

RETHINKING THE SUSTAINABLE PLASTIC PACKAGING FOR FOODSTUFFS

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Abstract: *The milestone of this year's European legislative process is the adoption of the so-called Single Use Plastic Directive, a piece whose impact on the industry, retail and consumers is still a matter of debate. For the food supply chain this might result in disruptive innovation of the way that food and beverages are packed, with particular regard to the plastic packaging. Originating from the principles of circular economy, the enactment aims that all plastic packaging on the EU market to be recyclable or reusable by 2030, resulting into a new system of relationships and flows amid food supply chain operators, that has to be promptly and properly communicated to the consumers. The scope of this contribution is to prospect how the industry could take advantage on the new opportunities of placing sustainable food packaging on the markets and how this transformation will be perceived by the customers. Its benefit is to share a preliminary out – of – the box examination of the way that business organizations, governments and public will accommodate the opposite options of immediate profits, from one side, and a cleaner environment, from the other. We hereby consider examining the trend of sustainable technologies for plastic packaging, to explore from a high level perspective the appetite of the foodstuffs producers to adopt these innovations and, respectively, to scrutinize the opinion of the consumers in social media and other assimilated public subjects. Being a matter of communication between stakeholders, the ante mentioned findings could result into a draft proposal of modelling the way industry, retail, consumers and governments speak together for new investment opportunities in the food packaging thus sustainably creating new jobs, reducing the food waste and protecting the environment.*

Keywords: *single use plastic, tethered caps, recycled content, attached closures, extended producers responsibility, plastic strategy, littering, food packaging, beverages packaging, circular economy, sustainable innovation, food waste, technology adoption, consumers rights, public communication, environment protection, SUP Directive*

1. PLASTIC FACTS

Plastic is generated out of crude oil. In fact, only 4% of the extracted oil worldwide is used to produce plastics. Only a small part of this 4% is used to manufacture plastic packaging material (1.5%), and even less oil is needed to produce plastic bottles [1]. All packaging materials (domestic and commercial) account only for 1.7% of the total average consumer carbon footprint in Europe. All packaging materials (domestic and commercial) account only

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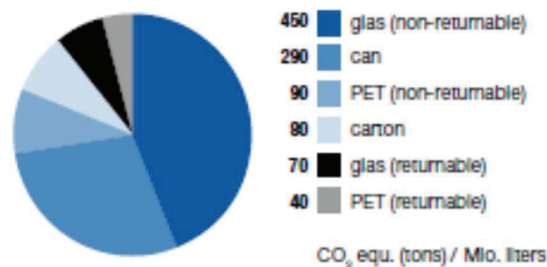
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for 1.7% of the total average consumer carbon footprint in Europe. Plastic packaging is related to 0.6% of the average consumer carbon footprint [2].

Plastic is recyclable, which means that plastic products can be collected, reheated and reprocessed several times without remarkably losing material integrity. The biggest challenge today is that materials coming out of one application field (e.g. bottles soft drinks) can be re-used in the same field. Very often, plastic products find new application fields (e.g. textile fibers) after being recycled without going through the additional processing steps required to re-enter in the product’s original stream.

Of a particular matter of interest for the bottling industry are the so – called ‘returnable’ PET bottles, which have the lowest carbon footprint compared to other beverage packaging materials, [3]. It is possible to reuse returnable PET bottles around 10-15 times before the quality is degrading. Then the bottles have to be recycled in order to keep the material in a circular economy.

Figure 1: Greenhouse gas emissions of different beverage packaging materials



Constant optimization, design adjustments and improvements in the production process allow, amid others, to significantly reduce the weight of packaging products. For example, as a result of the application of the innovative technologies on the soft drinks packaging systems, the average bottle weight was reduced with 48% within 8 years:

Table 1: Soft drinks packaging light weighting dynamic, 2008 - 2016

Year	Bottle size	500 ml
2008	Average bottle weigh	21.0 g
2016	Average bottle weight	11.0 g
	<i>Reduction by</i>	<i>48 %</i>

The development of new packaging materials is a big opportunity to effectively reduce negative environmental impacts. In the packaging market there are already available bio-based plastics made of plants, such as sugar cane (PlantBottle™) and the recent developments using Polyethylene Furanoate (PEF), a plant-based material. In the future, PEF might be gained from food waste or other second generation feedstock gained from food waste.

Current global economic conditions, depending on the fluctuating price of raw oil and the related price of new (virgin) PET, do not favor the recycling of plastics. For example, the recycled PET (rPET) produced in Austria – country with a strong legacy of environment related enactments after having chaired the rotating Presidency of the Council of the EU - has a carbon footprint of 0.45 kg CO₂ - equivalent per kilogram. That results in approximately 80% less greenhouse gas emissions compared to virgin PET (2.15 kg CO₂-eq./kg).

