



Plastic packaging: Food safety and Quality

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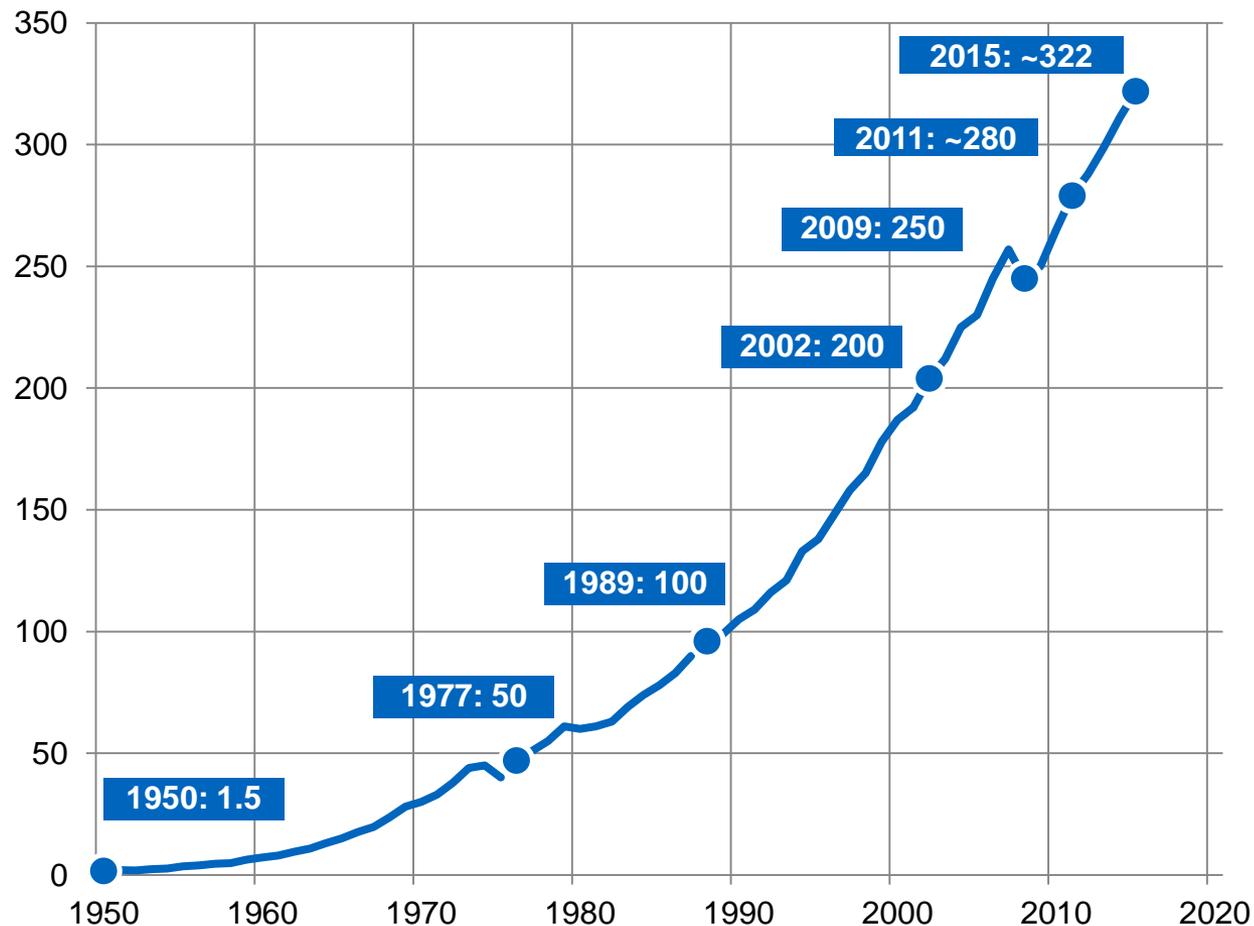
PlasticsEurope
Association of Plastics Manufacturers

1. Analysis of the plastics demand per geographical area, with particular reference to Europe (EU27+2), applications sectors and resin types;
2. Overview on the benefits deriving by the use of plastics packaging and its contribution in achieving food safety and quality.
3. Analysis of the EU Relevant Regulatory Framework on Materials and Articles intended to come into Contact with Food;

1. Analysis of the plastics demand per geographical area, with particular reference to Europe (EU27+2), applications sectors and resin types

World Plastics Production 1950 – 2015

Mio. ton



Includes Thermoplastics, Polyurethanes, Thermosets, Elastomers, Adhesives, Coatings and Sealants and PP-Fibers. Not included PET-, PA- and Polyacryl-Fibers

