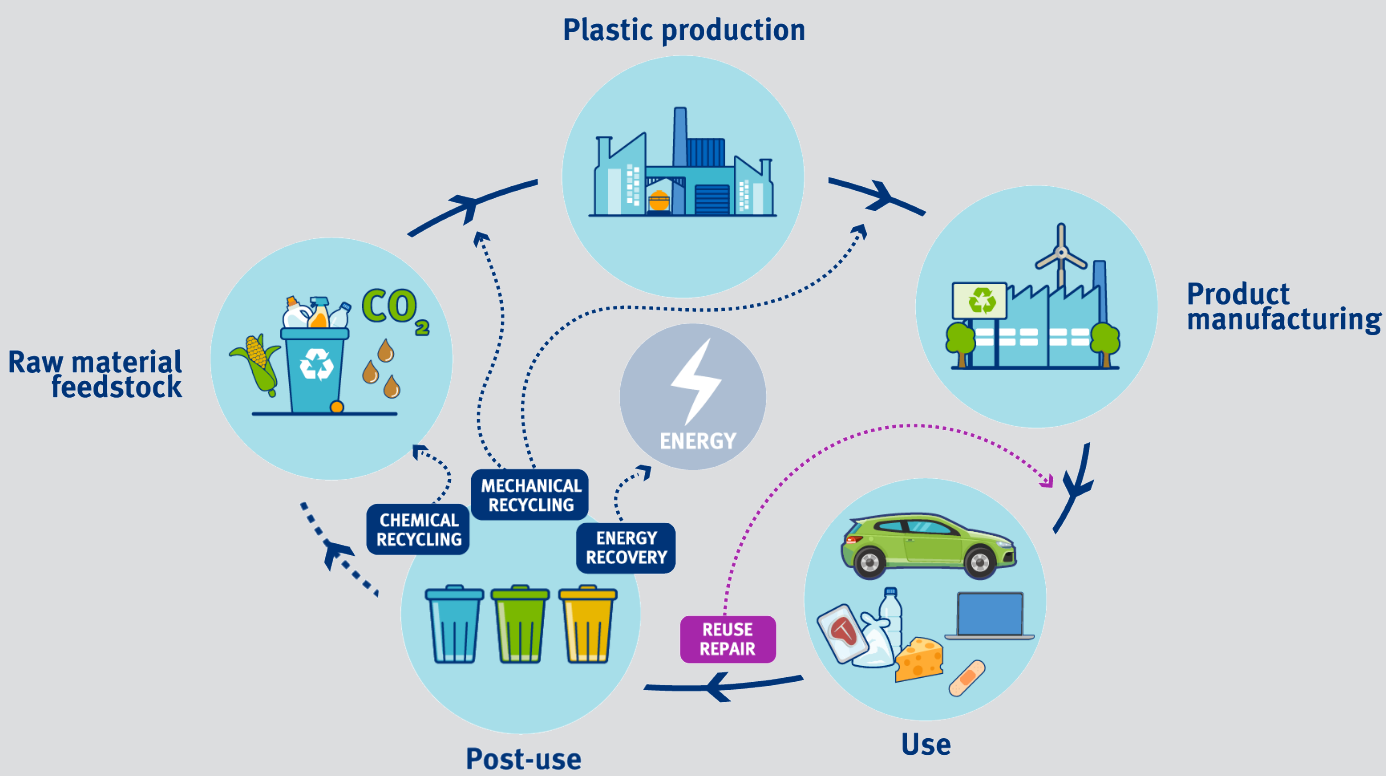

PlasticsEurope's Views on Eco-design with Plastics within the Circular Economy

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PlasticsEurope
Association of Plastics Manufacturers

PlasticsEurope's Views on

Eco-design with Plastics within the Circular Economy

Eco-design can be used as a voluntary tool to guide environmentally conscious decisions when:

- **Eco-design is based on a life cycle approach**
- **Eco-design with plastics is well understood**
- **Eco-design policy is supportive to the development of life cycle resource-efficient and low carbon footprint solutions**

Eco-design is based on a life cycle approach

Eco-design is already practiced and was the object of an ISO Technical Report published in 2002 (*ISO TR 14062: integrating environmental aspects into product design and development*) and of an ISO Standard published in 2011 ("*ISO 14006 Guidelines for implementing Eco-Design in Environmental Management Systems*"). At the same time, the environmental assessment of products in total life cycle is well covered in the ISO Standards 14040: 2006 and 14044:2006 for Life Cycle Assessments.

