

Sustainable Development and Packaging

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COST Action FP1405

Active and intelligent fibre-based packaging – innovation and market introduction (ActInPak)

ActInPak is a pan European (COST) network of the leading experts in active and intelligent packaging of over 150 institutes, universities and companies from 37 countries. Main goal of action is to develop a knowledge-based network on sustainable, active and intelligent fibre-based packaging in order to facilitate its introduction on the market.

<http://www.actinpak.eu>

http://www.cost.eu/COST_Actions/fps/Actions/FP1405

<https://www.linkedin.com/groups/COST-FP1405-ActInPak-8254568/about>

COBRO - PACKAGING RESEARCH INSTITUTE

State, self-supporting research institution
subordinated to the Ministry of
Economy,
founded in 1973.

Member of:

- ▶ World Packaging Organisation,
- ▶ International Association of
Packaging
Research Institutes,
- ▶ Polish Chamber of Packaging,
- ▶ European Bioplastics.

- Packaging R&D Department:
 - ✓ Packaging and Environment
Department
 - ✓ Laboratory for Packaging Materials
and Consumer Packaging Testing
- Laboratory for Transport Packaging
Testing
- Certification Centre
- Standardization Department
- *Packaging Spectrum Magazine*



Contents

- **What is sustainable development ?**
- **Can we measure it ?**
- **How can we measure it / what should we look for ?**
- **Sustainability of Active and Intelligent Packaging**

Sustainable Development

To use the traditional definition, sustainable development is:

"development that meets the needs of the present without compromising the ability of future generations to meet their own needs", in other words ensuring that today's growth does not jeopardize the growth possibilities of future generations.

Sustainable development thus comprises three elements - economic, social and environmental - which have to be considered in equal measure at the political level. The strategy for sustainable development, adopted in 2001 and amended in 2005, is complemented inter alia by the principle of integrating environmental concerns with European policies which impact on the environment.

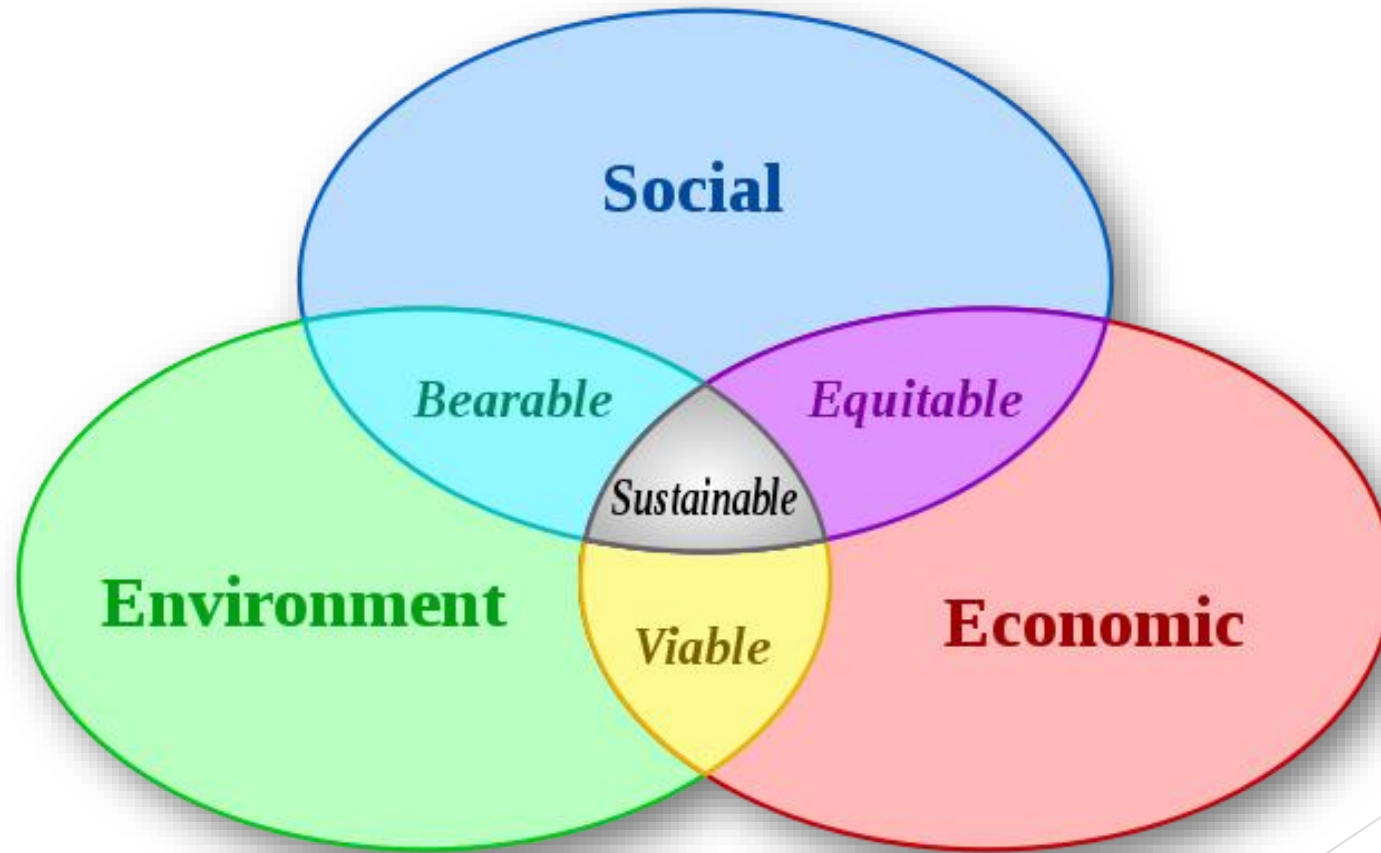
- source: <http://europa.eu>

Sustainable Development

Sustainable development is about integrating the goals of a high quality of life, health and prosperity with social justice and maintaining the earth's capacity to support life in all its diversity. These **social, economic and environmental** goals are interdependent and mutually reinforcing. Sustainable development can be treated as a way of expressing the broader expectations of society as a whole.

- source: ISO 26000:2010

Sustainable Development



Sustainable Development

Sustainable development concept for business consists of taking into consideration widely understood **economic, environmental and social** issues in the **daily and long term operations of a company**.

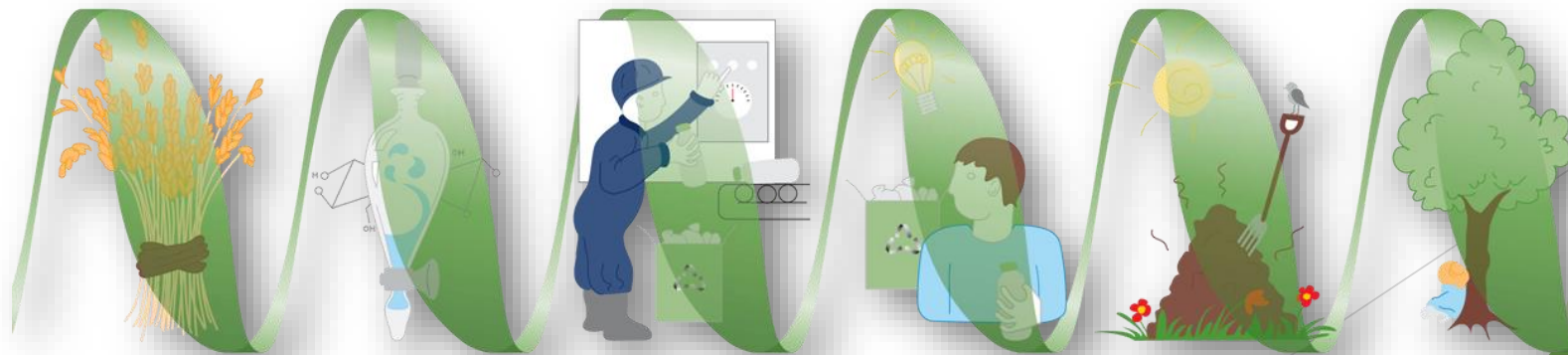
In packaging industrial practice that means being responsible for the introduction of packaging from the perspective of those three issues in a whole life cycle of both **the packaging** and **packed product**.