2. IS PLASTIC PACKAGING FANTASTIC, OR NOT?

“We all know that plastic is a success story. And yet we have to face the task - how can we make plastics more circular?” – was reasonably wondering Mr. Daniel Calleja Crespo, director - general of the European Commission’s Environment Department, [4]. In order to establish the right reference to its circularity, we will help addressing the above mentioned question by reviewing the five most debated issues on plastic packaging:

Issue no. 1: is plastic packaging really needed? We all agree that plastic is the champion of all materials and part of our daily lives, providing a lot of services to consumers. Plastic packaging protects our food and beverage products, making fresh meat, vegetables, fruits, and dairy products last up to 10 days longer [5]. One third of the globally produced food is lost or wasted each year. If only one fourth of the currently lost and wasted food would be saved, 870 million people could be saved from hunger [6]. Since global food waste accounts for 8% of total anthropogenic greenhouse gas emissions [7], the usage of plastic packaging is not only helping to reduce energy and water consumption needed for food production, but also tackles climate change by reducing food waste.

Issue no. 2: is plastic packaging really exhausting the natural resources? Fractioning crude oil by the size of its molecules, gas, gasoline and petroleum are generated. For the production of plastics, the raw gasoline (Naphtha) is the most important fraction. Within a thermal cracking process the hydrocarbon compounds are rebuilt to arrive at materials with different characteristics. In fact, only 1.5% of the extracted oil worldwide is used to produce plastic packaging. While 90% is used for fuel (for energy, heating and transport). [8]

Issue no. 3: is plastic packaging more harmful to the environment than the glass? The carbon footprint of PET bottles is lower than the one of some other packaging materials used for beverages. In fact, the carbon footprint of non-returnable glass bottles is 10 times higher than the one of returnable PET bottles. [9] This is caused by the high energy input required to manufacture glass. Constant optimization allows to significantly reducing the weight of packaging products. The weight of PET bottles could be reduced by almost 50% during the last decade. For example, 91% of packaging weight can be reduced by using 1.0 liter PET bottles instead of 0.7 liter glass bottles. Due to the light weight of plastics, up to 40% less fuel is used to transport drinks in plastic bottles compared to glass bottles. [10]

Issue no.4: is plastic packaging responsible for littering? Being recyclable, plastic can be reprocessed several times without remarkably losing material integrity. In countries with a well-functioning waste management system, a high percentage of plastic packaging is collected for recycling - PET collection rate 2016 of Germany: 91.8%, Switzerland: 85.2%, Austria: 73.2% [11]. PET collection rate 2015 of the US: 30.1% [12]. If the material is too contaminated for mechanical recycling, it is used for energy recovery through thermal recycling.

Issue no 5: is plastic packaging affecting marine life? It is true that marine litter is one of the biggest environmental concerns of our time. 80% of marine litter originates on land due to poor or insufficient waste management and the lack of sufficient recycling and recovery systems, especially in developing countries. It is also unclear what effects micro plastics may have on the food chain and if they cause a potential risk to human health, while it is clear that they have a negative impact on the environment particularly the marine eco and wildlife system. [13]

From a very high level perspective, we maintain that the solution to boost the circularity of plastic packaging, hence making it really “fantastic”, is investing in technology and innovation, along with improved infrastructures to increase collection rates and recycling. We perceive littering rather as a societal problem than a logistic one, that needs multi-faceted and multi-stakeholder approaches and solutions. All actors in society that contribute to the problem of litter have to share the responsibility for its prevention through proper disposal.

2. IN QUESTION – THE EU STANDARDS ON BIODEGRADABLE PACKAGING

Bio-based plastics made of plants or PEF are generally perceived as a great opportunity to effectively reduce negative environmental impacts. But beforehand it should be clarified what does biodegradable plastics means.

Biodegradability is a characteristic given by the inherent molecular structure of the product. The compostability of a plastic product refers to its end of life and it is given by the biodegradability of the products, does not have negative effects on the compost, quickly disintegrates in a composting cycle and does not release dangerous or heavy metals in the compost. Therefore, compostability is established by applying the existing standards, which, for plastic packaging is EN 13432. [14]

Biodegradable and compostable plastics are considered an alternative to non-biodegradable plastics in specific applications where the mechanical recycling is not technically, environmentally or economically not viable. The industry sector for biodegradable plastics exists since the late 1980s and during the last 30 years dozens of standards – amongst which are several harmonized European norms – have been established. Biodegradable and compostable plastics, in order to be considered as such, have to respect certain harmonized standards set up by the European Standardization Committee (CEN) on the basis of clear mandate of the European Commission.

