

# PlasticsEurope's Views on a Strategy on Plastics

## Plastics - Increasing Circularity and Resource Efficiency

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## Foreword

Society enjoys an enhanced quality of life as a result of highly innovative products which rely on plastics. Versatile plastic materials are widely adopted as they meet the demands of today's lifestyles while contributing to resource savings in diverse applications. Furthermore, PlasticsEurope is committed to working with key stakeholders such as value chain partners, academia and policy makers, to help find solutions for societal challenges; including the inappropriate management of products containing plastics at the end of their useful life.

Moreover, the upcoming Strategy on Plastics within the EU Circular Economy Package offers unique opportunities to deliver the innovation needed to ensure that Europe progresses towards a more circular and resource efficient economy. The document describes PlasticsEurope's ideas regarding the Strategy on Plastics with the aim of stimulating a constructive dialogue with stakeholders.

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### 1. Introduction

The European Commission supports a shift to a more circular economy as an alternative to a linear economic model. This offers the opportunity to maximise the utility of resources by retaining the value of goods for as long as possible within the economy; describing how this can help make Europe's economy sustainable, low carbon, resource efficient and competitive.

In this regard, plastics are among the key enabling materials. Their main contribution lies in the fact that plastics also facilitate the circularity of products. More specifically, they increase resource efficiency and sustainability along the value chain, thus stimulating economic growth and jobs. For instance, plastics enable the manufacturing of products that:

- use less energy and emit less CO<sub>2</sub> over their life cycle due to their low weight and/or insulating properties, such as in the packaging, building and construction, and automotive sectors
- last longer, allowing consumer goods and industrial packaging to have an increased lifespan
- contribute to reducing food waste, as packaging significantly protects and increases the shelf life of food
- increase the safety of electrical appliances and electronic devices, providing high strength and excellent electrical insulation
- are used in applications that help enable the supply of renewable energy, thanks to their mechanical strength and lightweight properties necessary for wind turbines and solar panels
- save and improve the quality of people's lives thanks to highly technical medical applications

In addition, plastics manufacturers continuously strive to optimise and diversify their energy sources and the types of raw materials used, while minimising emissions to air, water and soil.

This paper is intended to provide input to the European Commission's **Strategy on Plastics in the Circular Economy**. It draws attention to how plastics play a crucial role in the transition towards a more circular economy based on resource efficiency. It also highlights challenges to be addressed as well as areas where appropriate actions from industry and policy makers can achieve tangible and long-term results.