Sustainable Development

Sustainable development has to be present in **all product life cycle stages**, starting from production process, delivery chain, demand for sources, processing methods, packaging, distribution, usage and waste management including transport.

At the same time sustainable products should match up or exceed conventional products by **functional** and quality properties, fulfil today's environmental protection standards, and also contribute to waste management system.



Sustainable Packaging

According to **Sustainable Packaging Coalition** sustainable packaging:

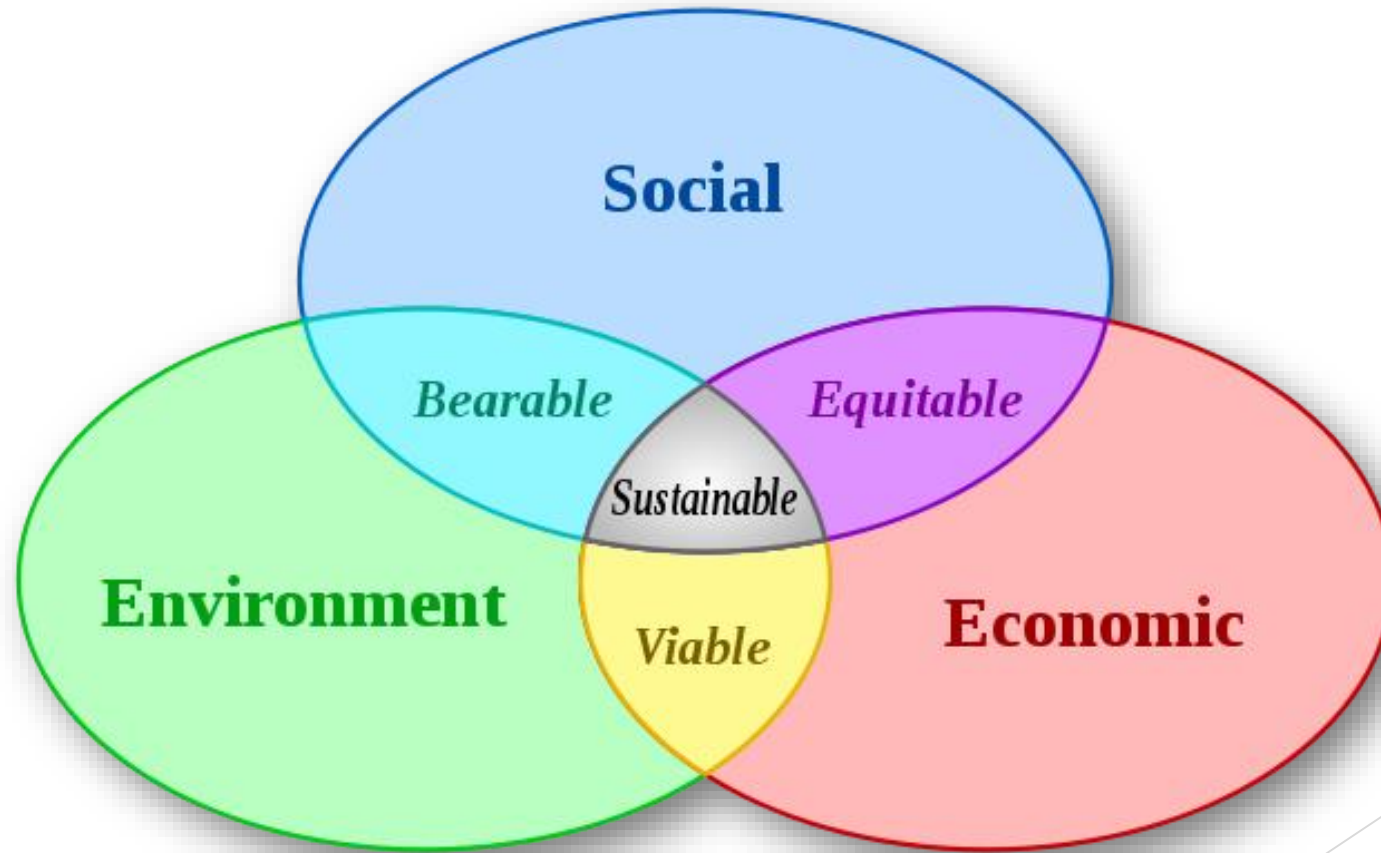
- Is beneficial, safe & healthy for individuals and communities throughout its life cycle;
- Meets market criteria for both performance and cost;
- Is sourced, manufactured, transported, and recycled using renewable energy;
- Is manufactured using clean production technologies and best practices;
- Is made from materials healthy in all probable end of life scenarios;
- Is physically designed to optimize materials and energy;
- Is effectively recovered and utilized in biological and/or industrial closed loop cycles.

How to assess sustainability

- If you want to do it objectively and by following internationally recognised standard? -
 - **Short answer: YOU CAN'T (yet)**
- ISO 14021 – Self Declared Environmental Claims – clearly prohibits from making any self-declared sustainability claims

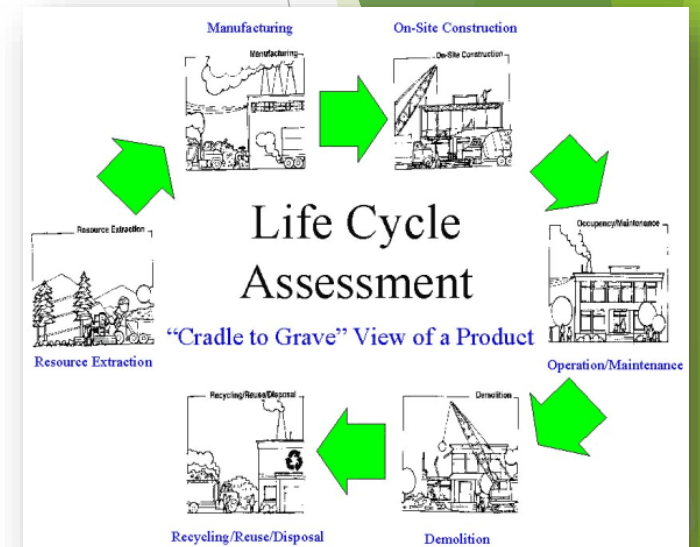


Sustainable Development



How to assess sustainability

- LCA = **Life Cycle Assessment**
- Probably the most popular sustainability and environmental assessment methods
- Can be used to assess products, value chains, processes, whole companies, economy and even socio-cultural implications
- Its main goal is to assess the aspects of environmental impacts in whole life cycle of selected subject matter.



How to assess sustainability

Packaging LCA is used to assess the environmental impact of packaging and includes such factors as infrastructure (transport), multi-usability of packaging and how the packaging is/can be disposed.

LCA is best used as a comparative assessment tool – i.e. in terms of packaging it is best to compare different packaging types for the same group of products.