- Plastics production ramped up from **1.5 Mio t in 1950** to **322 Mio t in 2015**.
- European production (EU28+NO and CH) in **2015; 58 Mio t**

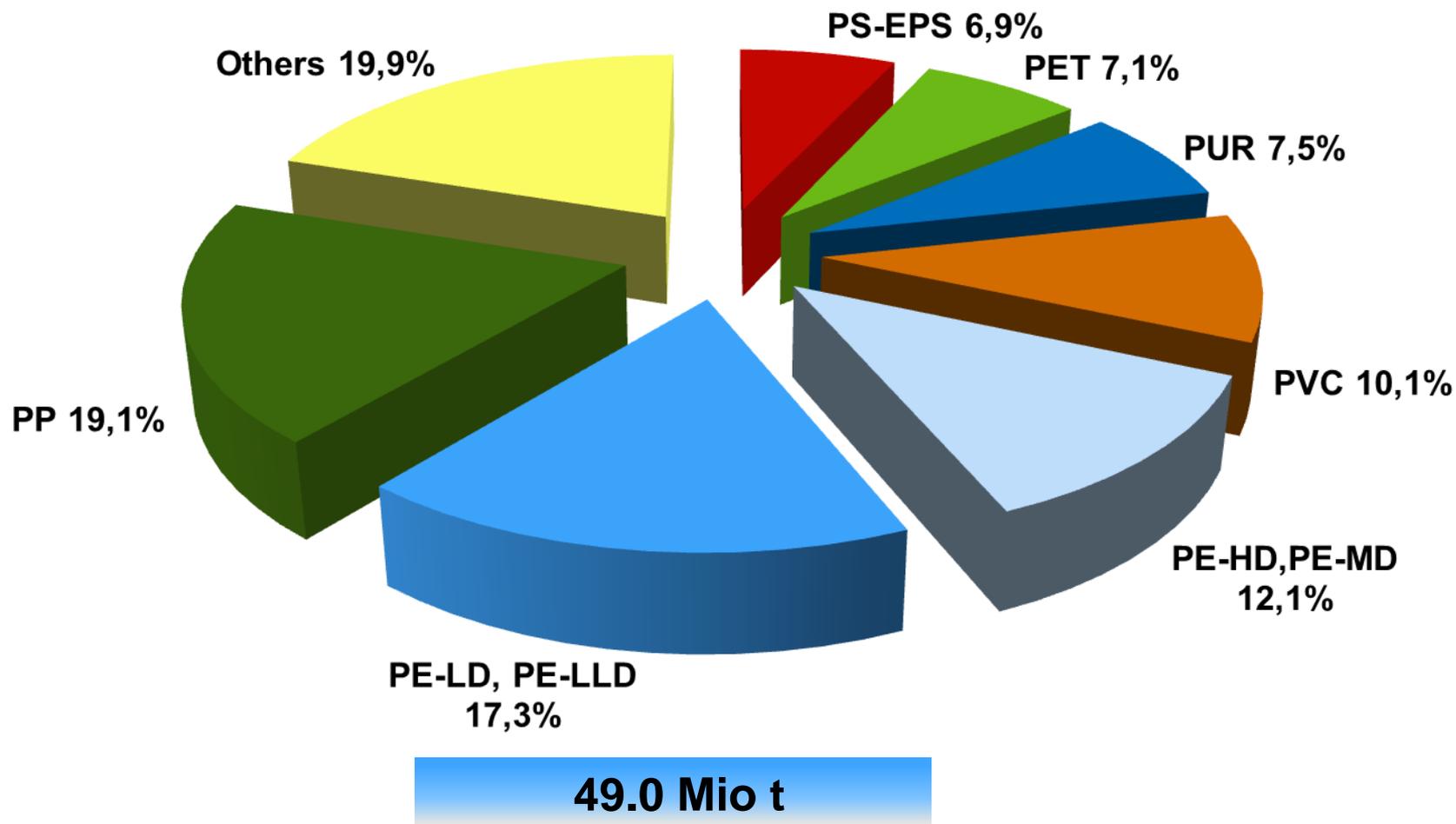
Europe Plastics Demand* by Segments 2015

49.0 Mio t



Source: PlasticsEurope Market Research Group (PEMRG)