## 2. Innovation for a Circular and Resource Efficient Europe

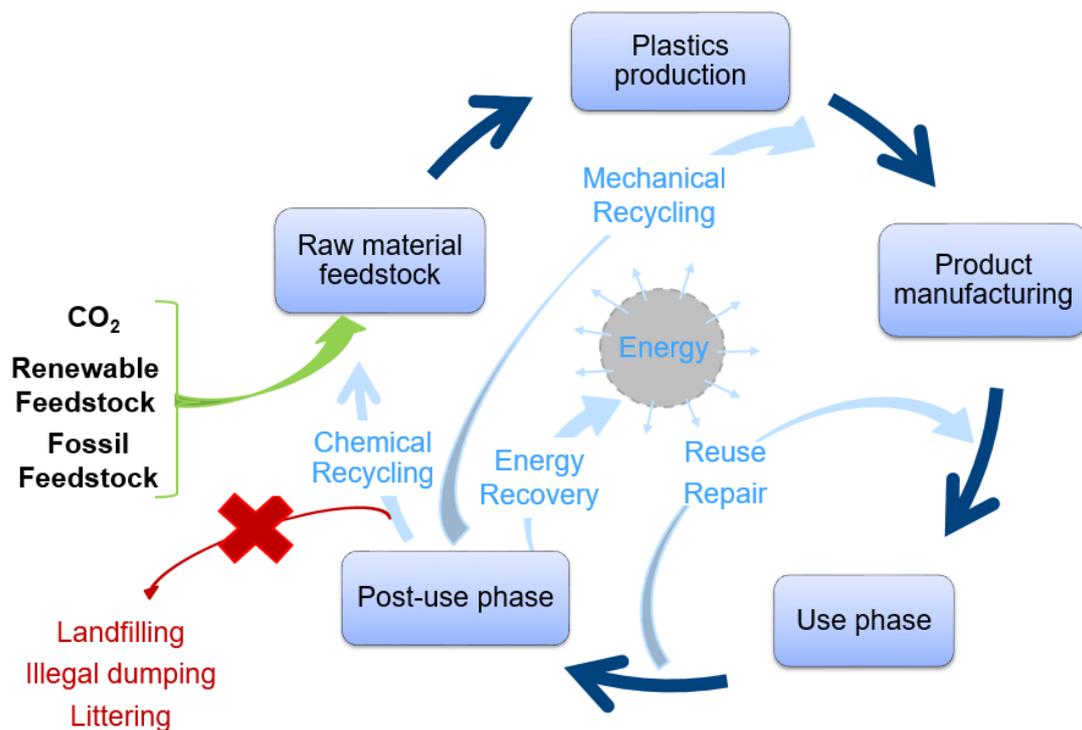
### Applying three Guiding Principles

The European Commission's Strategy on Plastics should stimulate the delivery of practical solutions for today and innovations that drive an increasingly circular, resource efficient and competitive Europe for the future. At the same time, it should aim at preventing the leakage of any waste into the environment. In the view of PlasticsEurope this can be achieved through three guiding principles:

- **Full Life Cycle Thinking**
- **Environmental Protection & Societal Wellbeing**
- **Awareness Building**

### Full Life Cycle Thinking

The most important objective of the circular economy should be to **preserve resources** by applying a holistic approach which considers the total consumption of all resources (including energy) **over a product's full life cycle**. The life cycle of **a product made fully or partly of plastics** 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.



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

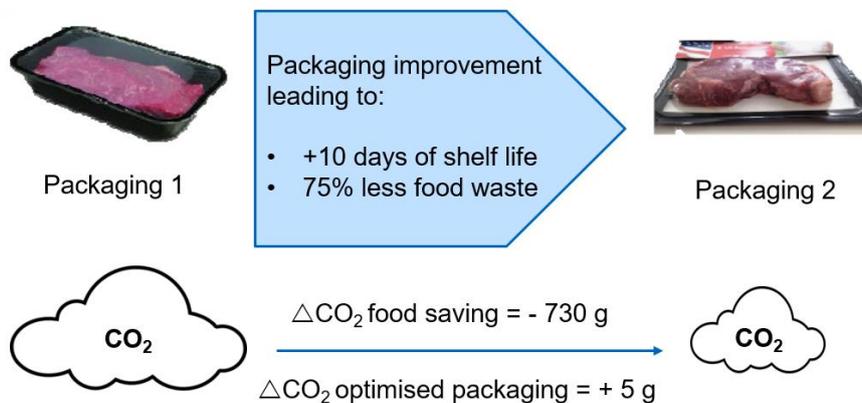
## Feedstock and Plastics Production

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<sup>(1)</sup>.

On top of producing materials which enable e.g. significant energy savings, plastics producers continuously pursue resource efficiency objectives in their own operations. This is realised through installed quality and environmental management systems. These also cover measures such as plastics pellet containment and increasing operational efficiency. Plastics producers also endeavour to increase energy efficiency in production and to use lower carbon energy and feedstock where competitively available and sustainable. Renewable and natural gas are possible examples of feedstocks which can be used as lower carbon emission raw materials. In the long run, innovations to utilise alternative carbon sources, be it **CO<sub>2</sub> as a feedstock, plastic waste or renewable raw materials**, will effectively contribute to improving the resource efficiency of plastics raw material production.

## 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. 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**<sup>(2)</sup>. 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.



*Figure 2\**: How plastic packaging contributes to food waste prevention – case study sirloin steak

\* Data was updated between v1, v2 and v4 of this document

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 when using an optimised packaging solution. In this example, the savings from avoiding food waste by improving the protective properties of the packaging (-730 g CO<sub>2</sub> equivalent per package) are much greater than the savings from optimising the packaging production footprint (+ 5 g CO<sub>2</sub> equivalent per package).

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 range 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.

A recent study done by Trucost <sup>(3)</sup> confirms the findings of previous studies such as *denkstatt* <sup>(4)</sup> and concluded that the environmental costs of using plastics in consumer goods and packaging are nearly four times lower than if plastics were not used. The authors highlight the importance of choosing the materials that create the least impact of the final goods over the full life cycle. Looking ahead in addition to this significant in use benefit, a further reduction of environmental costs is possible through e.g. lightweight packaging solutions.

There are more available studies on packaging as well as for the automotive and building and construction sectors <sup>(5)</sup>. All show that the main opportunity to save resources is in the use phase of final products such as packed goods, cars or buildings. Therefore, it is of key importance to use a **holistic approach that includes a thorough life cycle assessment when looking at resources management within a circular economy**.

### ***End-of-Life***

First and foremost, the aim should be to **prevent waste**. A study recently performed by GVM showed that for the German plastic packaging market in 2013 nearly 1 million tonnes of additional plastic packaging would have been used, if since 1991 no innovation resulting in material savings would have taken place <sup>(6)</sup>. At the same time, those highly resource efficient plastic packaging solutions have enabled the increased protection and preservation of goods and foodstuffs through improved functionality thereby providing further resource savings.

Coming back to the example of the packed sirloin steak it is self-evident that protecting and preventing spoilage 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 that allow us to eco-efficiently recycle the packaging. Innovations in materials and technologies throughout the whole plastics value chain will contribute to increase the potential for recycling. For example, when packaging is separately collected and appropriately sorted, the full potential of products containing plastics at their end-of-life can be achieved.

The **strategy on plastics** offers, both the European Commission and industry an **opportunity to look towards the future to improve Europe’s Competitiveness and Resource Efficiency**. Applying full life cycle thinking in designing products and focusing on more than only one phase of the life cycle will ensure the continued innovation required for a resource efficient circular economy in Europe.

Eco-design may be used as a voluntary tool to guide environmentally conscious decisions which should be based on full life cycle assessment and balanced with the economic and social pillars of sustainability.

**Eco-Design with Plastics**

Final products such as packed goods, buildings or cars will often contain different types of materials 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.

Eco-design based on full life cycle thinking will support the development of resource efficient final products. Within the Circular Economy Package reference is often made to recyclability, durability and biodegradability. This document refers to these as examples of levers of circularity together with material efficiency, energy efficiency and CO<sub>2</sub> reduction. Table 1 shows the overall life cycle contributions of each of those levers towards the objective of resource efficiency within the Circular Economy.

Level of circularity / Application sector	Resource Efficiency						Impact on marine litter	Life time of products
	Material Efficiency	Energy Efficiency	CO <sub>2</sub> Reduction	Recyclability	Durability	Bio-degradability		
Packed goods	✓✓✓	✓✓✓	✓✓✓	✓	✓	✓	High	Short/ Medium
Building & Construction	✓✓	✓✓✓	✓✓✓	✓	✓✓✓		Very low	Very long
Automotive	✓✓	✓✓✓	✓✓✓	✓	✓✓		Low	Long

*Table 1: Examples of circularity levers for plastics application sectors according to life cycle approach*

It shows that **material and energy efficiency** are the most important levers contributing to resource efficiency when it comes to designing with plastics for the three main application sectors. As a result, this also leads to reduced CO<sub>2</sub> emissions. Plastics are both materials and energy resources and, in some cases, it is better from an environmental and cost perspective to recover the energy from the plastic waste than it is to recycle it. Such an option is not available for inorganic materials.

It is therefore important to always assess the **life cycle resource efficiency of the final product within the circular economy**. This will lead to the most environmentally benign, cost-effective and socially beneficial solution. It will also ensure that the whole life cycle resource efficiency of the entire system is optimised, not only one aspect, e.g. packaging. Increasing recyclability, durability and biodegradability are always to be balanced against the overall resource efficiency and environmental impact of the required final product. They should never be used as separate or standalone levers for circularity.