Source: <http://amanac.eu/workshops/lca-lcc-approach/>

Life Cycle Assessment

Input:

What we have
taken from the
environment

Life:

Detailed
Biography
and Family
Tree of our
product

Output:

What we
are leaving
behind -
emissions

Life Cycle Assessment

LCA is used to *model* **complex** reality

+

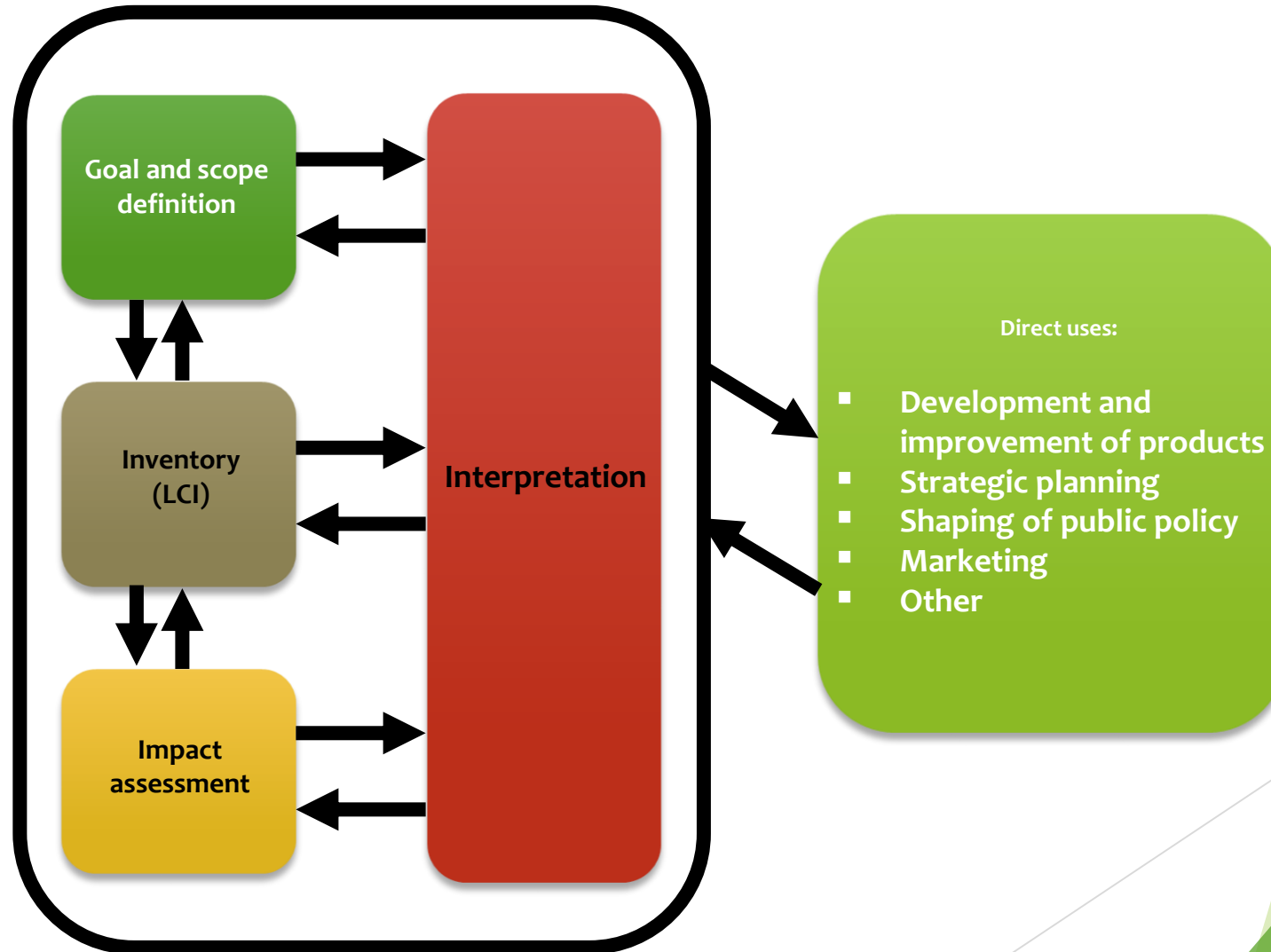
Each *model* **simplifies** the reality

=

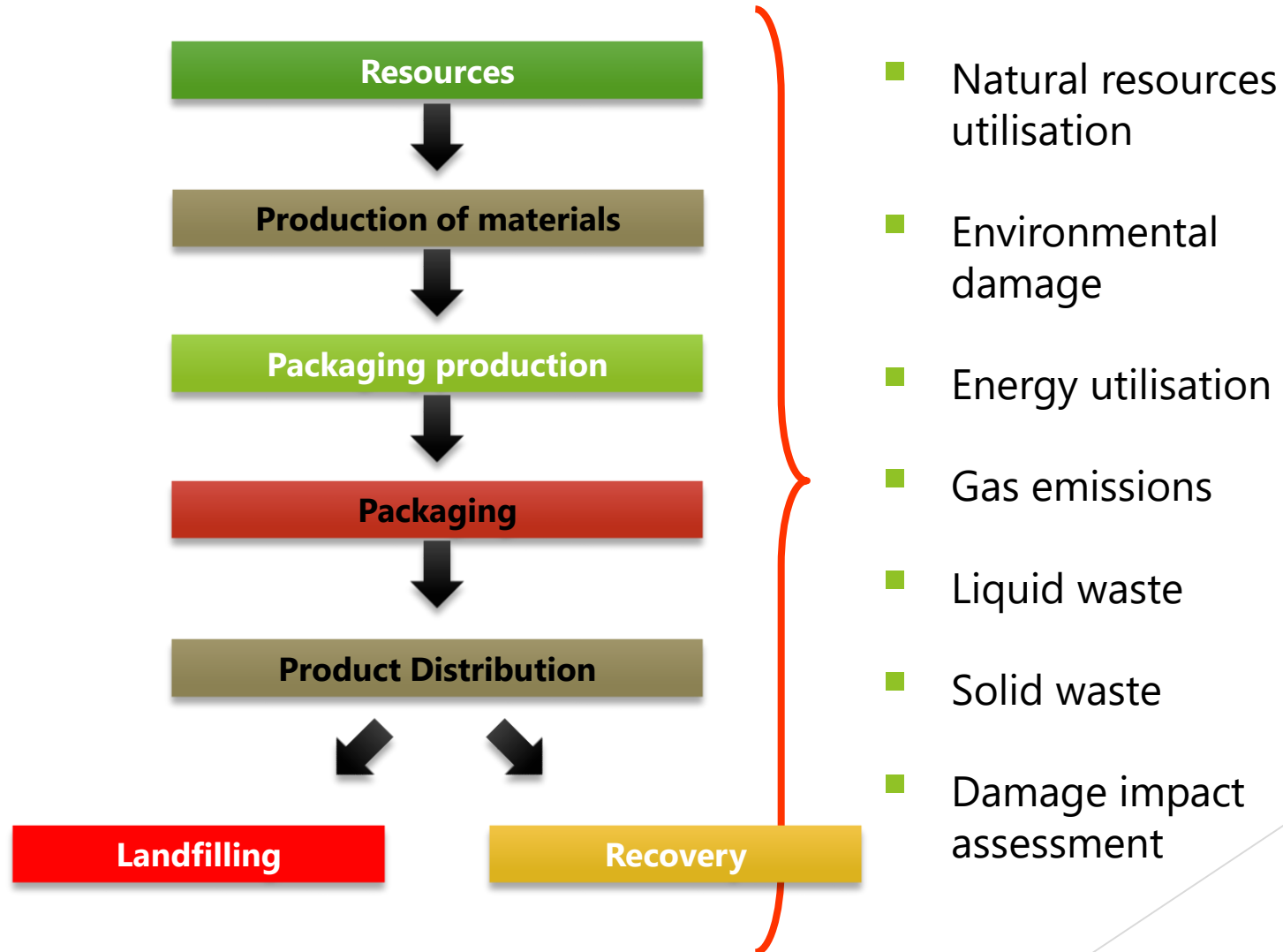
Contradiction – simplification distorts the reality

Main goal of LCA – minimise this distortion

Life Cycle Assessment



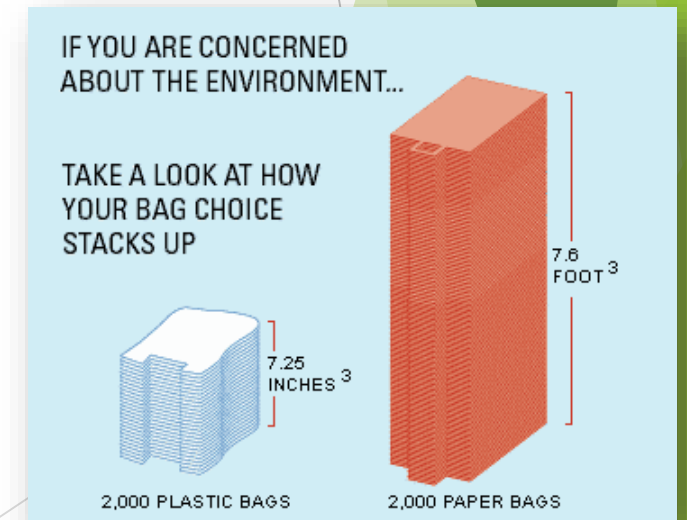
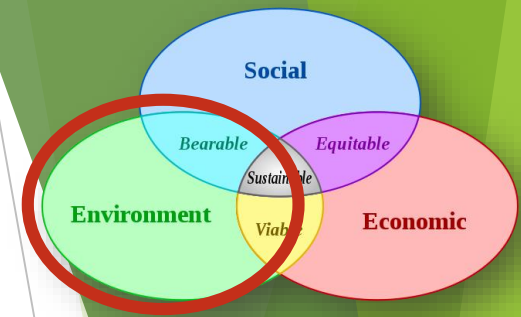
Life Cycle Assessment