In 1996, the European Commission published “Mandate to CEN for standardization and a study related to packaging and packaging waste” asking, among the other things, to develop a standard on the organic recovery of biodegradable & compostable packaging in a composting facility. The CEN delivered the standard EN 13432 “Packaging - Requirements for packaging recoverable through composting and biodegradation - Test scheme and evaluation criteria for the final acceptance of packaging” in the year 2000 which was then considered as a harmonized standard. [15]

Biodegradable and compostable plates and cutlery are often used in closed systems with integrated waste management schemes, such as air travel, sport arenas, or open-air events, where it is ensured that the waste is collected and then recycled. Besides the material itself, there are cases in which reusable plastic is the single solution to comply with hygiene reasons, as required by specific EU Regulation, such as Regulation 853/2004 on the hygiene of foodstuffs, Regulation No 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety or Regulation 1935/2004 on materials and articles intended to come into contact with food. In these cases, reusable plates, cutlery and glasses are allowed only if compliant to hygiene rules set by the above mentioned EU Regulation.

A distinction needs to be made between take-out/away food containers and packaging used by the food and drink industry. Food containers, such as those used for fast food, are in most cases

filled at the point where they are sold and consumed. The circumstances for use also exhibit different potential for substitution. In contrast, for the food and drink industry’s products, the time and distance between packaging and consumption is greater, often even cross-border.

Having no harmonized EU definition of food containers will result in divergence in interpretation and implementation in Member States. If some Member States include the food and drink industry’s packaging in their interpretation of “food containers”, it risks distorting and fragmenting the Single Market, thereby hindering the free movement of food and drink products.

In a nutshell, the current EU legislation contains enough resources to harmonizing the environmental and economic interests, so the EU consumers to continue enjoying, thanks to the variety of packaging, the widest possible choice of products. On the other side, the data around consumers’ awareness on how to handle biodegradable packaging is not sufficient to know whether the simple replacement of the plastic packaging will tackle the root cause of littering, or the consumers will keep on disposing packaging into the environment.

3. LEGISLATIVE CHALLENGES FOR THE SINGLE USE PLASTICS

The milestone of this year’s European legislative process is the adoption of the so - called Single Use Plastic Directive or the “SUP Directive” (European Commission’s Proposal 340/2018 for a Directive on the reduction of the impact of certain plastic products on the environment), a piece whose impact on the industry, retail and consumers is still a matter of debate.

Instrumenting SUP for market restrictions to achieve consumption reduction for items that are considered packaging is a source of concern for the food and beverage industry; we are hereby treating those concerns as ‘threats’; however, current EU legislation contains enough resources to harmonizing the environmental and economic interests, so the EU consumers will continue to enjoy, thanks to the variety of packaging, the widest possible choice of products; we are hereby treating those resources as ‘opportunities’.

A selection of both of the above is illustrated bellow:

Table 2: SUP legislative challenges for food and beverage industry

SUP Opportunities	SUP Threats
Internal Market is the cornerstone of the EU’s global competitiveness and of advancing the Circular Economy objectives	Any disturb of the Internal Market would have a chilling effect on investment, innovation, circularity, growth and jobs in Europe
EU consumers enjoy, thanks to the variety of plastic packaging, the widest possible choice of products	Product choice will be limited if Member States take unilateral measures on plastic packaging
The vast majority of goods circulating within the Union are packaged in the same way	Divergent packaging restrictions across the EU would undermine the free movement of plastic packaging and packaged goods
Member States can derogate in order to restrict, for example, the placing of the plastic carrier bags on the market	Further derogations for plastic packaging could trigger a much more harmful effect on the Internal Market, given the very wide variety of products targeted in the SUP Directive

Smaller Member States could easier stop production of plastic items for which have introduced unilateral packaging measures	Such a loss in the economy of scale at an EU level would also run contrary to the ambition for a Circular Economy and would also impact consumers in terms of price
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The proposed SUP definition of plastic creates legal uncertainty about what is considered a "main structural component". Such uncertainty might lead to diverse legal interpretation by member states. As expressed in Article 1, the SUP Directive intends to promote the transition to a circular economy with innovative materials. [16] Such materials need to meet equal packaging functionality and performance requirements ensuring that the safety and quality of food and drink products are maintained.

Alternative fibers need to contain a small amount of plastic acting as barrier to fulfill functionality requirements. In the case of food and drink packaging, alternative fiber materials alone would not fulfill the necessary functional barrier properties to ensure safety and quality, causing food to degrade rapidly. Such functionality concerns could be solved by adding a polymeric coating, layer or lining to the surface of the material, representing a fraction of its weight. Where the plastic coating, lining or layer does not impede the main material from being accepted into a recycling stream for that main material, it should be outside the scope of this Directive.