The optimisation of life cycle product performances can only be achieved through a good cooperation between all stakeholders along the value chain. For example:

- Reducing the packaging thickness while maintaining or increasing the performance for packed goods. Further improvements for **food waste prevention** will be achieved through active or intelligent packaging to extend shelf life and to control quality. At the same time the full potential of plastics packaging at the end of their useful life should be taken into consideration.
- Increasing the energy efficiency of buildings. The greatest potential for energy savings in the EU is actually in its buildings as they consume 40% of the energy resource <sup>(7)</sup>. Energy-efficient **renovations of the building envelope** offer a great potential to cut energy use and should be a key priority for Europe.
- Driving towards lower CO<sub>2</sub> emissions for cars. Continuous efforts to **reduce the weight of cars** through the use of advanced plastics solutions and the resulting vehicle fuel efficiency will greatly contribute to Europe's environmental goals.

**Biodegradability** is another lever shown in Table 1. In certain use areas and under holistic consideration, biodegradability serves a useful function for applications such as compostable plastic bags which may facilitate the separate collection of organic waste. In all cases, it is important to have appropriate standards in place which provide complete and safe biodegradation to guide requirements for specific biodegradable applications. Biodegradable plastics are however not the general solution to solve the problem of littering on land and sea.

Last, but not least, **marine litter** is listed in a separate column within Table 1. Leakage of plastics into the environment is caused mainly through uncontrolled or improper handling of goods and waste. This has a negative impact on the environment and resource efficiency as valuable resources are lost. No validated data exists today on the amount of waste reaching our oceans. Also the mechanism on the sources and sinks are not yet fully analysed and understood. A first rough indication about the global amounts has been reported by J.R. Jambeck <sup>(8)</sup> et. al. in 2015. They estimated a global emission in the order of 10 million metric tonnes for the year 2010. Marine litter is a significant global challenge affecting the world's oceans, seas and rivers, its wildlife, fisheries and tourism. Any waste entering the oceans is unacceptable. Therefore, the priority is to **stop waste of any kind, including plastic waste, from entering the oceans and from being littered on land.**

The European Commission's Circular Economy Package plays an important role in **tackling marine litter at source** through working with stakeholders and encouraging the:

- Development of efficient waste management systems,
- Design of mindful products taking resource efficiency and litter into consideration, and
- Promotion of wise consumer behaviours to increase their appreciation of the valuable goods and their resource recovery opportunities.

## **Environmental Protection & Societal Wellbeing**

Section 2.1. shows how life cycle thinking can guide decisions on designing products with a reduced impact on the environment. Plastic products also make life safer and increase the quality of life thanks to e.g. blood transfusion bags, syringes, plastic skull implants, prosthetics, airbags, seat belts, etc.

A key aspect of products safety is ensuring that **products – produced from virgin or recycled raw materials e.g. plastics – are safe for their intended uses.** In the development of plastic materials, producers consider all aspects of safety, health and environmental impacts throughout the life cycle as part of their Responsible Care<sup>®</sup> programme <sup>(9)</sup> and the obligations of the REACH regulation.

**Risk assessment along the life cycle plays a key role.** It is the best way to determine if and how exposure to a chemical that may be used and/or be present in a plastic product could be a cause of concern for workers, the consumers and the environment. In such cases, one can define and apply appropriate risk management measures. In principle, measures should be proportional, non-discriminatory, consistent, based on an examination of the potential benefits and impacts of action or lack of action, in the light of latest scientific evidence.

In the framework of the European Circular Economy Package, concerns have been voiced on the presence of substances of very high concern (and in particular legacy additives) found in recycled materials. **Restrictions on the use of substances of very high concern need to be considered with caution and they must follow the basic principles and procedures as laid out in the REACH regulation.** The mere presence of a substance of very high concern embedded in a plastic material does however not necessarily make this material dangerous and the final recycled product unsafe. Therefore, a thorough risk assessment has to be applied.

It is crucial that recycled materials abide by the regulatory prescriptions as laid out in the REACH Regulation when put on the market. Full compliance with REACH (following the respective ECHA Guidance Document) and other appropriate use related regulations (toys, food contact, RoHS, etc.) is therefore also required for recycled raw materials, to ensure that they are safe for their intended use. This applies to imported plastic products, too. Materials containing substances of very high concern can be recycled as long as there is proven traceability in line with the REACH regulation and where there is no risk to human health and the environment. This enables recyclers to meet the different legislative requirements to secure safety of workers and safety of their product applications.