Sustainability

Responsible resources usage in manufacturing

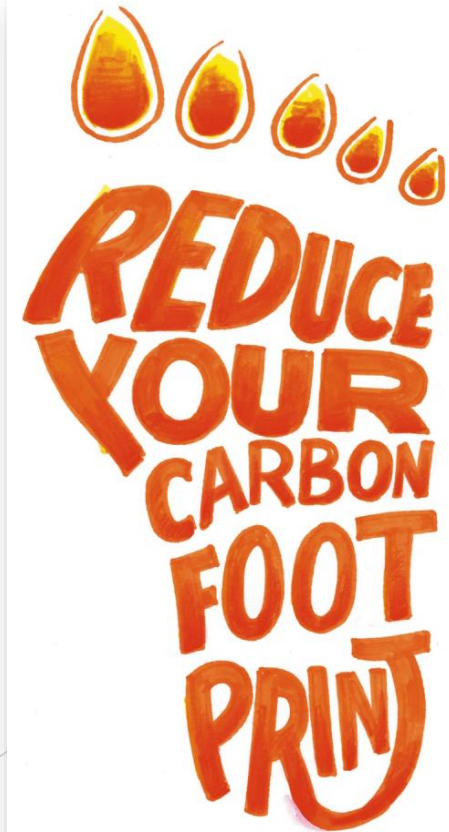
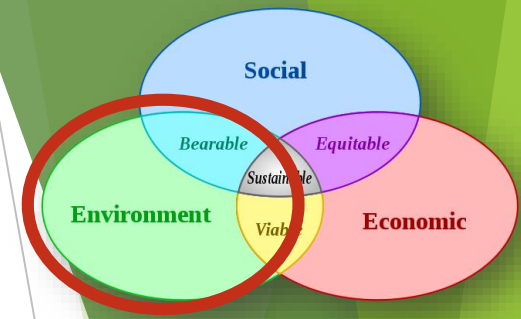
- Current extensive exploitation of non-renewable resources (hard coal, brown coal, oil, petroleum gas) will one day result in their final depletion.
- This in turn could have a catastrophic effect for future generations.
- That is why, according to the sustainable development policy it is recommended to try to utilise less materials in product applications and use renewable resources whenever possible.



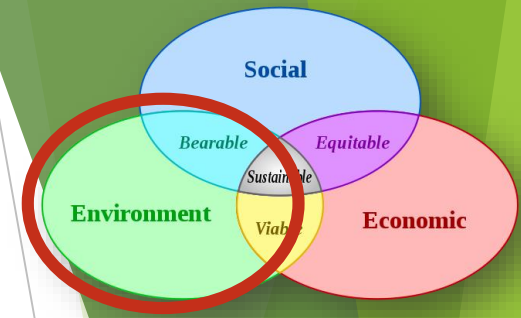
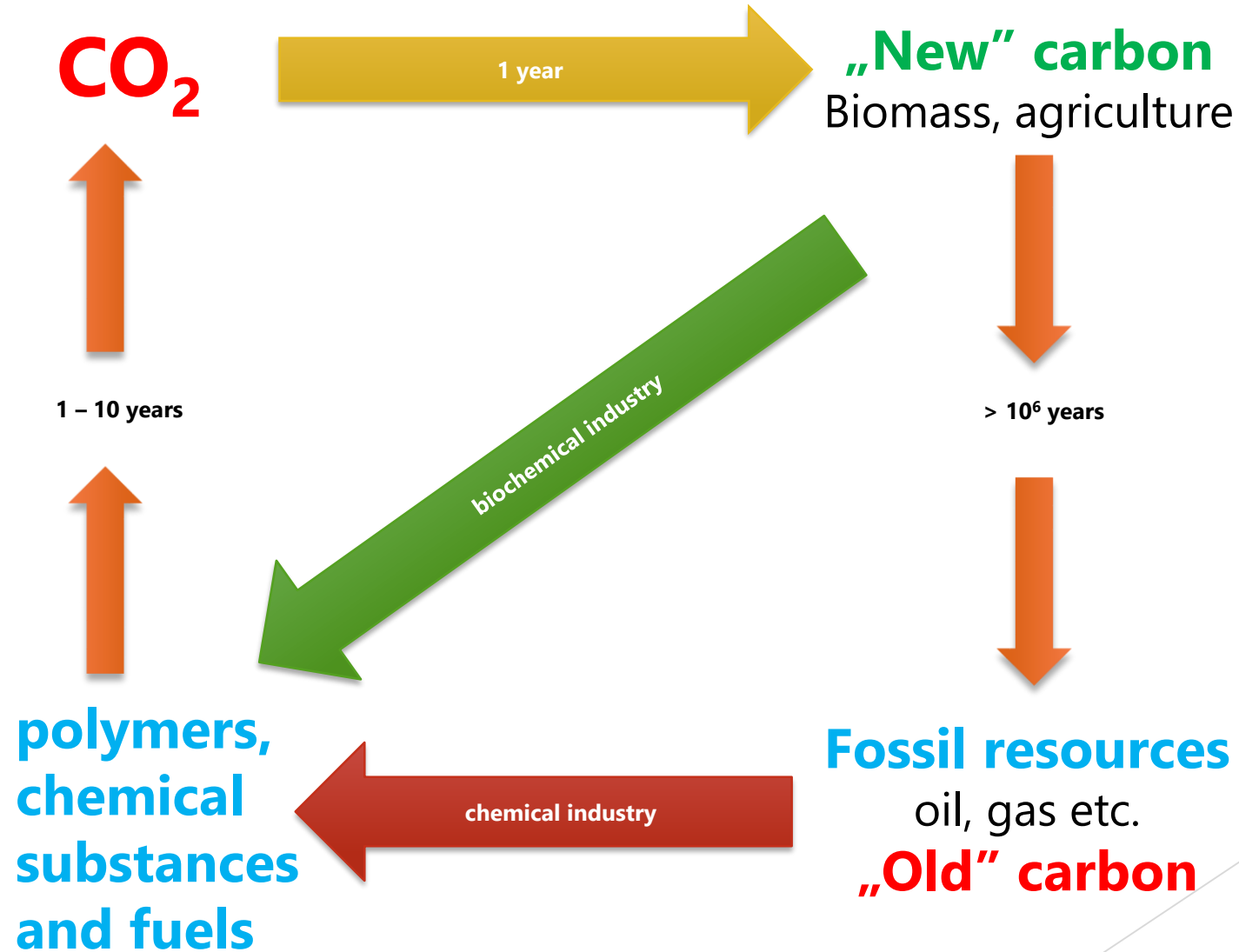
Sustainability

Responsible resources usage in manufacturing

An indicator called “Carbon Footprint” shows total greenhouse gases emission produced directly and indirectly in all life cycle stages of a given product. Usually the indicator is given in tons or kilograms of carbon dioxide equivalent gases.



