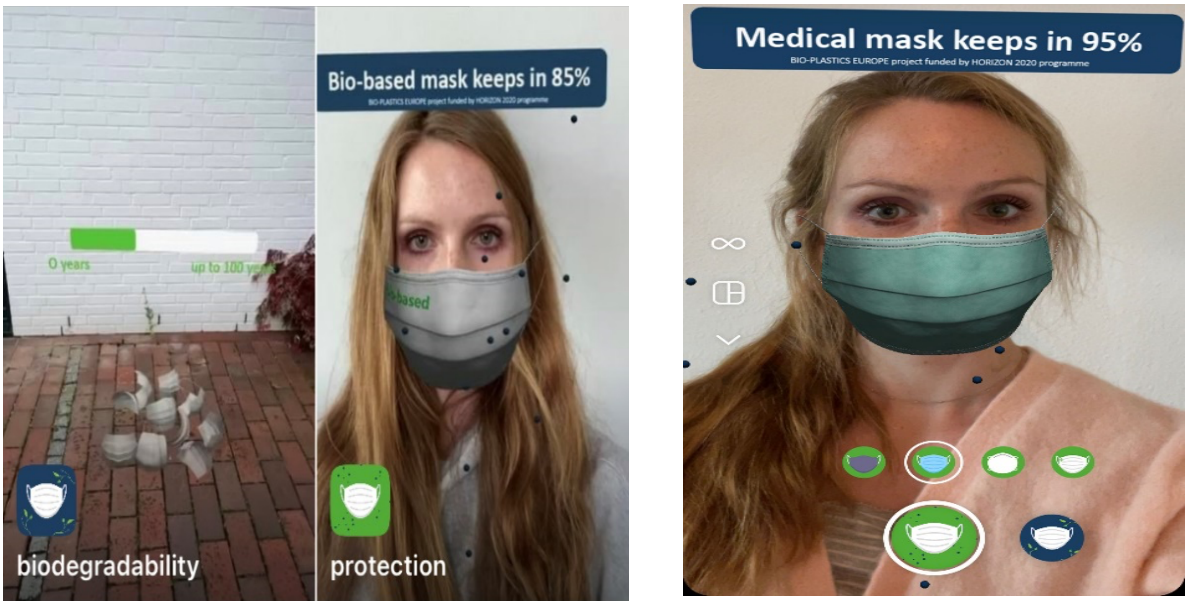


Image 1: The Instagram filter visualizes biodegradability and protection level of biobased masks vs conventional masks, here is a typical medical mask.

Filter on Facebook:

Filter 1: https://www.facebook.com/fbcameraeffects/tryit/1448517575504557/

Filter 2: https://www.facebook.com/fbcameraeffects/tryit/573978916955792/

Impacts of plastics on terrestrial ecosystem

By Ewa Liwarska-Bizukojc, Lodz University of Technology, Poland

Plastics are one of the most ubiquitous pollutants in the environment nowadays. Almost one third of improperly disposed plastic waste might end up on land, including in agricultural soils. As a result, even more plastic particles might be stored in soils compared to oceanic basins. Plastics in surface water are more visible, and thus they draw more of our attention, but at the same time, plastic particles accumulated in the soil threaten the entire terrestrial ecosystems, i.e. both the living organisms and its non-living parts. Thus, in the BIO-PLASTICS EUROPE project the

effect of plastics on soil organisms is studied.

Plastics contribute to changes in the chemical composition of soil, changing its physical properties and affecting processes such as pore space, capillarity, wetting processes, bulk density, soil moisture, evaporation and evapotranspiration. Plastics in soil also influence water saturation and transformation, which may disturb the water cycle. Their presence increases the rate of soil water evaporation by forming channels for water movement. This ultimately leads to soil dryness, harming plant germination and growth.

Image 3: Crisps package disposed in the environment. Image by Markus Distelrath from Pixabay.

Plastics are able to adsorb hazardous contaminants, including toxic organic chemicals, heavy metals (e.g. zinc, lead), and antibiotics such as amoxicillin and tetracycline. This poses greater threats to the ecosystems, particularly to its living organisms. Plastic micro- and nanoparticles can be accumulated in earthworm intestines and then transferred into the food chain.

Finally, the fate and behaviour of plastic particles on land depend on many factors that can be divided into three groups: (1) soil properties, (2) plastics properties including their susceptibility to biodegradation, and (3) climate and weather conditions. The bottom line is: plastic pollution of soil causes harmful impacts to the terrestrial ecosystems. For this reason, the proper management of plastic post-consumer waste is extremely important for all of us.

No silver bullet for sustainable plastic consumption

By Anna Fråne, Swedish Environmental Research Institute, Sweden

It is hard to imagine a world without plastics. Whether we like it or not, plastics have become an essential part of everyday life. On a normal working day, plastics are integrated in our computers, our phones, perhaps in our clothes, and in our glasses. Our lunch may be delivered in plastic packaging, and we brush our teeth with a plastic toothbrush. Our society is undeniably depending on plastics, but there are good reasons why plastics are used this extensively, and why its consumption continues to rise.