Such standards provide useful processes in guiding decisions on product design. They help in anticipating and identifying the **environmental aspects of a product throughout its life cycle.** Such standards furthermore explain how a product's environmental impact over its life cycle must also be balanced against other factors, such as the product's intended function, performance, safe use, quality, legislative compliance, cost and marketability. Nowadays, by adding the social aspects to this list[1] [2], the whole sustainability of products can be assessed by stakeholders along the entire value chain[3]. An efficient eco-design process requires application at the early product design planning stage to be most beneficial. It should also be "iterative and flexible, promoting creativity and maximising innovation and opportunities for environmental improvement" and "competitiveness"[4].

Experience has shown that the best solutions are specific to the product. Products are complex and diverse. Knowledge and technology today evolve at an ever increasing rate, thereby improving the ability to create and apply novel solutions that previously would not have been considered possible.

For this reason, plastic materials are widely used by the value chains to eco-design their products, providing unique benefits in a multitude of different innovative applications; often in synergy with other materials, thanks to their:

- wide range of tailorable properties
- potential for innovation
- competitiveness.

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[1] Guidelines for Social Life Cycle Assessment of Products, UNEP SETAC Life Cycle Initiative, 2009
[2] Round table for social metrics handbook 2016
[3] Towards a Life Cycle Sustainability Assessment, Making informed choice of products, UNEP SETAC Life Cycle Initiative, 2011
[4] *ISO TR 14062: integrating environmental aspects into product design and development*

In order to support the general understanding and applicability of full life cycle thinking in eco-designing products, PlasticsEurope organized two workshops on "Eco-design with Plastics – Putting Circular Economy into Motion". Participants across a wide range of stakeholder groups evaluated two main topics; i) "Definition of eco-design", and ii) "How to put eco-design into practice".

Workshop participants agreed on the following **definition of eco-design**:

- Eco-design is the design of products to minimise the environmental impacts over the full life-cycle.
- Eco-design is the integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life-cycle (Eco-design directive).
- It is part of the decision-making process in product development and marketing, using product and process innovation.
- The outcome should be a product specific balance, taking into consideration:
  - Optimised production (energy efficiency, material use)
  - Functionality and use phase benefits
  - Durability and low maintenance
  - Recyclability and share of recycled content
  - Increased reuse and recycling
  - Reduced littering
  - Consideration of economic and social aspects
  - Potentially biodegradability in very specific cases

The workshop results on "How to put eco-design into practice" are described at the end of this paper.

Eco-design with plastics needs to be well understood

Final products such as packed goods, buildings or cars will often contain different types of materials, including plastics, to deliver the required functionality. This document therefore refers to eco-design **with** plastics and not eco-design **of** plastics, which is often mistakenly being referred to. It is about the functional unit's life cycle (e.g. a car's life cycle) and not the plastics material's life cycle. Eco-design must always refer to this specific intended function of products. Different materials or material combinations can enable such functions with more or less life cycle resource efficiency.

The life cycle of a product made fully or partly of plastic(s) is composed of a series of value adding steps, from the extraction of natural resources through to the end of the final product's life when its embedded resources can be recovered as shown in figure 1. The application of products is expressed in the functional unit which can be used as a basis for meaningful LCA calculations.