Carbon Cycle

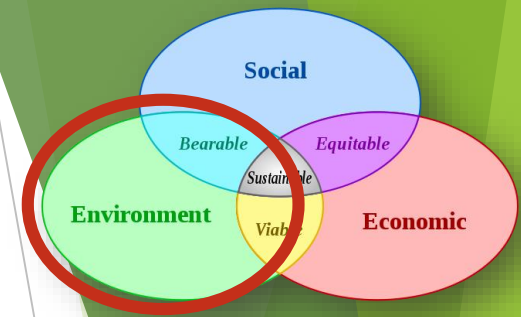


Sustainability

Meeting of higher requirements than set by current law, including non-obligatory environmental protection certification

There are many non-obligatory environmental certifications systems in existence in EU. For example:

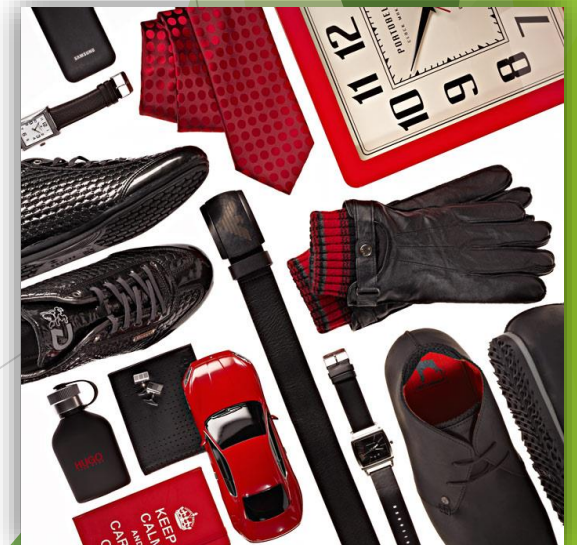
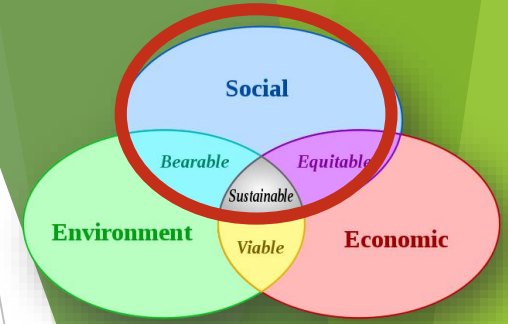
- compostable products certification
- products with renewable source certification
- greenhouse gases emission reduction confirmation
- EPD / PEF



Sustainability

Fulfilling customers' expectations

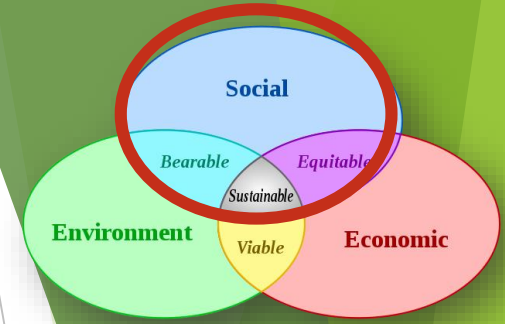
- According to current marketing trends products should offer attractive look, high usage comfort, ergonomic shape, durability, etc.
- In other words the race for sustainability should not reduce aspects that are appealing from the point of view of end consumers.



Sustainability

Waste collection systems and recycling availability

- Introduction of new products on a market should consider waste collection systems and recycling methods availability in the region.
- A product can be sustainable from the point of view of environment, but when it turns into waste it can become a problem if end-of-life treatment is not supported in the region.
- For example compostable plastic waste which is not collected with organic waste, but is being deposited on a landfill will have a negative social environmental impact.

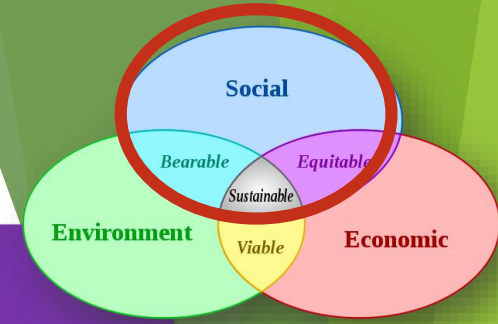


Sustainability

**Recycling
System**

TECHNOSPHERE

ORGANOSPHERE



END-OF-LIFE
recycling technologies

COLLECTION
network

INFRASTRUCTURE
recycling value chain

IDENTIFICATION
certification & labels

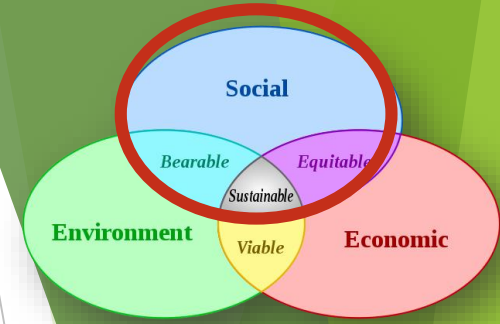
KNOWLEDGE
education & information

INSTRUMENTS
legislative & economic

Sustainability

Customers knowledge and education level

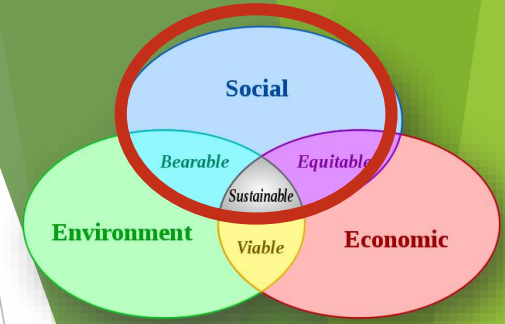
- New technical and technological solutions approvals by market and society requires high level of customers awareness which depends on capital and education expenditure.
- This factor depends on knowledge level and awareness of society and can be influenced by marketing/PR actions and educational schemes on different levels (school/university modules, seminars, conferences etc.)



Sustainability

Legal and normative regulation for defined actions for certain products, including environmental protections requirements

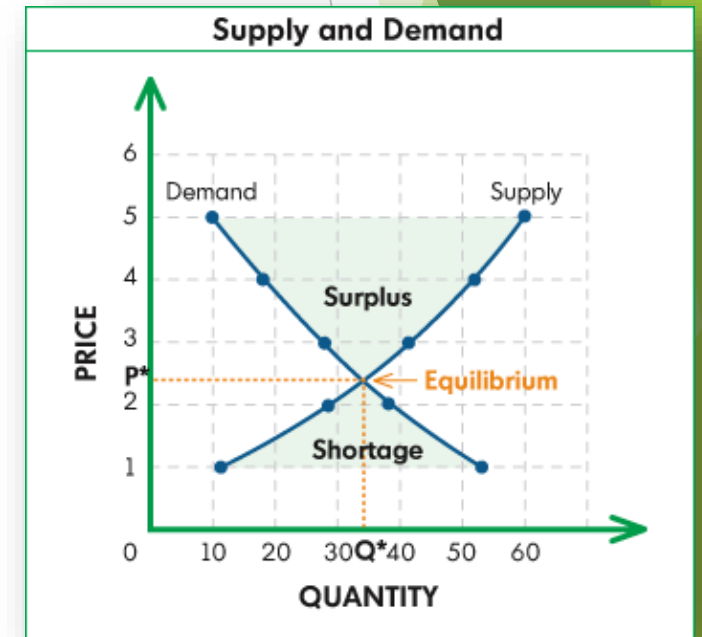
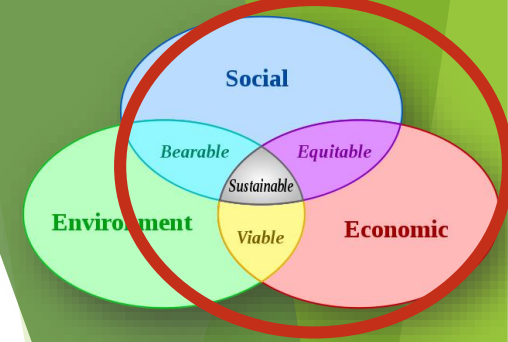
- *Example:* Directive 94/62/EC



Sustainability

Demand of polymer materials

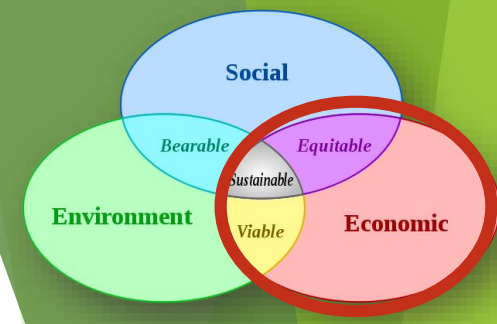
- Launching a new product on a market, and determining its price should be of course based on the total costs of manufacturing, including polymer material costs. This however should be based on the market analysis of a potential consumers on specific output market.