### **Awareness Building**

Last but not least, working on **consumer education/behaviour will be crucial to achieve the EU Circular Economy objectives.** Plastics exist to serve many different purposes. They make things happen and enable access to a broad range of products that citizens use in their everyday life. It is therefore essential that consumers understand that “resource efficient products” lead to a lower environmental impact; Consumers should play their part in properly managing those products at the end of their use phase. Additionally, consumers should be informed about the benefits of correct waste separation, appropriate recycling methods and be aware of the negative consequences of littering behaviour. Installing well designed, good functioning waste management systems and ensuring the separate collection of all packaging waste is a prerequisite for maximising the recovery of resources and preventing their escape into the environment.

The above can only be achieved through a joint effort by all industries and with the support of governments. Awareness raising campaigns have an important role to play in changing behaviours for the proper and responsible management of goods and services.

It is also important to build greater awareness throughout the value chain to create the most resource efficient products, and to help advocate for improved waste management, mindful product design and changes in human behaviour.

### 3. Addressing the Circularity Challenges of Products using Plastics – The Path Forward

#### PlasticsEurope will:

##### PROMOTE INNOVATION

- that **enables increased circularity and resource efficiency of the various sectors**, based on principles of full life cycle thinking, environmental protection and societal wellbeing, by:
  - Lightweighting, miniaturisation and digitalisation of products
  - increasing durability and lifespan of finished goods
  - further developing and enhancing all forms of recycling (e.g. mechanical/feedstock recycling)
  - increasing the use of by-products and waste streams, including CO<sub>2</sub>, to make plastics
  - investigating the use of renewable feedstock to produce plastics
- by supporting initiatives **on eco-design with plastics for increased circularity and resource efficiency based on life cycle consideration**

##### ENGAGE WITH OTHERS

- to actively pursue **partnerships with the industry value chain** in activities aimed at increasing the sustainability of plastics at production stage, use and end-of-life
- to share expertise and facts on plastics and **engage in circular economy initiatives** such as the European Commission's Circular Economy Package, the New Plastics Economy initiative by the Ellen MacArthur Foundation, World Business Council for Sustainable Development (WBCSD), etc.
- to work with key stakeholders to ensure appropriate **risk-based management of recycled plastics**
- to raise awareness of consumers, policymakers, academia as well as the industry's value chain **on the benefits of plastics and their contribution to resource efficiency and societal wellbeing**

##### PURSUE MARINE LITTER SOLUTIONS

- by continuing the initiative **zero plastics to landfill** and promoting the separate collection and recovery of all packaging waste

- by fully implementing the **Operation Clean Sweep**<sup>®</sup> programme to prevent plastic pellets entering the marine environment and by actively engaging with the value chain for overall implementation
- by engaging in activities to **prevent plastic marine litter** both at European and global level through its active role in the World Plastics Council

## How policymakers can contribute:

### FOSTER INNOVATION

- by mobilising public funding (such as Horizon 2020) to **encourage and stimulate innovation in plastics:**
  - feedstock recycling (plastic waste and CO<sub>2</sub>)
  - re-use models
  - lower carbon feedstocks
  - innovation in traceability of materials, collection schemes, sorting and treatment of secondary raw materials
- by helping secure and enable **competitive access to raw materials** (fossil and renewable) and low carbon energy to produce valuable plastics for society's needs
- by implementing Circular Economy initiatives which create a **level-playing field** to avoid global market distortion and unfair competition

### PROVIDE POLICY SUPPORT

- Enhance understanding and use of **life cycle assessment**
- create a **single directive for energy efficient buildings**, with a stronger focus on existing buildings to achieve Nearly Zero Energy Buildings (NZEB) by 2050 and support modern **resource efficient packaging** and **automotive lightweighting**
- implement and enforce a harmonised, **evidence-based waste legislation** using life cycle thinking, resource efficiency principles and cost-benefit analysis
- call for **zero plastics waste to landfill as part of municipal solid waste management**
- ensure **consistency between waste, product and chemicals legislation** with respect to recycled materials

### STRENGTHEN COLLABORATION & DIALOGUE

- Engage industry and key **stakeholders in collaborative forums** throughout the entire process of development and implementation of the plastics strategy and associated initiatives
- engage in awareness raising campaigns to promote an understanding of the benefits of plastics and their **contributions to a resource efficient economy**

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<http://science.sciencemag.org/content/347/6223/768>
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## Glossary

### Biodegradable plastic

Refers to the specificity of the property of plastic at its end-of-life. The choice of whether or not to use biodegradable plastic is directly linked to its functionality and not to the raw material base of the plastic.