However, the advantages of using plastics come at a high price. Environmental impacts are linked to every part of the plastics' life cycle, from the extraction of the raw materials to waste treatment. Three aspects are often mentioned as central:

- Climate impact of plastics due to its current dependence of fossil fuels, both as raw material and as energy consumed in the manufacturing processes.

- Hazardous substances that may be present in plastics, mostly in the form of additives which are meant to improve the properties of plastics.

- "Leakage" of plastics to the environment in the form of littering, abrasion of car tires, artificial turfs etc. - the sources of plastic pollution are numerous.

So, how can we reduce the negative side of plastics while still benefiting from the positive ones? Here, we can talk about three main pathways to a more sustainable use of plastics.

1. The first one, which we can call "smarter use", is about showing the material some respect and using it wisely, where it is most useful. It is also about reducing the need for products or services fulfilled by plastics, using less plastics to fulfill the same function, and reusing plastic products so that their lives are prolonged – this would diminish the demand and the production of new products. BIO-PLASTICS EUROPE is addressing this in the frame of its HISCAP network, a network dedicated to raising awareness among European cities.

2. The second pathway, and the main focus in BIO-PLASTICS EUROPE, is about moving from fossil-based feedstocks to bio-based feedstocks, but also to avoid using fossil fuels in the production of plastics.

3. The third pathway focuses on increasing the circularity of plastics – this can be achieved by collecting and recycling more plastic waste, making sure that recycled plastics are used in meaningful applications, implementing "design for recycling" and "design from recycling" principles, being transparent about chemical content and potential hazardous substances present in plastics, as well as having business models enabling this to happen. Circularity is a cornerstone of BIO-PLASTICS EUROPE and is addressed in several work packages.

Focusing on one strategy is, however, not enough. All three pathways must be combined and worked on simultaneously in order to reach more

sustainable consumption of plastics. There is simply no silver bullet, but a palette of potential solutions to be further explored.

Distributed recycling: an alternative for some biodegradable bio-based plastics

By Freddys R. Beltrán, Marina P. Arrieta, Jorge Ramírez, María U. de la Orden, Joaquín Martínez Urreaga, Universidad Politécnica de Madrid and Universidad Complutense de Madrid, Spain

Biodegradable bio-based plastics have emerged as an alternative to petroleum-based, non-biodegradable plastics, with the main objective of lowering the environmental impact of the growing plastic consumption. However, choosing an adequate end-of-life scenario for these materials is key for keeping their low environmental impact.

In this context, the possibility of mechanically recycling these materials can both reduce waste and recover valuable raw materials, following the principles of a circular economy. However, this is a complex and expensive process, including many stages such as waste collection, grinding, sorting, washing, and reprocessing. Mechanical recycling is traditionally carried out in large facilities, which are designed to manage the immense flow of conventional plastics which are most commonly used, such as PET (polyethylene terephthalate) or PE (polyethylene).

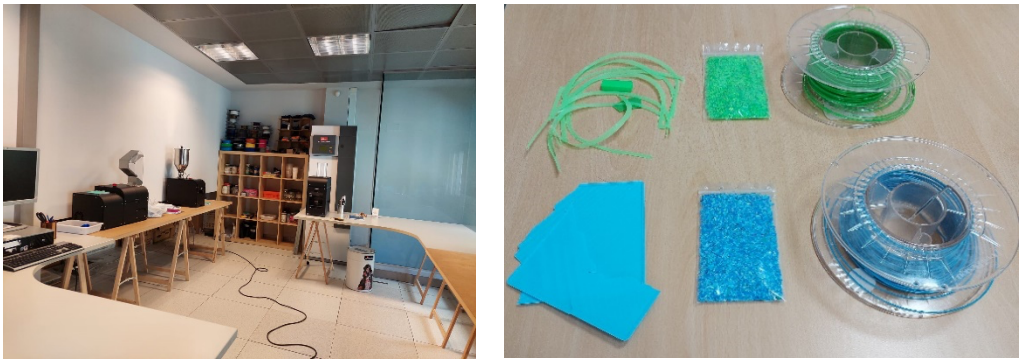
This leads to a problem: because biodegradable bio-based plastics represent only a small share of the plastics market, it is economically unviable to recycle them in large scale, since then it would be necessary to build dedicated infrastructure, which is very costly. This could be overcome if, instead of a centralized mechanical recycling approach, a distributed one could be adopted, in which each consumer (or small group of consumers) recycles their own plastic waste. This would also save energy and emissions, since less waste would need to be transported.

How could this look like? Let us take the example of poly (lactic acid) (PLA), one of the most commonly available bio-based and biodegradable plastics. Restaurant chains, grocery stores, and shopping centers could collect, clean and recycle their own PLA packaging waste.

PLA is also widely used in 3D printing. Significant amounts of PLA waste are generated in universities and educational centers. Previous studies have shown that, if properly recycled, PLA can be successfully used for 3D printing. With this in mind, the Industrial Engineering School of UPM is currently developing a laboratory which is collecting, washing, and reprocessing 3D printing wastes into new

filaments which can be used in 3D printing applications.