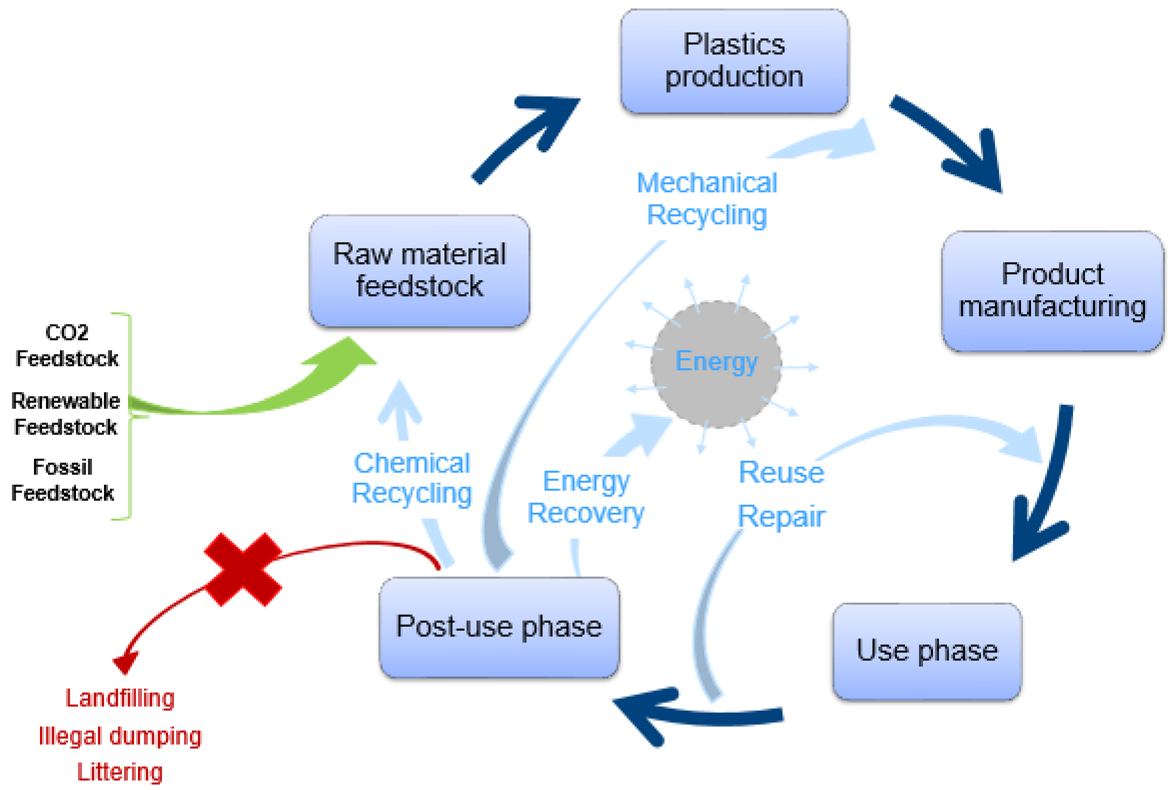

Figure 1: Schematic view: life cycle of products (e.g. packed goods, cars, buildings,..) containing plastics

Each phase offers an opportunity to contribute to the overall environmental improvement of the product over its total life cycle. It is however important not to focus only on one of the phases to avoid shifting of burdens to a different life cycle phase.

Examples of some popular eco-design short-cuts are: design for recycling, for biodegradability, for durability, and for recycled content. They may all be good or bad options potentially leading to sub-optimum designs, and must be assessed holistically. This means to assess the environmental and cost aspects, during the entire life cycle of the product, from cradle to grave, including the benefits delivered in the use phase.

Let's look closer at some of the life cycle phases of products using plastics. This requires also looking at the main environmental impacts or hotspots along the life cycle of products containing plastics and to continuously minimise negative externalities such as CO_2 emissions over the full life cycle of those products.

Feedstock and plastics production

The production of plastics raw materials is only one part of the full product life cycle. For example, in terms of energy, the plastic material used to produce building insulation requires less than 0.4% of the energy that the insulation saves over the whole life time of the building. In this example, the main impact is not in the production of the insulation material nor in the end-of-life, but in the use phase over the building's life cycle.

When eco-designing with plastics for a building, the plastics producers will continuously develop materials which enable increased energy savings over the building life time. On top of that, plastics producers pursue resource efficiency objectives in their own operations.

This is achieved through installed quality and environmental management systems. Plastics producers also endeavour to increase energy efficiency in production and to use energy and feedstock with a lower carbon footprint where it is competitively available and sustainable to do so.

Renewable and natural gas feedstocks are possible examples of feedstocks with a lower carbon footprint. In the long run, innovation to utilise carbon sources, be it CO_2 as a feedstock or wastes containing plastics or renewable raw materials, will effectively contribute to improving the resource efficiency of plastics raw material production. This will in return positively contribute to the overall environmental performance of the final product, provided it meets or exceeds its functional requirements, e.g. increased energy savings in buildings. However, from a life cycle perspective, there are other indicators beyond global warming that may result in trade-offs. Those trade-offs need to be considered and balanced by their relevance. In this context, LCA will support decision-making processes for the development of more sustainable solutions.

Use phase

The use phase is often the most important part of the life cycle of final products where plastics can offer significant benefits in terms of resource-efficient solutions which result in reducing the product's environmental impact over its whole life cycle. There are numerous studies illustrating the benefits of the use phase, the latest being a recent *denkstatt* study on how packaging contributes to **food waste prevention**[5]. For example, an **innovative packaging** system for sirloin steak, based on a multilayer plastic film, has demonstrated up to a 75% reduction of food waste by extending its shelf life as shown in figure 2. Based on detailed data from a big retailer, wastes in the stores could be reduced from 12% to 3%.