Sustainability

Life cycle costs evaluation (LCC). Processes costs in all life cycle

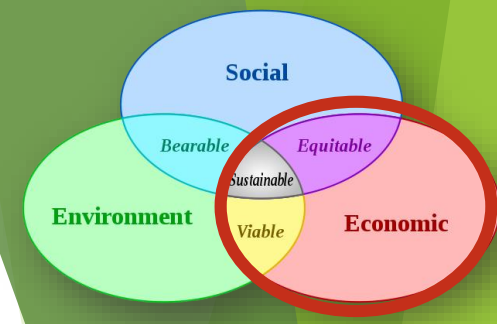
- Processes costs evaluation in all life cycle stages could be analysed by LCA method taking into consideration costs of processes. With this approach to LCA separate processes contribution could be analysed and managerial decisions can be fashioned on this basis.



Sustainability

Economically supported polymer choice

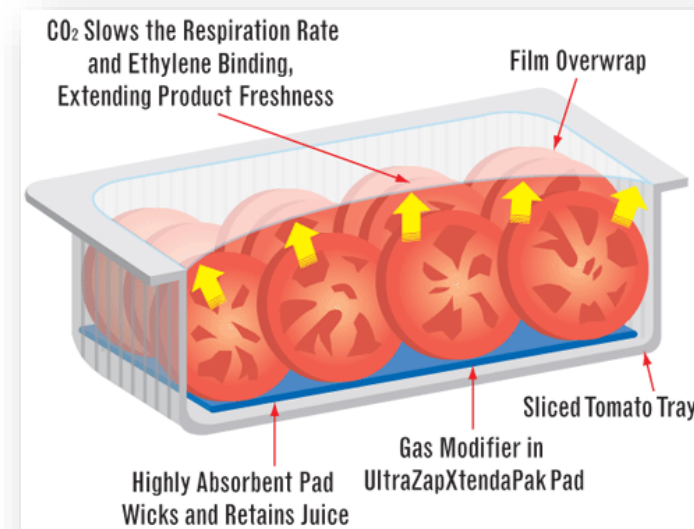
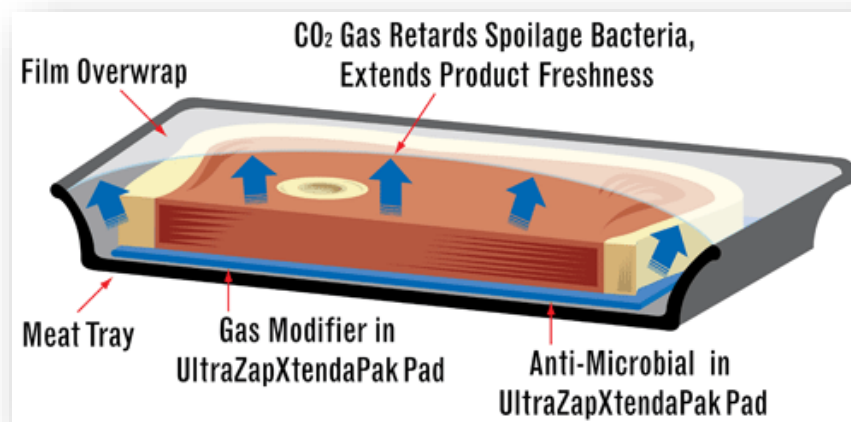
- Polymer sources should be chosen by:
 - market analysis
 - risk analysis (feasibility study)
 - producers and suppliers portfolio analysis (competition analysis)



Active and Intelligent Packaging

Active Packaging

intended to extend the shelf-life or to maintain or improve the condition of packaged food. They are designed to deliberately incorporate components that would release or absorb substances into or from the packaged food or the environment surrounding the food



Active and Intelligent Packaging

Intelligent Packaging

Refers to packaging systems that have the ability to inform the consumer of aspect of the quality, nature or production history of the food, or other packed product

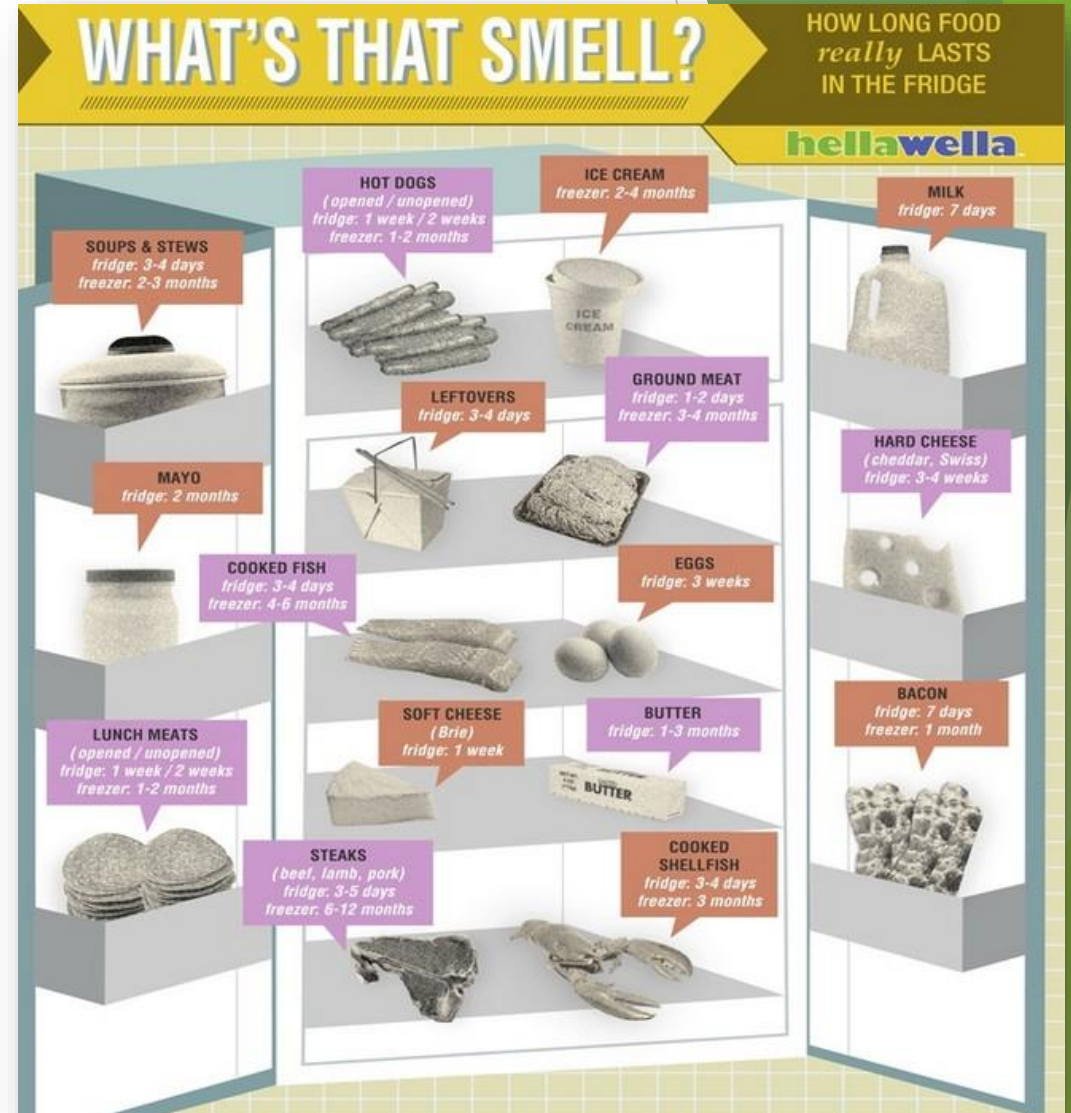


Source: Thin Film Electronics

Sustainability Benefits

Main Sustainability benefit:

- Extended shelf life



Sustainability Benefits

Disturbing FAO facts:

- Roughly one third of the food produced in the world for human consumption every year — approximately 1.3 billion tonnes — gets lost or wasted.
- Industrialized and developing countries dissipate roughly the same quantities of food — respectively 670 and 630 million tonnes.
- Every year, consumers in rich countries waste almost as much food (222 million tonnes) as the entire net food production of sub-Saharan Africa (230 million tonnes).
- Per capita waste by consumers is between 95-115 kg a year in Europe and North America, while consumers in sub-Saharan Africa, south and south-eastern Asia, each throw away only 6-11 kg a year.