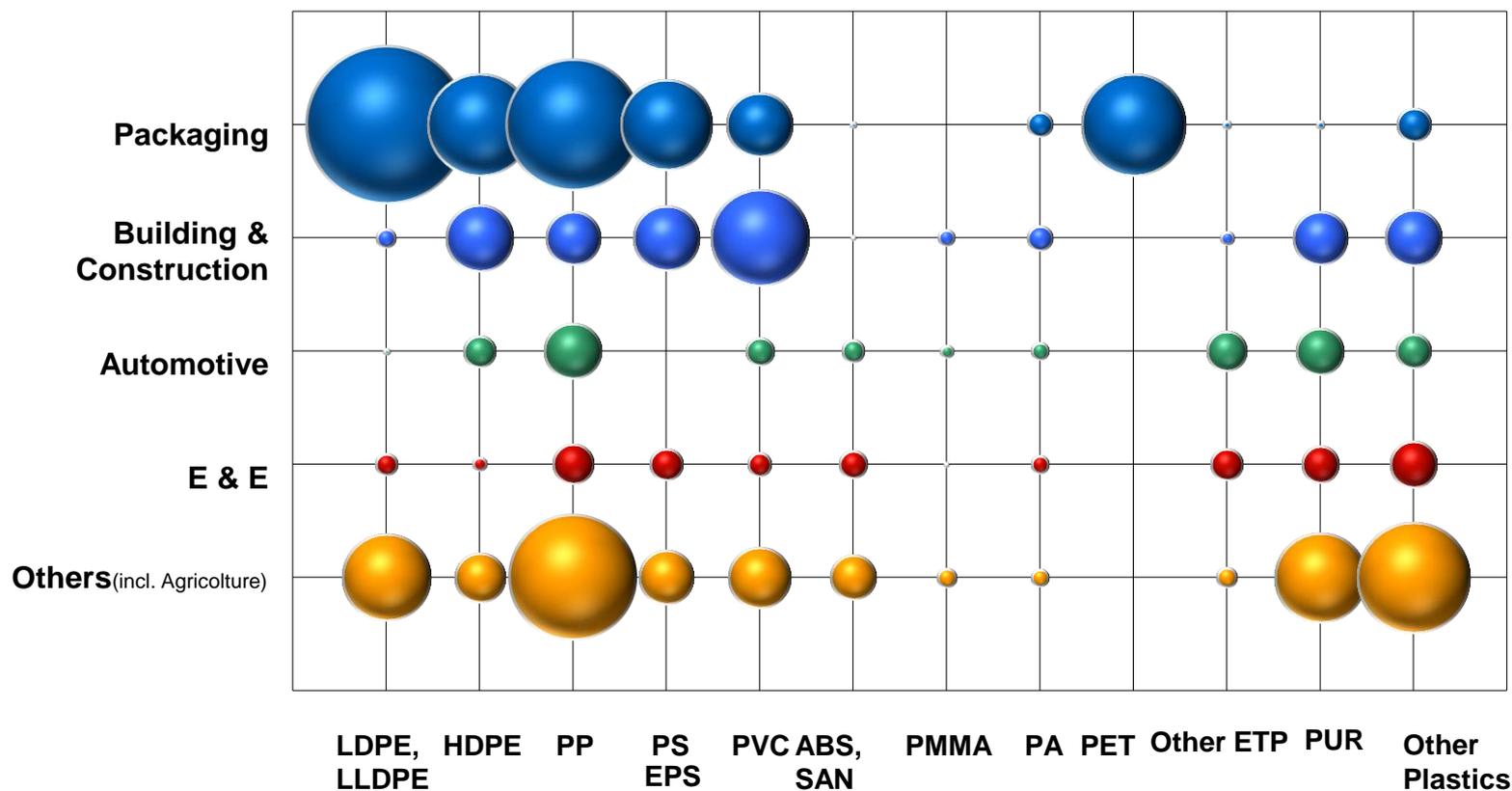
Europe Plastics Demand* by Resin Types 2015



Source: PlasticsEurope Market Research Group (PEMRG)

Europe Plastics Demand by Segments 2015

49.0 Mio t



2. Overview on the benefits deriving by the use of plastics packaging and its contribution in achieving food safety and quality

In developing countries 40% of food losses occur at post-harvest and processing levels. This is partly due to the lack of appropriate packaging solutions.