With regard to the attached caps and lids, as proposed by the SUP Directive, they do not appear as the most environmentally sound solution since it will require more plastic, and therefore more CO₂ emissions. It also comes with a high opportunity cost as the investment necessary to meet the requirement could yield greater environmental benefits if channeled towards improving recycling infrastructure. As an alternative, the Food and Drink industry has to play its part to contribute towards educational campaigns and consumer communications.

In what concern the straws that are attached to a food or beverage package, it appears as necessary to allow an adequate transition time before market restrictions apply; the reason is that they qualify as packaging - as defined by article 3 of Directive 94/62/EC on packaging and packaging waste – so they are essential for the presentation or delivery of a product. For these plastic straws are presently no safe alternatives readily available at industry scale. Apparently, the industry is working on alternatives, but it will take a few more years until innovations such as paper straws or entirely new packaging designs and openings will be approved for food and fully commercially available.

Straws attached to portion-sized packages can and should be collected and recycled as part of the packaging. Directive 94/62/EC already mandates extended producer responsibility (EPR) for all packaging, packaging components and ancillary elements, such as straws attached to food and beverage packages. Until market restrictions for these plastic straws apply, we think that they shall be still subject to the extended producer responsibility measures.

A major impact on the food and beverage industry could have the mandatory provision of using at least 35% recycled PET (rPET) in their beverage bottles by 2025. Before discussing mandatory percentages, there are certain boundary conditions that need to be in place to ensure sufficient quantity of high-quality food-grade secondary raw materials. If there is not enough supply of food grade secondary raw materials, a mandatory recycled content requirement would mean that producers would not be able to put bottles on the market. Therefore, we consider that the mandatory target should be replaced by an indicative one.

4. CONCLUSIONS

The Internal Market is the cornerstone of the EU's global competitiveness and of advancing the Circular Economy objectives. Food and beverage industry, consumers and governments have the option to work together in a harmonized manner thus creating sustainable market opportunities, instead of market restrictions caused by fragmentation.

For the food and beverages supply chain, the implementation of the incoming norms on the single use plastics might result in disruptive innovation of the way that food and beverages are packed, with particular regard to the plastic packaging.

Originating from the principles of the Circular Economy, the European Plastic Strategy launched earlier this year and its subsequent act, the SUP Directive, aims that all plastic packaging on the EU market to be recyclable or reusable by 2030, [17].

All the above result into a new system of relationships and flows amid food supply chain operators that have to be promptly and properly communicated to the consumers.

REFERENCES

- [1] http://bpf.co.uk/press/Oil_Consumption.aspx
- [2] http://www.plasticseurope.org/documents/document/20111107114107-zusammenfassung_kunststoffverpackungen_e_thg_denkstatt_vers_1_0_de.pdf
- [3] http://www.greenpeace.org/austria/Global/austria/marktcheck/uploads/media/getraenkeverpackungen_umweltberatung_01.pdf
- [4] <https://www.euractiv.com/section/circular-economy/news/life-in-plastic-is-it-fantastic/>
- [5] <http://www.kunststoffverpackungen.de/show.php?ID=6126>
- [6] <http://www.fao.org/save-food/resources/keyfindings/en/>
- [7] <http://www.fao.org/3/a-bb144e.pdf>
- [8] <http://www.kunststoffverpackungen.de/show.php?ID=6126>
- [9] https://www.ifeu.de/oekobilanzen/pdf/Oekobilanz_%20Getraenkeverpackungen_Oest_erreich%202010_Langfassung.pdf
- [10] <http://www.kunststoffverpackungen.de/show.php?ID=5309>
- [11] *rPET Study – 2016 West Europe*, PCI Wood Mackenzie, 2017
- [12] The Association of Plastic Recyclers, *Report on Postconsumer PET Container Recycling Activity in 2015*, NAPCOR 2016
- [13] <https://www.marinelittersolutions.com/about-marine-litter/what-causes-marine-litter/>
- [14] B. De Wilde, N. Mortier & S. Verstichel (OWS) D. Briassoulis, M. Babou, A. Mistriotis & M. Hiskakis (Agricultural University of Athens) *Report on current relevant biodegradation and ecotoxicity standards*, KBBPPS, Work package 6, OWS Dok Noord 5 9000 Ghent Belgium
- [15] <http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32001D0524&from=IT>
- [16] <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A8-2018-0317+0+DOC+XML+V0//EN&language=EN>
- [17] <http://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf>