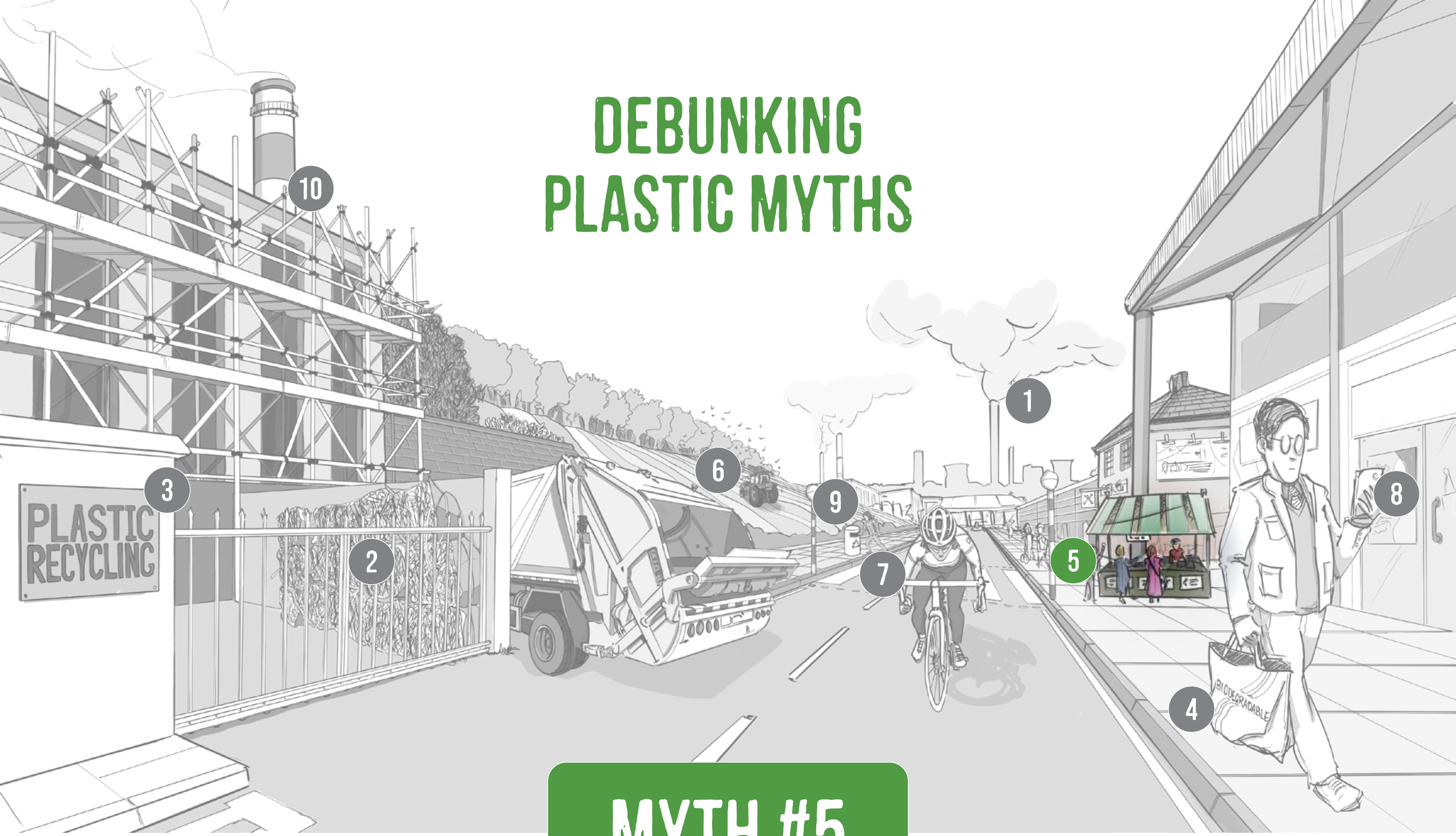
DEBUNKING PLASTIC MYTHS



MYTH #5

PLASTIC PACKAGING FOR FOOD IS UNNECESSARY

Plastic packaging has become an essential part of food safety and quality in most parts of the world. The use of plastic protects food from the time of production and processing to the time it arrives on the table for consumption, and in some cases reduces food loss and waste. The notion that plastic packaging for food is unnecessary is false. The absence of appropriate systems to manage the packaging waste from food distribution can however, cause significant harm to the environment. The volume of this plastic waste presents serious challenges to society to deal with globally.

Food packaging, much of which is single-use, accounts for half of global plastic waste and with an industry growth rate of 12 per cent per year, raises increasing concerns about greenhouse gases and greater carbon footprints (Ncube et al., 2021). The demand for catered and take-away food and drinks has resulted in a significant increase in packaging waste and in the risk of overpackaging (Maye et al., 2019).

Historically, Europe and North America have dominated plastics production, but the increasing global demand and production of plastic products is resulting in a proportionate rise in plastic waste in municipal solid waste streams globally (UNEP, 2018; Geyer, 2020). In sub-Saharan Africa, for example, plastic packaging of food, beverages, iced water and other products has replaced the traditional packaging methods of leaf wrappers, brown paper and metal cups in cities and rural towns (Fobil & Hogarh, 2009).

Despite its short use phase, food packaging may be responsible for a considerable part of the environmental burden of a product (Abejón et al., 2020). The possibility of overpackaging, which is challenging to define, adds another layer to the problem. On the other hand, food packaging increases food safety, and helps reduce food loss and waste in some applications. Thus, we need to balance these benefits of food packaging against the corresponding environmental costs.

The benefits of plastic packaging for food

Manufacturers have developed plastic packaging to suppress microbial growth, to protect foods from external microbial contamination, prevent spoilage resulting from exposure to air, moisture, and pH changes associated with the food or the surrounding atmosphere (Cutter, 2002). Both flexible and rigid packaging materials, alone or in combination with other preservation methods, offer the necessary barrier, inactivation, and containment properties required for successful food packaging (ibid.).

Consumer demand for safe food with high nutrition, appealing sensory properties, and long shelf life has been increasing. Technologies that extend shelf life contribute to the reduction of food waste (Matar et al., 2020), but a study of Dutch consumers demonstrates the tension between the reduction of food waste and the fate of plastic packaging. Two thirds of the participants reported that sustainable packaging of fruits and vegetables was 'important' or 'very important' to them. For example, many expressed their annoyance with cucumbers wrapped in plastic (Swart, 2020). Despite the fact that the food waste from the unpackaged cucumbers was twice that of the packaged cucumbers, so the decision to add packaging was a rational response in the prevention of food waste (ibid).

The environmental costs

In broad terms, the environmental costs associated with food packaging include: greenhouse gas emissions and the harm to human health, wildlife, and ecosystems caused by plastic pollution. The additives and other contaminants in plastic and the technologies employed by the food packaging industry exacerbate the environmental damage and present challenges that current recycling processes cannot fully meet.

Greenhouse gas emissions

Researchers in California developed a model to estimate the greenhouse gas emissions across the food cycle – from production through packaging, transportation, and waste management – and applied it to cherries, onions, plums, strawberries, avocados, lemons, celery, oranges, and tomatoes. The model showed that packaging accounted for 19 per cent of the food cycle emissions, while food loss accounted for 36 per cent, transportation 28 per cent, and production 19 per cent (Qin & Horvath, 2021). Forgoing retail-provided polyethylene bags for loose produce could reduce total GHG emissions by 4–12 per cent, and for tomatoes and onions, more than half of the emissions due to food loss (ibid).

Contamination and recycling

The contamination of food packaging comes in many forms. In recycling, contamination may occur simply when materials are sorted into the wrong recycling bin, or when materials are not properly cleaned, such as when food residue remains on a yogurt container. The more insidious form of recycling contamination occurs when the materials to be recycled contain additives.

Additives are used in packaging products to achieve desired properties, but they are difficult or impossible to remove. As a result, the additives in recycled plastic products are highly likely to be integrated into the new products (Wagner & Schlummer, 2020). The lack of transparency and reporting across the value chain often results in a lack of knowledge concerning the chemical profile of the final products (Muncke, 2021).

Multi-material multilayer plastic packaging (MMPP) consists of two or more layers of distinct materials where the components form flexible packaging such as pouches, bags, or shrink films – or rigid packaging such as trays, cups, or containers (Soares et al., 2021). This type of packaging is widely applied in the Fast-Moving Consumer Goods industry in relatively low-cost and short lifespan items (ibid.). MMPP accounts for an estimated 26 per cent of the flexible packaging market by weight (World Economic Forum & Ellen MacArthur Foundation, 2017). Packaging for fresh food products may consist of four to seven layers.

Current standard recycling technologies are not able to identify, sort, and separate the layers of MMPP, which is usually sorted as mixed plastic waste in post-consumer streams and frequently incinerated with energy recovery in European countries (Soares et al., 2021). In low-income countries, these packaging materials usually end up in dumpsites or landfills, with a fraction leaking into the environment (Hahladakis & Iacovidou, 2019).

Harm to human health and the environment

A recent review revealed that out of more than 4,000 chemicals potentially or likely associated with all types of plastic packaging, 63 were ranked by the European Chemicals Agency as "highest for human health hazards" and 68 as "highest for environmental hazards" (Groh et al., 2018). Researchers in a Texas-based study of Bisphenol A in packaged foods found detectable levels of the chemical in 60 per cent of the 105 samples of fresh, plastic-wrapped, and canned foods, including some of the fresh foods (Schecter et al., 2010). Migration of the chemicals to food is most likely scenario and the interventions to avoid that needs to be revised (Muncke 2021).

Many jurisdictions ban some of the harmful additives – such as cadmium, chromium, lead and mercury – that have been used in plastic production, but these additives are still found in some plastic food packaging (Groh et al., 2018; Kiyataka et al., 2015; Musoke et al., 2015). Heavy metals were detected, for example, in polyethylene bags used for cooking in Uganda where the use of these bags is a recent development as a substitute for banana leaves (Musoke et al., 2015).

Finally, plastic fragmentation into microplastics and nanoplastics can allow chemical additives to move in the environment far from the point of use (Hahladakis et al., 2018).

We can we do?

The search for responses includes the consideration of alternative materials, improved design, the development of business models and cultures that support sustainability and the use of life cycle assessments.

1. Use alternative materials where possible

Bioplastics can prevent moisture loss, reduce lipid oxidation, improve flavour attributes, enhance the handling properties, colour retention, and microbial stability of foods (Cutter, 2006). Some bioplastics are made from renewable resources and are biodegradable, and analysts expect that they may contribute to sustainable development and that proper management of the materials may reduce their environmental impact upon disposal (Davis & Song, 2006). However, not all bioplastics are actually biodegradable and further research and development is necessary in this area.

In sub-Saharan Africa, the tomato production systems experience post-harvest losses of 20–50 per cent related to handling techniques and poor packaging (Fobil & Hogarh, 2009). Reducing such post-harvest losses of vegetables can contribute substantially to improving food security. An alternative to reduce food losses in Africa and elsewhere, comes in the form of an edible film layer formed on the surface of food which is useful in protecting the integrity of food during mass transfers.

2. Improve packaging design to reduce food waste

The findings in a Swedish study showed that 20–25 % of food waste is attributable to packaging (Williams et al., 2012) and called for better design. Manufacturers sometimes wrongly considered packaging as an additional economic and environmental cost rather than an added value for waste reduction (Guillard et al., 2018). It is clear that poor design can undermine sustainability and increase food waste (Sundqvist-Andberg & Åkerman, 2021). Proper design that meets the protection, convenience, and communication functions can decrease food waste at the household level (Williams & Wikström, 2011).

3. Develop more sustainable business models for food distribution

Food distribution companies can adopt more sustainable business models in response to their considerable environmental footprints. Such models can include the development of greener products and packaging, service-based approaches to new modes of consumption, and changes in sourcing and logistics. They can also contribute to a corporate culture that values sustainability alongside profits. A key challenge is to design business models that facilitate consumer adoption of new solutions.

4. Use life cycle assessments

Life cycle assessments (LCAs) are commonly used to identify the environmental impacts of production and recycling, and to view environmental issues from a wider perspective (Toniolo et al., 2013). The LCA approach can help sort out the complex issue of food waste and loss prevention versus overpackaging and can guide decisions related to plastic recycling. This 'multidimensional', quantitative tool allows for the evaluation of environmental impacts and food safety of a product or production system. When applied to the food industry, LCA can handle all the stages of the food chain: raw materials; packing and packaging; distribution; use of products; reuse or recycling; and management of waste. (Pérez-Rodríguez, Skandamis & Valdramidis, 2018).

References

Abejón, R., Bala, A., Vázquez-Rowe, I., Aldaco, R., & Fullana-i-Palmer, P. (2020). When plastic packaging should be preferred: Life cycle analysis of packages for fruit and vegetable distribution in the Spanish peninsular market. Resources, Conservation and Recycling, 155, 104666. doi: 10.1016/j.resconrec.2019.104666

Cutter, C. (2002). Microbial Control by Packaging: A Review. Critical Reviews in Food Science and Nutrition, 42(2), pp.151–161. doi: 10.1080/10408690290825493

Cutter, C. (2006). Opportunities for bio-based packaging technologies to improve the quality and safety of fresh and further processed muscle foods. Meat Science, 74(1), pp.131–142.

Davis, G., & Song, J. (2006). Biodegradable packaging based on raw materials from crops and their impact on waste management. Industrial Crops And Products, 23(2), 147–161. doi: 10.1016/j.indcrop.2005.05.004

Fobil, J., & Hogarh, J. (2009). The dilemmas of plastic wastes in a developing economy: Proposals for a sustainable management approach for Ghana. West African Journal Of Applied Ecology, 10(1). doi: 10.4314/wajae.v10i1.45716

Geyer, R. (2020). Production, Chapter 2– Production, Use and Fate of Synthetic Polymers. in Plastic Waste and Recycling. Letcher, T.M. (ed.). Cambridge, MA: Academic Press. pp. 13–22.

Guillard, V., Gaucel, S., Fornaciari, C., Angellier-Coussy, H., Buche, P., & Gontard, N. (2018). The Next Generation of Sustainable Food Packaging to Preserve Our Environment in a Circular Economy Context. Frontiers In Nutrition, 5. doi: 10.3389/fnut.2018.00121

Groh, K., Backhaus, T., Carney-Almroth, B., Geueke, B., Inostroza, P., & Lennquist, A. et al. (2019). Overview of known plastic packaging-associated chemicals and their hazards. Science Of The Total Environment, 651, 3253–3268. doi: 10.1016/j.scitotenv.2018.10.015

Hahladakis, J. & Iacovidou, E., (2019). An overview of the challenges and trade-offs in closing the loop of post-consumer plastic waste (PCPW): Focus on recycling. Journal of Hazardous Materials, 380, p.120887.

Hahladakis, J.N., Velis, C.A., Weber, R., Iacovidou, E., & Purnell, P. (2018). An overview of chemical additives present in plastics: migration, release, fate and environmental impact during their use, disposal and recycling. Journal of hazardous materials. 344, pp.179–199.

Kiyataka, P. H.M., Dantas, S.T., & Pallone, J.A. L. (2015). Method for Analysis and Study of Migration of Lead, Cadmium, Mercury and Arsenic from Polypropylene Packaging into Ice Cream and Simulant. Food Anal. Methods (2015) 8:2331–2338. doi: 10.1007/s12161-015-0124-8

Matar, C., Gaucel, S., Gontard, N., Guilbert, S., & Guillard, V. (2018). Predicting shelf life gain of fresh strawberries ' Charlotte cv' in modified atmosphere packaging. Postharvest Biology And Technology, 142, 28–38. doi: 10.1016/j.postharvbio.2018.03.002

Musoke, L., Banadda, N., Sempala, C., & Kigozi , J. (2015). The Migration of Chemical Contaminants from Polyethylene Bags into Food During Cooking. The Open Food Science Journal, 2015, 9, 14–18

Muncke, J. (2021). Tackling the toxics in plastic packaging. PLOS Biology 19(3): e3000961. https://doi.org/10.1371/journal.pbio.3000961

Ncube, L., Ude, A., Ogunmuyiwa, E., Zulkifli, R. & Beas, I., 2021. An Overview of Plastic Waste Generation and Management in Food Packaging Industries. Recycling, 6(1), p.12.

Pérez-Rodríguez F., Skandamis P., & Valdramidis V. (2018). Quantitative Methods for Food Safety and Quality in the Vegetable Industry. In: Pérez-Rodríguez F., Skandamis P., Valdramidis V. (eds) Quantitative Methods for Food Safety and Quality in the Vegetable Industry. Food Microbiology and Food Safety. Springer, Cham. doi: 10.1007/978-3-319-68177-1_1

Qin, Y., & Horvath, A. (2021). What contributes more to life-cycle greenhouse gas emissions of farm produce: Production, transportation, packaging, or food loss?. Resources, Conservation and Recycling, 176, 105945. doi: 10.1016/j.resconrec.2021.105945

Schecter, A., Malik, N., Haffner, D., Smith, S., Harris, T., Paepke, O., & Birnbaum, L. (2010). Bisphenol A (BPA) in U.S. Food. Environmental Science & Technology, 44(24), 9425–9430. doi: 10.1021/es102785d

Soares, C., Ek, M., Östmark, E., Gällstedt, M., & Karlsson, S. (2021). Recycling of multi-material multilayer plastic packaging: Current trends and future scenarios. Resources, Conservation And Recycling, 176, 105905. doi: 10.1016/j.resconrec.2021.105905

Sundqvist-Andberg, H. & Åkerman, M., 2021. Sustainability governance and contested plastic food packaging – An integrative review. Journal of Cleaner Production, 306, p.127111.

Swart, A. J. (2020). Sustainable packaging: The love-hate relationship between consumers and plastic packaging. ABM-AMRO. https://www.abnamro.nl/nl/media/ABN-AMRO-Rapport-Duurzaam-verpakken-dec-2020_tcm16-94255.pdf

Toniolo, S., Mazzi, A., Niero, M., Zuliani, F. & Scipioni, A. (2013). Comparative LCA to evaluate how much recycling is environmentally favourable for food packaging. Resources, Conservation and Recycling, 77, pp.61–68.

UNEP. (2018). Mapping of Global Plastics Value Chain and Plastics Losses to the Environment: With a Particular Focus on Marine Environment. United Nations Environment Programme. Nairobi, Kenya.

Wagner, S. & Schlummer, M. (2020). Legacy additives in a circular economy of plastics: Current dilemma, policy analysis, and emerging countermeasures. Resources, Conservation and Recycling. 158, 104800.

Williams, H., & Wikström, F. (2011). Environmental impact of packaging and food losses in a life cycle perspective: a comparative analysis of five food items. Journal Of Cleaner Production, 19(1), 43–48. doi: 10.1016/j.jclepro.2010.08.008

Williams, H., Wikström, F., Otterbring, T., Löfgren, M., & Gustafsson, A. (2012). Reasons for household food waste with special attention to packaging. Journal Of Cleaner Production, 24, 141–148. doi: 10.1016/j.jclepro.2011.11.044

World Economic Forum & Ellen MacArthur Foundation. (2017). The New Plastics Economy – Catalysing action. http://www.ellenmacarthurfoundation.org/publications

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