Extended shelf life means less preservatives plus extended life in the home



LONGER ON THE SHELF



LONGER IN THE FRIDGE

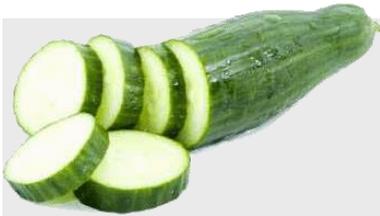


LONGER LIFE AT HOME



PARTICULARLY SUITABLE FOR PRESERVING PERISHABLE GOODS

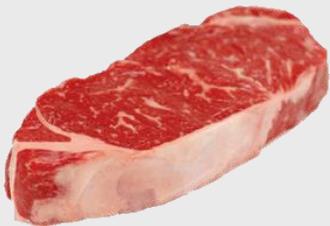
According to the UK's Advisory Committee on Packaging [ACP, 2008]:



An unwrapped cucumber loses moisture and becomes dull and unsalable within 3 days, whereas **only 1,5 grams of wrapping can keep it fresh for 14 days.**



Selling grapes in trays or bags has **reduced in-store waste of grapes by 20 %.**

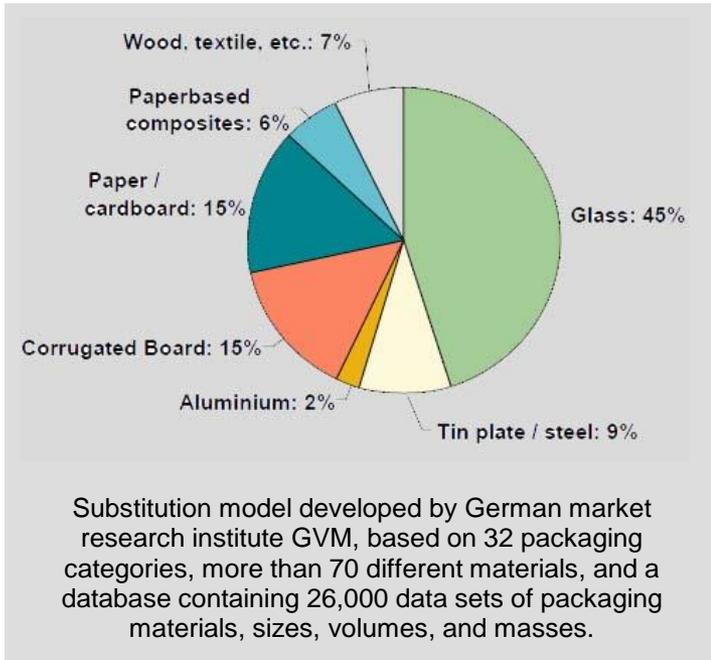


In the UK, a retailer who switched meat packaging from MAP (modified atmosphere packaging) to skin packs has increased shelf life from 5 to 10 days. **Food losses in stores were reduced from 16 % to 4 %, i.e. -12%!**

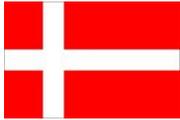
- 70 % of **all food packaging** (plastics and other materials) prevent the loss of **20 %** of the food packed (compared to distribution of goods without packaging).
 - This accounts for 190 Mt of prevented CO₂ emissions, i.e **nearly half of France's annual emissions !**
- **Plastic** packaging used to pack **fresh food** prevents at least **10 % more** food losses than alternative packaging materials (coated wrapping paper, for instance).
 - The benefit of this reduction is approximately 22 Mt of prevented CO₂ emissions, i.e. **Croatia's annual emissions !**



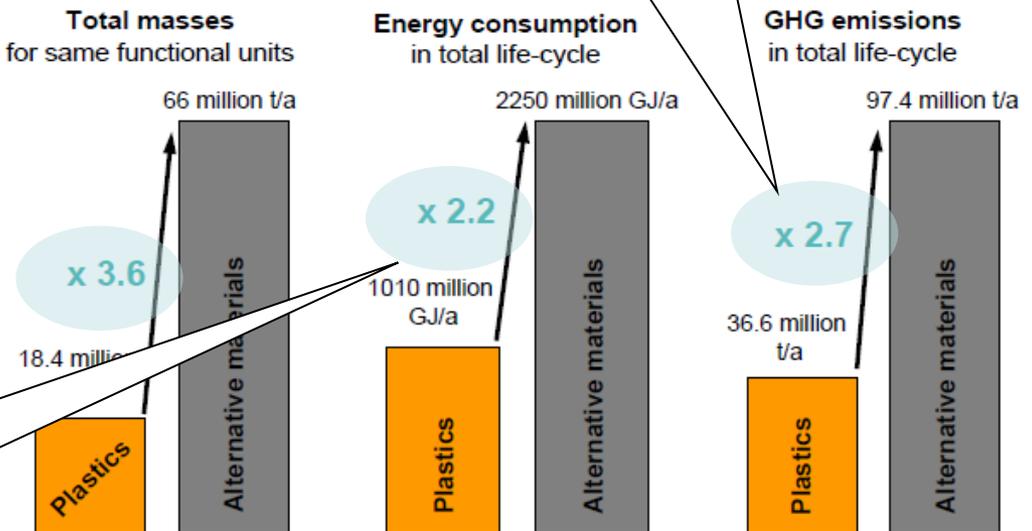
Replacing plastics packaging with:



= 21 million more cars on the road, i.e. the total CO₂ emissions of Denmark !