Source: FAO factsheet



**Food and Agriculture
Organization of the
United Nations**

Sustainability Benefits

- Reduced use of land required to grow (fewer products are wasted, less products need to be grown to start with)
- Reduced use of resources needed to grow products
 - Pesticides
 - Water
 - Fuel
 - Energy
 - Packaging



Sustainability Benefits

- Logistics – longer shelf life = more transport options
- Possibility to set lower cooling temperatures in transport / storehouses = reduced energy use



Sustainability Benefits

- Economic advantages of extended shelf life
 - Marketability of extended shelf life (=competitive advantage)
 - Increased sales because of better looking products (=competitive advantage)
 - Ability to store products for longer → ability to flatten out availability peaks = increase financial gains during peak season



Sustainability Benefits

- Possible health hazards avoidance - lower risk of food poisoning
- Avoidance of possible spreading of diseases (for intercontinental shipments)



Source: <https://www.recipal.com/blogs/55-how-to-figure-out-food-product-shelf-life>

Sustainability Benefits

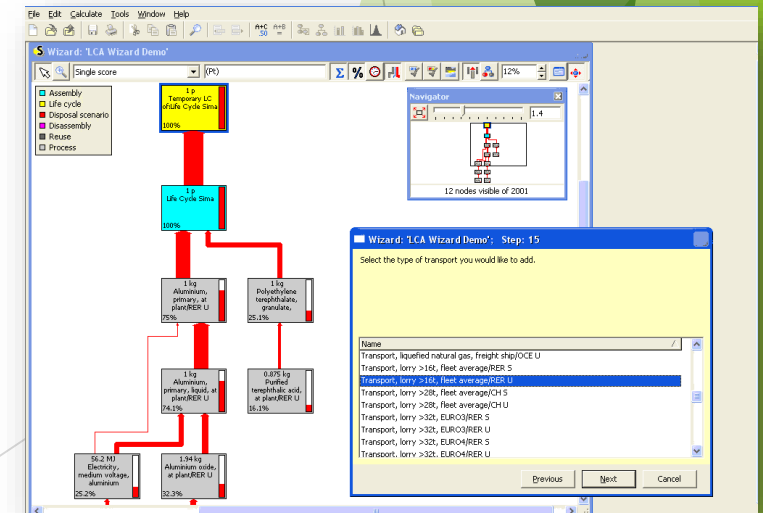
- Possible recycling benefits
 - antimicrobial coatings may be beneficial to keep dirty paper from getting mouldy, thus increasing the amount of fibres available for paper recycling
 - antimicrobial agents reduce the amounts of CODs (fatty acids) that are formed in the paper mill's process waters, thus reducing the need for adding anti-foaming chemicals to the process water



Sustainability Challenges

- Material composition
 - what materials and substances are used ?
 - how do they affect the life cycle ?
 - how do they compare to life cycle of traditional packaging.

It may happen that even when accounting for increased shelf life, the impact assessment of A&I materials can have harmful environmental effects in comparison to traditional packaging

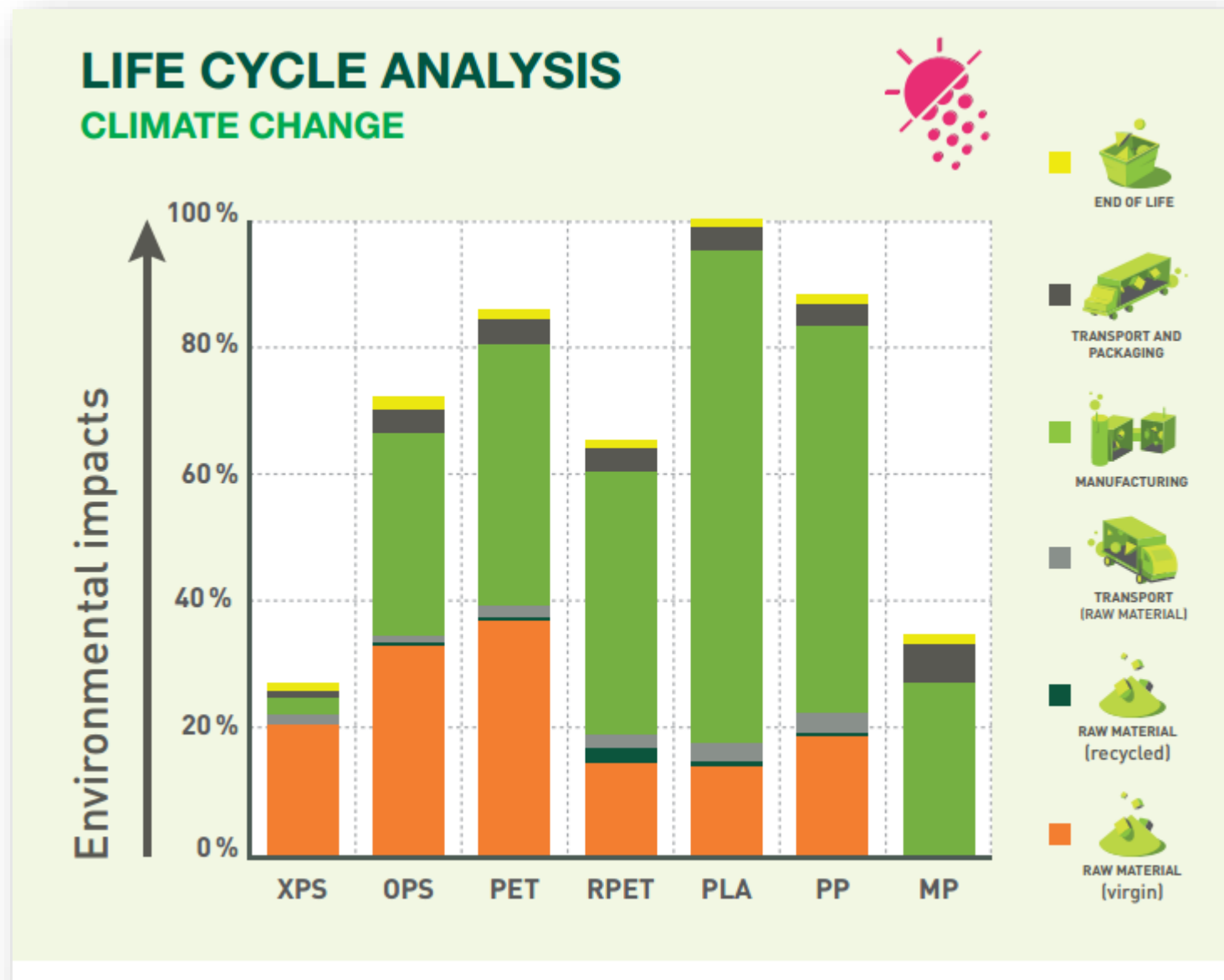


Sustainability Challenges

- Material processing
 - what is done with the raw material to make it into a packaging?
 - How do the A&I technologies affect these processes - e.g. are higher temperatures, surface treatments, etc.?
- Production process
 - what are the processes of producing A&I materials and including them into the actual packaging materials.
 - What are the extra energy requirements of production of A&I packaging