In summary, distributed recycling systems open the door to mechanically recycling some bio-based and biodegradable plastics, helping overcome the economic barriers of the recycling process.



Pictured: 3D printing wastes recycling equipment in "Fabrication Lab Circular" at UPM (left) and 3D printing filament made from recycled PLA wastes (right).

Increase of plastic household waste due to Covid-19

By Viktoria Voronova, Technical University of Tallinn, Estonia

Our Estonian BIO-PLASTICS EUROPE team at Tallinn University of Technology (TalTech), together with international colleagues, conducted a survey to investigate how consumption habits changed in 23 countries during the COVID-19 pandemic and how the pandemic impacts household waste generation. The level of household consumption has increased during the pandemic, which has led to changes in waste generation. For instance, consumers are buying more packaged or frozen products and relying more on food delivery services. This results in a rise in food and plastic waste worldwide, according to our survey results.

The survey received 204 responses among 23 countries all over the world. The largest portion of the respondents were aged 31 to 40 (36%), followed by respondents between the ages 21-30 (30%). It is also important to mention that more than 60% of the respondents have post-graduate qualifications. Approximately 45-48% of respondents started buying more packaged and fresh food, and used a food delivery service since the beginning of the COVID-19 pandemic. This has led to an increase in household waste generation, especially in single-use plastics. The highest increase was observed in plastic packaging and food waste. The main reason for such behaviour is that people are spending

more time at home. Only 31% of respondents answered that they always look for sustainable packaging options when purchasing products (e.g., reusable packaging, biodegradable packaging).

In order to improve the situation, some consumers mentioned that food producing companies should pay more attention to product design, so they can come up with ways to use less packaging, and to increase the recyclability of the existing packaging materials. Awareness of the citizens regarding the reduction of waste generated very much depends on the communication with the municipalities and local waste management authorities.

Collaboration between all stakeholders including producing companies, municipalities and consumers is necessary to increase awareness on waste prevention, correct waste separation and recycling of valuable fractions of household waste. This will facilitate the circulation of valuable materials and contribute to the shift to a more circular economy.

The full research article can be found using the following link: https://doi.org/10.1016/j.scitotenv.2021.145997

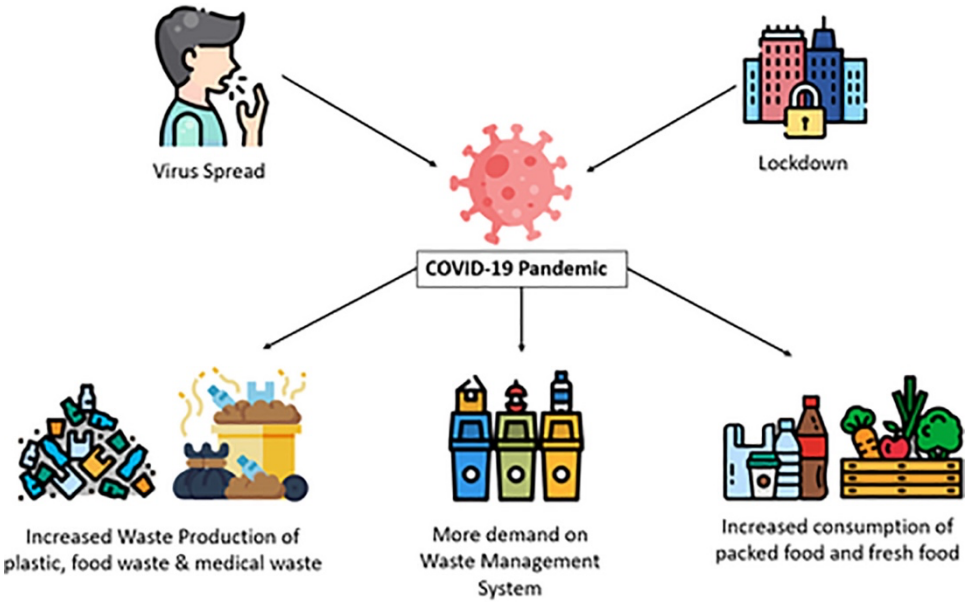


Illustration: graphical abstract of the paper "COVID-19 and waste production in households: A trend analysis" (Filho et al., 2021).

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Upcoming events

Join us for the presentation “Bio-based and Biodegradable Plastics: a Solution or an Issue for Europe?” about BIO-PLASTICS EUROPE at the eREC – Digital Recycling Expo and Conference for Circular Economy and Waste Management on 04.10.2021 from 14.30 to 15.15 CET. Visit https://erec.info/visitor/

Thank you for reading! We hope that you have enjoyed our first edition of the newsletters and that you will follow us in the future!

If you still did not, please subscribe to out newsletter at:

www.bioplasticseurope.eu

Sincerely yours,

The BIO-PLASTICS EUROPE Project Team

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BIOPLASTICS EUROPE project website: www.bioplasticseurope.eu