Would lead to...



= 20 million more heated homes, i.e. the annual consumption of Romania's population!



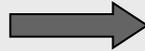
Source: Denkstatt study on the impact of plastic packaging on energy consumption and GHG emissions

- Fresh food which is not pre-packed (meat, cheese, salad, ...) often has a short shelf life. Using plastic can significantly increase shelf life and thereby reduce food wastes in stores

Example : plastic-packaged meat



6.7 kg CO2 per
kg of meat



26 grams
packaging per kg
of meat, leads to
0.05 kg of CO2

With 10% of prevented food loss,
**plastics packaging helps spare 670g
CO2**

Benefit is 13 times higher than burden
of packaging production



CO2 emissions related to meat are **130 times higher** than CO2 emissions of packaging !



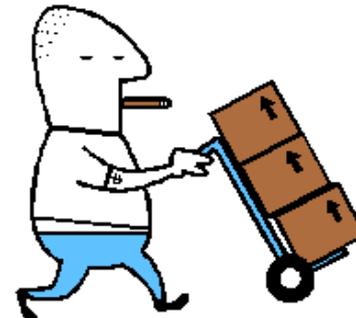
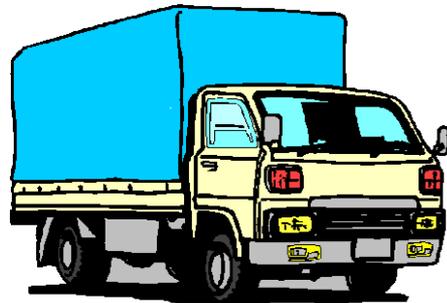
The benefit of 10 % prevented food loss is **13 times higher** than the CO2 emissions caused by plastic packaging

Function of food packaging

To guarantee that in the “path” between producer and consumer, food is safe, without significant modifications of its composition and its organoleptic characteristics.



Producer



Consumer



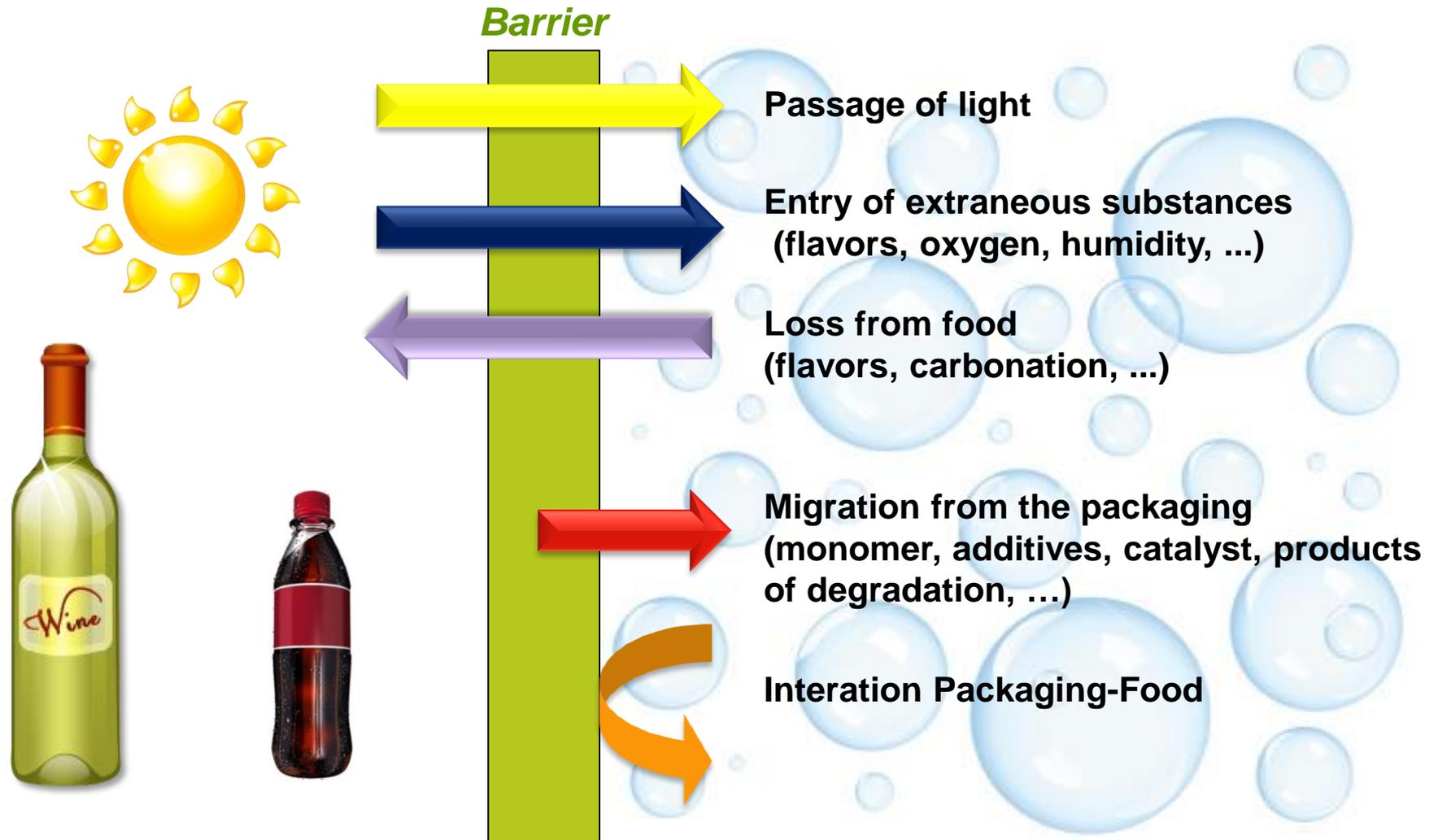
- **Absolute barrier** against the external environment
- **Inert** towards food



Packaging = System

- Container
- Closure
- Label





- Plastic packaging enables:
 - **significant savings** of energy and GHG emissions
 - **resource efficient** packaging solutions
- The **substitution of plastic packaging** with other materials will in most cases increase energy consumption and GHG emissions.
- Plastic packaging often facilitates **reduced material consumption**.
- Plastics used for food packaging enable extraordinary **benefits in the use phase** (prevented food losses and efficient transportation).
- A “**carbon balance**” shows that the estimated use benefits of plastics packaging are at least 5 times higher than the emissions from production & recovery.

- Food Shelf life extension
 - Preservation of color
 - Maintain nutrients
 - Avoid loss of humidity
 - Maintaining organoleptic properties
- Avoid food contamination
- Allow usage of recycled plastics in food contact applications
- Avoid spoilage of drugs and pharma products active principles

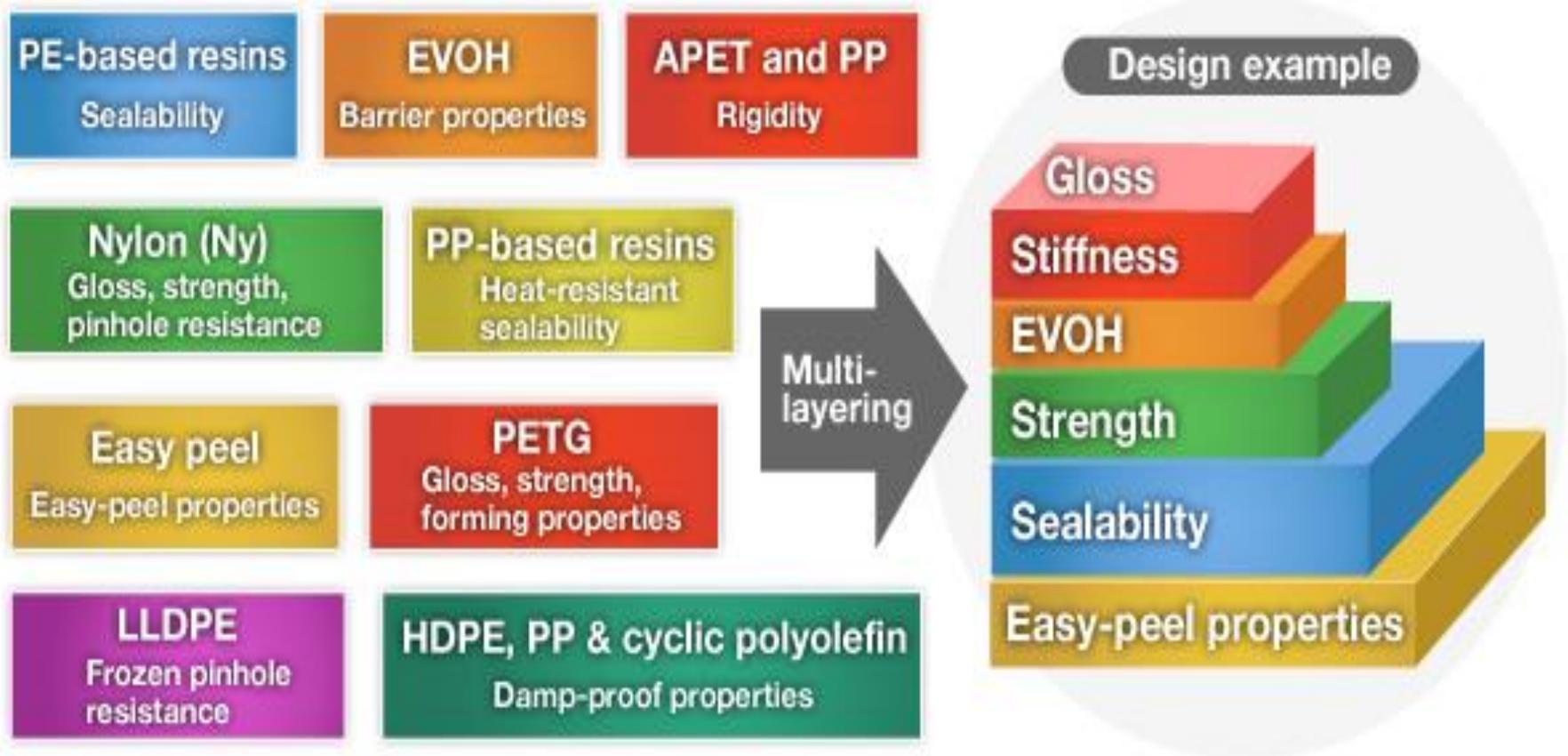
It is not an Absolute barrier against the external environment