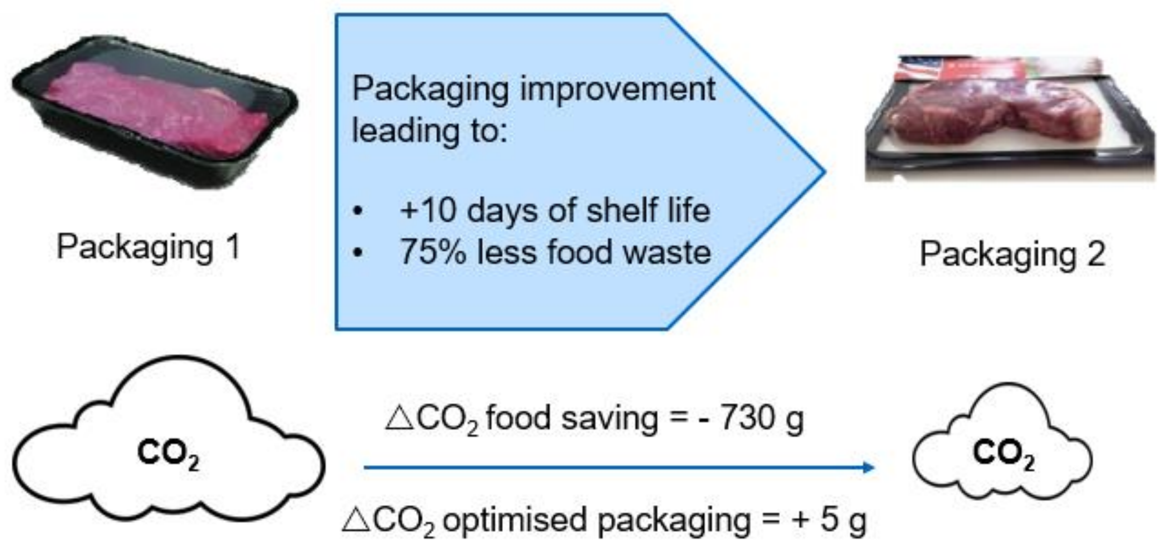

Figure 2: How plastics packaging contributes to food waste prevention – case study sirloin steak

The production of meat is generally a highly resource-intensive process. The packaging protection of a sirloin steak results in a high net environmental benefit if food loss can be reduced using an optimised packaging solution.

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[5] *denkstatt* 2014 – How packaging contributes to food waste prevention (Update 2017; http://denkstatt.at/files/How_Packaging_Contributes_to_Food_Waste_Prevention_V2.0.pdf)

In this example, the savings from avoiding food waste by improving the protective properties of the packaging are 10 times higher than the carbon footprint of the total packaging, and they are much greater than the additional impact of optimising the packaging. Furthermore, emissions to water, resource consumption, toxicity potential, etc. can be reduced with the application of this more sustainable vacuum packaging solution.

The plastic material and the material composition chosen for the different packed products demanded by society will differ depending on the requirements to contain, protect and preserve these wide ranges of products. It is therefore important to recognise that it is **the type of packed product and its production and consumption patterns that govern life cycle resource efficiency** rather than only the plastic materials used to make the packaging.

End-of-life

Coming back to the example of the packed sirloin steak, it is self-evident that protecting and preventing degradation of the steak has a far greater impact on the environment than the actual packaging. The priority is therefore to protect the food in the most resource efficient way, even if this would be at the expense of today's limited ability to recycle such packaging. This is where **innovation plays a significant role**; e.g. to produce the most resource-efficient packaging to protect and save the food and as such reduce the overall environmental impact. At the same time, it is important to continue to search for innovations to eco-efficiently recycle packaging as well as keeping in focus the function of the materials.

Eco-design policy should support solutions which are resource efficient, with reduced carbon footprint and improved sustainability

Plastic materials offer amazing possibilities in contributing to more sustainable products thanks to their potential for innovation and competitive costs.

Eco-design of sustainable products must be a multicriterial approach based on life cycle assessments to lead to the most environmentally friendly, cost-effective and socially beneficial solution. It is to be ensured that the resource efficiency is optimised across the entire life-cycle of a system and not only for one part. For example, increasing recyclability, durability or biodegradability should always be balanced against the actual environmental impact of the required final product in its specific application.