Sustainability Challenges



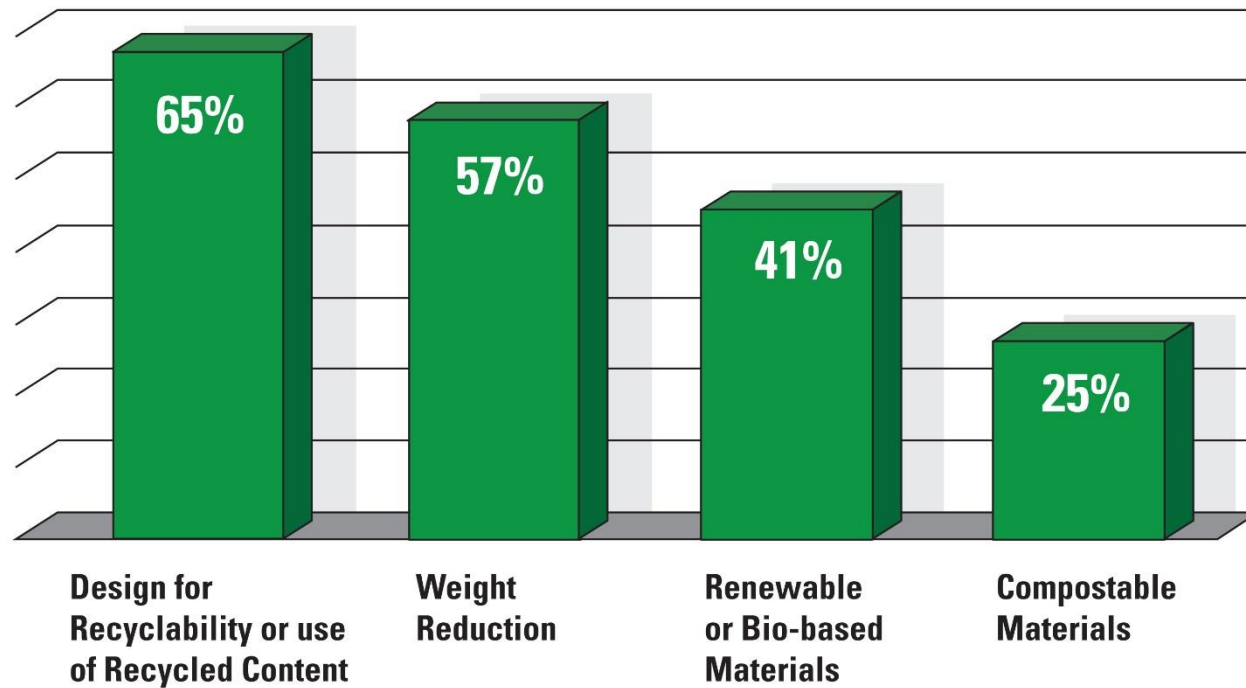
Source: <http://www.cascades.com/en/sustainable-development/commitment/responsibility-on-products-and-services/>

Sustainability Challenges

- End-of-Life – Recyclability
 - Is the A&I material/additive suitable for recycling?
 - Is it possible to easily separate A&I material/fraction from the standard packaging?
 - What is the stock preparation of A&I food packaging waste?
 - How do antimicrobials/antifungals affect the compostability?

Sustainability Challenges

Where Most Sustainable Packaging Efforts are Directed



Source: 2011 DuPont survey of global consumer packaged goods manufacturers and converters.



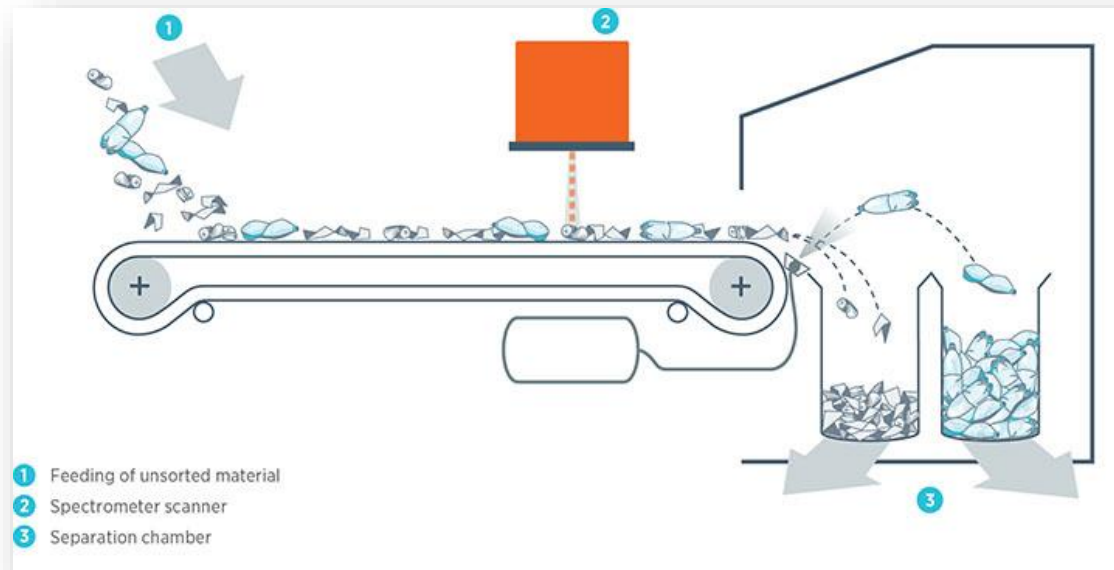
Sustainability Challenges

- End-of-Life – Collectability
 - how to collect A&I packaging waste?
 - Is it possible to collect it with normal packaging waste, or a special collection system is required?
 - Do consumers need to be informed about a special method of separating A&I food packaging waste?



Sustainability Challenges

- End-of-Life – Sortability
 - interference of A&I components with sensor based sorting technologies in waste processing plants
- End-of-Life – Reusability
 - is it possible to reuse A&I components of packaging waste, if so – how?



Source: <https://www.tomra.com/en/solutions-and-products/sorting-solutions/recycling/recycling-technology/>

Sustainability Challenges

- Consumer acceptance of A&I packaging
 - are consumers aware of the extra benefits, and will they be able to use and understand how A&I work?
- Consumer acceptance – reliability
 - do A&I components of food packaging actually work as advertised?



Sustainability Challenges

- Sourcing
 - Are substances for production and preparation of A&I packaging readily available on the market?

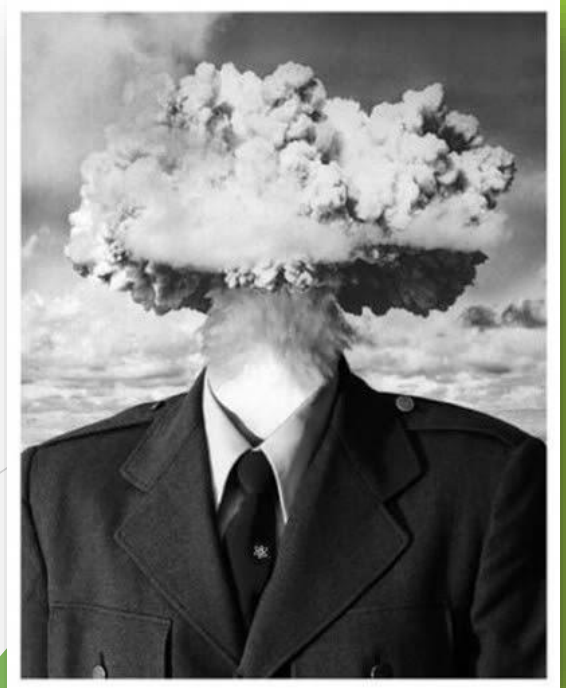
LAST but probably the most important

- How much do they cost?
 - Does the value added have economic advantages?



Conclusion

- Sustainability
 - complex issue - as it includes environmental, economic and social pillars
- Assessing the sustainability
 - Complex issue – tools to assess sustainability objectively do not exist (yet).
- Sustainability of A&I packaging
 - Complex issue – do benefits outbalance the challenges?



THANK YOU

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