- Must protect and preserve food for a long enough period (shelf life)
- Best before...

It is not fully Inert towards food

- Must not leave harmful substances
- Must not alter the characteristics of the food

Model barrier coex or laminated structures



- Traditional

- PVDC
- ALU foil
- EVOH
- PET, coated or uncoated
- PA, coated or uncoated
- PA-MXD6
- PAN

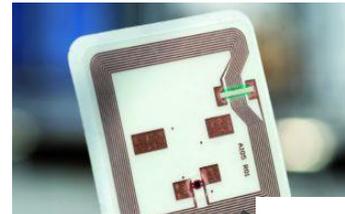
- New

- SiOx coatings
- Nanocomposites
- Cycloolefin copolymers
- Active barrier

Plastic packaging can already triple shelf life thanks to its unique properties that allow for resealable portioned films and packs, anti-microbial agents, humidity control systems and modified atmosphere packaging solutions

In the future;

- ***Printable RFID tags (Radio-frequency identification)*** that provide warnings of changes in and humidity levels that might affect the integrity of the product.
- ***Absorbers and emitters of natural occurring gaseous substance*** prolong shelf life are already entering the market.
- ***Biosensors that detect bacteria and viruses*** will pave the way to safeguard the quality and safety of food for consumers whilst further reducing food waste.



Sensing technologies for barrier efficiency

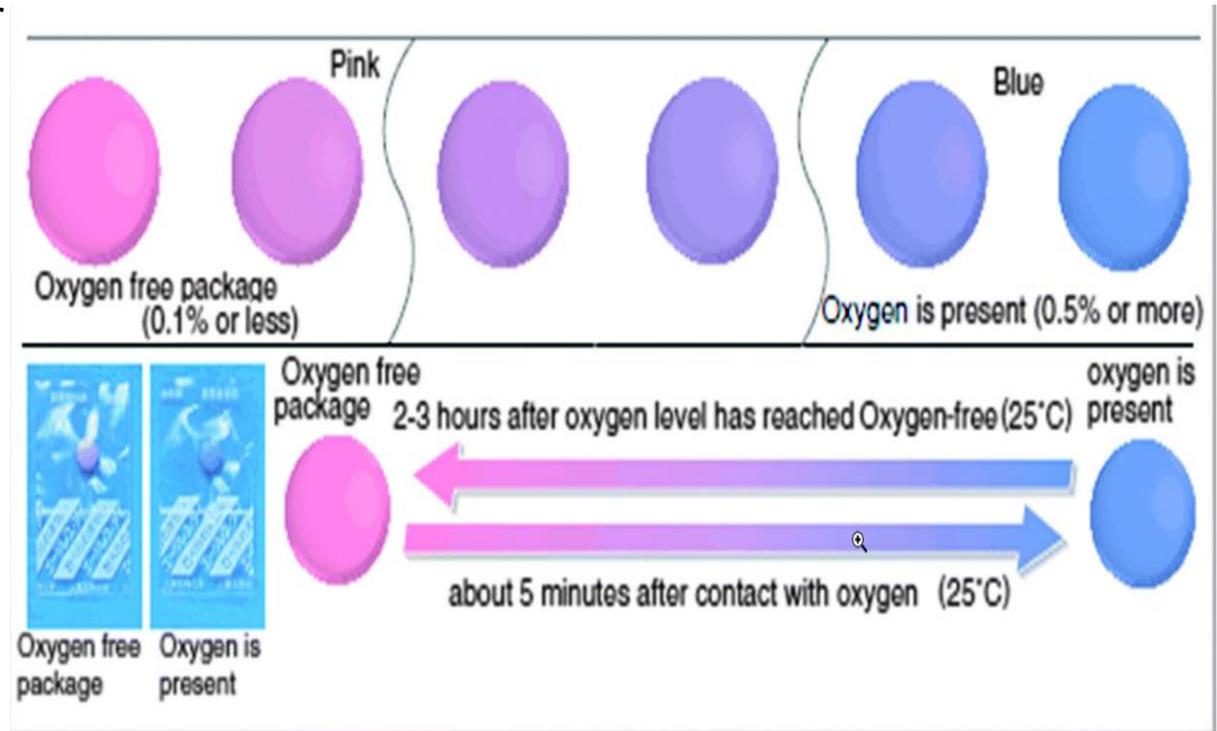
Oxygen sensor: TiO_2 in polymer with blue dye (blue color indicates exposure to O_2)