### Bioplastics

Refer to two categories, namely plastics made from a renewable raw material source, so-called bio-based plastics, as well as bio-degradable plastics.

### Eco-design

A method of designing products that includes a detailed environmental assessment of the life cycle along all value chain steps from raw materials selection, manufacture, use and end-of-life of the products. The final design is selected based on a rational weighting of product requirements and life cycle impacts.

### Eco-efficiency

Is a comparison of costs and environmental effects, e.g. in form of greenhouse gas abatement costs given in EUR per tonne of CO<sub>2</sub>.

### Environmental costs

Consumption of natural resources and the emission of pollutants into air, land and water impacts upon the earth's stock of resources (such as clean air and water) and services (such as climate regulation and food provision) commonly referred to as natural capital. Businesses depend on natural capital to be able to operate and provide goods and services to society.

### European Commission Circular Economy Package

[https://ec.europa.eu/priorities/jobs-growth-and-investment/towards-circular-economy\\_en](https://ec.europa.eu/priorities/jobs-growth-and-investment/towards-circular-economy_en)

### Life Cycle Assessment (LCA)

Environmental management tool that assesses the overall performance of a particular product or service. LCA considers the whole life cycle (from material extraction, manufacture, packaging, distribution, use and post-use recovery and disposal), and a wide range of impact categories. LCA is defined by various ISO standards (ISO 14040 series).

### Life Cycle Thinking

An approach that considers the environmental impacts associated with providing a product or service from the extraction of resources, through the manufacture and use of the product, to the final processing of the disposed product.

### New Plastics Economy Initiative – Ellen MacArthur Foundation

<https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics>

## Operation Clean Sweep®

Operation Clean Sweep® (OCS) is an international programme designed to prevent the loss of plastic granules (pellets) during handling by the various entities in the plastics industry and their release into the aquatic environment.

## Potential for EU energy savings

Final energy consumption is usually shown split into transport (31.6%), households (26.8%), industry (25.1%), service (13.8%), agriculture & fishery (2.3%) and other (0.5%) (see EU energy in figures 2015, p 81). Buildings, other than residential households, constitute also part of the other sectors. The EU Commission states that Europe's buildings are responsible for 40% of energy consumption and 36% of CO<sub>2</sub> emissions in the EU. While new buildings generally need less than three to five litres of heating oil per square meter per year, older buildings consume about 25 litres on average. Some buildings even require up to 60 litres.

(<https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>).

## Product

A product in this paper is an end-product which uses plastics to deliver a function, e.g. a packed good, a car, a building, etc.

## Raw materials and feedstock

Raw materials are all materials used in the production of plastics. This includes feedstock which is the building block to produce plastics (e.g. ethylene to produce polyethylene) and additives required for the plastic (e.g. anti-oxidant to stabilise the plastic material).

## Responsible Care®

Global chemical industry's unique initiative to improve health, environmental performance, enhance security, and to communicate with stakeholders about products and processes.

## Resource efficiency

A general concept currently promoted by the EU as part of the Europe 2020 strategy to achieve sustainable growth; includes the efficient use of resources and a low carbon economy.

## Risk assessment

Tool to assess risk and safety for humans and/or the environment. Consists of two parts: hazard assessment, which looks at the toxicity of the material and the dose at which an effect is observed, and exposure assessment, which predicts the likely concentration of the material that will be encountered.

## Value chain

Value chains are an integral part of strategic planning for many businesses today. A value chain refers to the full life cycle of a product or process, including material sourcing, production, consumption and disposal/recycling processes.

<http://wbcspublications.org/project/collaboration-innovation-transformation-ideas-and-inspiration-to-accelerate-sustainable-growth-a-value-chain-approach/>

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