Although eco-design based on a life cycle approach requires a significant assessment effort, it is increasingly practiced based on cooperation between all stakeholders along the value chain, accompanied by the availability and further development of sectorial guidelines and tools (see example in Annex 1).

An eco-design policy should be supportive of this effort, keeping the market competition as the main driver. The capacity for innovation by the value chain to design functional superior solutions using plastics and other materials will – in the end - provide for more optimised solutions to each final product instead of a "one size fit all approach".

An eco-design of products policy should support the development of:

- A multi-criteria life cycle approach capability by all value chain stakeholders, particularly small and medium size companies
- Consensual eco-design tools per category of products & application, based on LCA
- Economic and social aspects methodology to address sustainability as a whole

PlasticsEurope is engaged in this development with its Eco-profile programme[6] providing environmental information of main plastics materials and by contributing to the UNEP-SETAC Life Cycle Initiative[7].

During the workshops mentioned above it became clear that questions on the applicability, robustness and comparability of LCA are still discussed. PlasticsEurope is preparing a Q&A document to address topics which are important to ensure best practice usage of LCA.

How to put eco-design into practice

The stakeholder workshops on “Eco-design with Plastics – Putting Circular Economy into Motion”, organized by PlasticsEurope, also discussed how eco-design could be put into practice. Here are the main results of the dialogue:

- As a first step, specific **eco-design guidelines** should be elaborated for different product categories, using the above mentioned definition of eco-design as a starting point. Long lifetime products will need other guidelines than short lifetime products.
- Also incentive systems might be relevant drivers to make eco-design happen in the market. Nevertheless, the stakeholder dialogue has shown that such incentive systems will have to be designed with care by
    - Considering the mentioned eco-design definition and guidelines
    - Using incentives in a positive way rather than via penalties
    - Checking if the incentives are causing the intended effect
    - Integrating LCA methodology and results
    - Making sure that innovation is not hindered
- Finally all actors should continue to work on open questions like:
    - How to support companies in applying the principles of eco-design?
    - How to solve conflicting goals?
    - How to define comprehensive but simple enough indicators and metrics to measure progress?
    - How to contribute to reduced littering by eco-design?

PlasticsEurope will continue to cooperate with the value chain on the started journey of eco-design with plastics.

6 http://www.plasticseurope.org/plastics-sustainability-14017/eco-profiles.aspx
7 http://www.lifecycleinitiative.org/

Annex 1: examples of existing private and public initiatives

In its paper "*Tour d'horizon sur l'éco-conception des produits*" (Translation: overview of eco-design of products) MEDDE (French Ministry of Sustainable Development and Energy) reminds the benefit of eco-design for the environment and for the competiveness as well. The importance of the life cycle multi-criteria and multi-disciplinary approach is underlined as well as the concrete help that is brought to companies thanks to associations like APEDEC (www.apedec.org), training (www.ademe.fr/eco-conception), development of tools (bilan produit) and of methodology and product category rules ('affichage environnemental' project)

In the packaging sector

- The French COTREP gathers actors of packaging, conditioning and waste management to support packaging designers in balancing for LCA based eco-design, recyclability in the existing national waste management scheme and functional requirements. Hundreds of use cases with recommendations are publicly available on their website http://www.cotrep.fr/en/cotrep/
- The Global Protocol on Packaging gives a very practical guide to packaging designers about how to improve the environmental performance of packaging by considering improvement of a number of concrete attributes (like packaging weight versus content weight ratio) and checking the result against a life cycle approach. http://www.theconsumergoodsforum.com/download-global-protocol-on-packaging-sustainability-gpps

In the automotive sector

- Ford Motor Company explains how they move from "designing for disassembly" to "designing for recycling" for finally implementing "designing for sustainability" based on a life cycle approach, because they experienced that focusing only on a single part of life cycle, like end-of-life, was often counter-productive. (House of Lords Science and Technology Select Committee: Waste reduction Enquiry, Written Submission from Ford Motor Company)

In the building and construction sector

- Standardisation body CEN TC350 (*) has developed a set of standards which enable to evaluate the construction products by the overall contribution of the life cycle of the building. The dynamism of the EPD (**) programmes, particularly advanced in Germany and in France, show the success of their implementation in the value chain.

(*) Committee of European Normalisation, Technical Committee 350: Sustainability of Construction Works

(**) Environmental Product Declaration

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