Gas sensors: conducting polymer nanocomposites, resistance changes of sensors produce pattern of respective gases.

Electrochemical sensors: detect ethylene

Available since early 2000

Controversial at retailing



3. Analysis of the EU Relevant Regulatory Framework on Materials and Articles intended to come into Contact with Food.

The Relevant Regulatory Framework on Materials and articles intended to come into contact with food



- **Regulation (EU) 1935/2004 – on materials and articles intended to come into contact with food**
- **Regulation (EU) 2023/2006 – Good Manufacturing practice for materials and articles intended to come into contact with food**
- **Regulation (EU) 282/2008 –on recycled plastic materials and articles intended to come into contact with food**
- **Regulation (EU) 10/2011 – on plastic materials and articles intended to come into contact with food**

- **Member State Regulatory Framework, e.g. Italy**



- **Ministerial Decree 21.3.1973 - on materials and articles intended to come into contact with food-General framework**
- **Ministerial Decree n. 113 of 2010/05/18, and Ministerial Decree, n. 139 2012/07/09– on recycled PET for the production of bottles for soft drinks**

Regulation (EU) 1935/2004 – on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC

Article 3

1. *Materials and articles, including active and intelligent materials and articles, shall be manufactured in compliance with good manufacturing practice so that, under normal or foreseeable conditions of use, they do not transfer their constituents to food in quantities which could:*
 - a) *endanger human health;*
or
 - b) *bring about an unacceptable change in the composition of the food;*
or
 - c) *bring about a deterioration in the organoleptic characteristics thereof.*
2. *The labeling, advertising and presentation of a material or article shall not mislead consumers.*

- **General Provisions**
 - Apply to any material / article
 - Reference in the absence of regulations
- **Procedure of european authorization of new substances**
 - Petition
 - Evaluation(EFSA)
 - Decision (European Commission)
- **Field of application of the national legislation**
 - It is applied in the absence of Community provisions
 - Principle of free circulation of the goods
 - National regulations possible if justified (health protection)
- **Communication**
 - Declaration of Compliance
 - Labelling
- **Control (Member State)**
- **Fines** (effective, proportionate and dissuasive)

Regulation (EU) 2023/2006 – Good Manufacturing practice for materials and articles intended to come into contact with food

- Good Manufacturing Practices (GMP)
- Quality assurance system
- Quality control system
- Documentation

In Italy the concept has been further developed in the **Progetto CAST**, which is a “working document / guideline” shared between Industry and Authority

Regulation (EU) 282/2008 –on recycled plastic materials and articles intended to come into contact with food and amending Regulation (EU) n. 2023/2006

- National laws will no be more valid when the regulation enter into force
- Field of application: mechanical treatment of post-consumption materials
- Requirements for recycled plastic materials and articles
- Condition for the authorisation of recycling processes
- Application for authorisation of a recycling processes and opinion of Authority
- Authorisation of a recycling processes
- Community register
- Official control



Regulation (EU) 10/2011 – on plastic materials and articles intended to come into contact with food

- Composition requirements
 - Authorised Substances (positive list)
 - Authorised Substances (producer responsibility)
- General and specific requirements
- Restrictions
- Overall migration limit
- Specific migration limits
- Plastics multi-layer materials and articles and multi-material multi-layer materials and articles
- Declaration of Compliance
- Supporting Documents
- Compliance



Plastics

The Material for the 21st Century