

Plastic Packaging Enabling Environmental Benefits – A Scientific Approach

**5th PAGEV INTERNATIONAL
PLASTIC PACKAGING TECHNOLOGIES CONGRESS
“Packaging of the Future”**

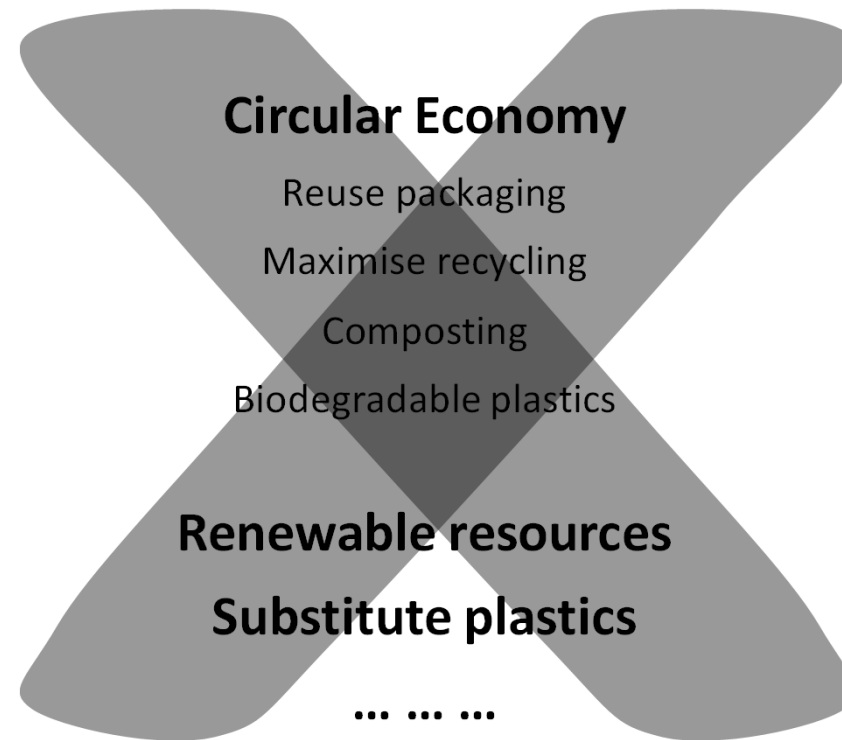
October 30th, 2018

Hilton İstanbul Bomonti Hotel

Bernd Brandt



How can plastic packaging enable environmental benefits



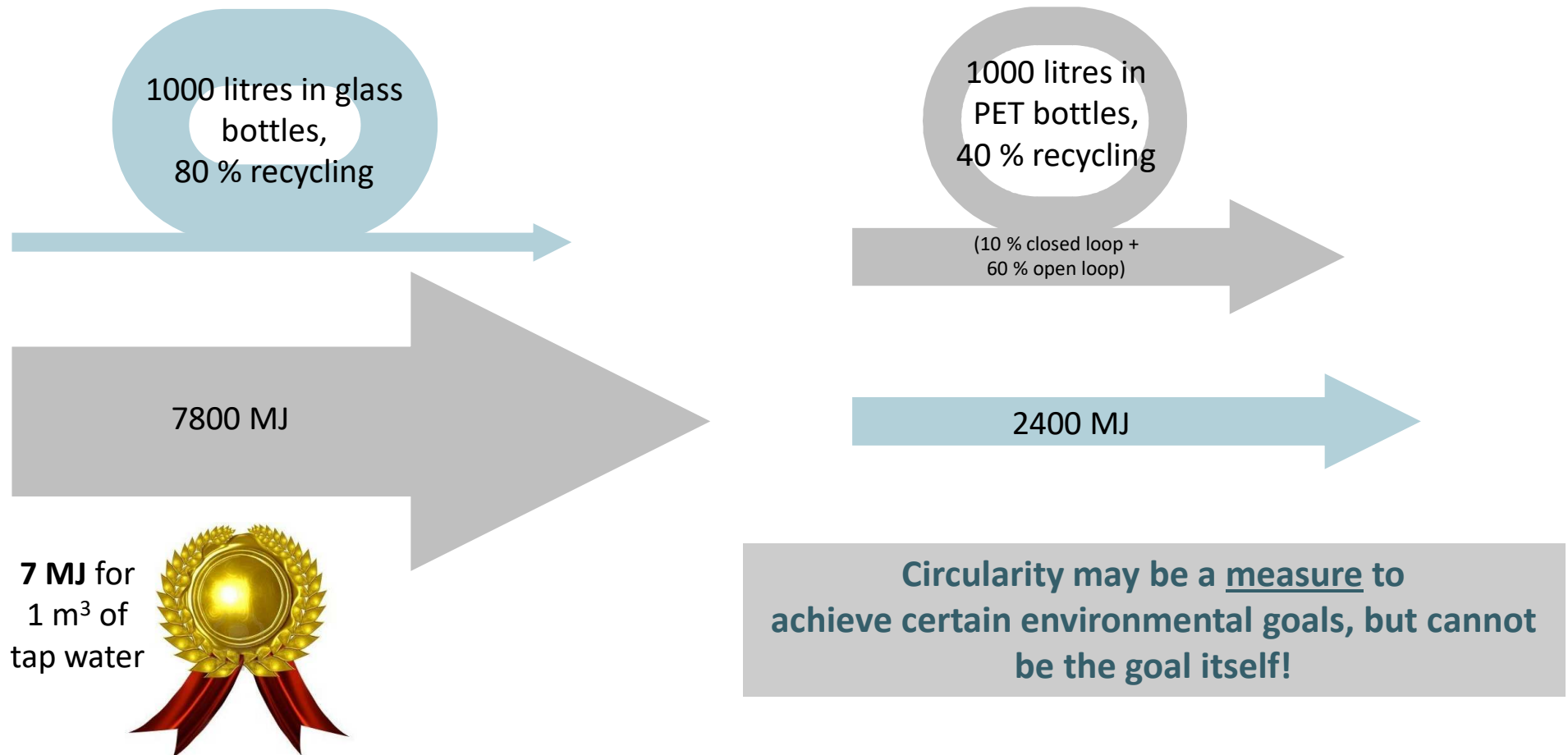
**These might sometimes be beneficial actions,
but never suitable general objectives**

Facts!

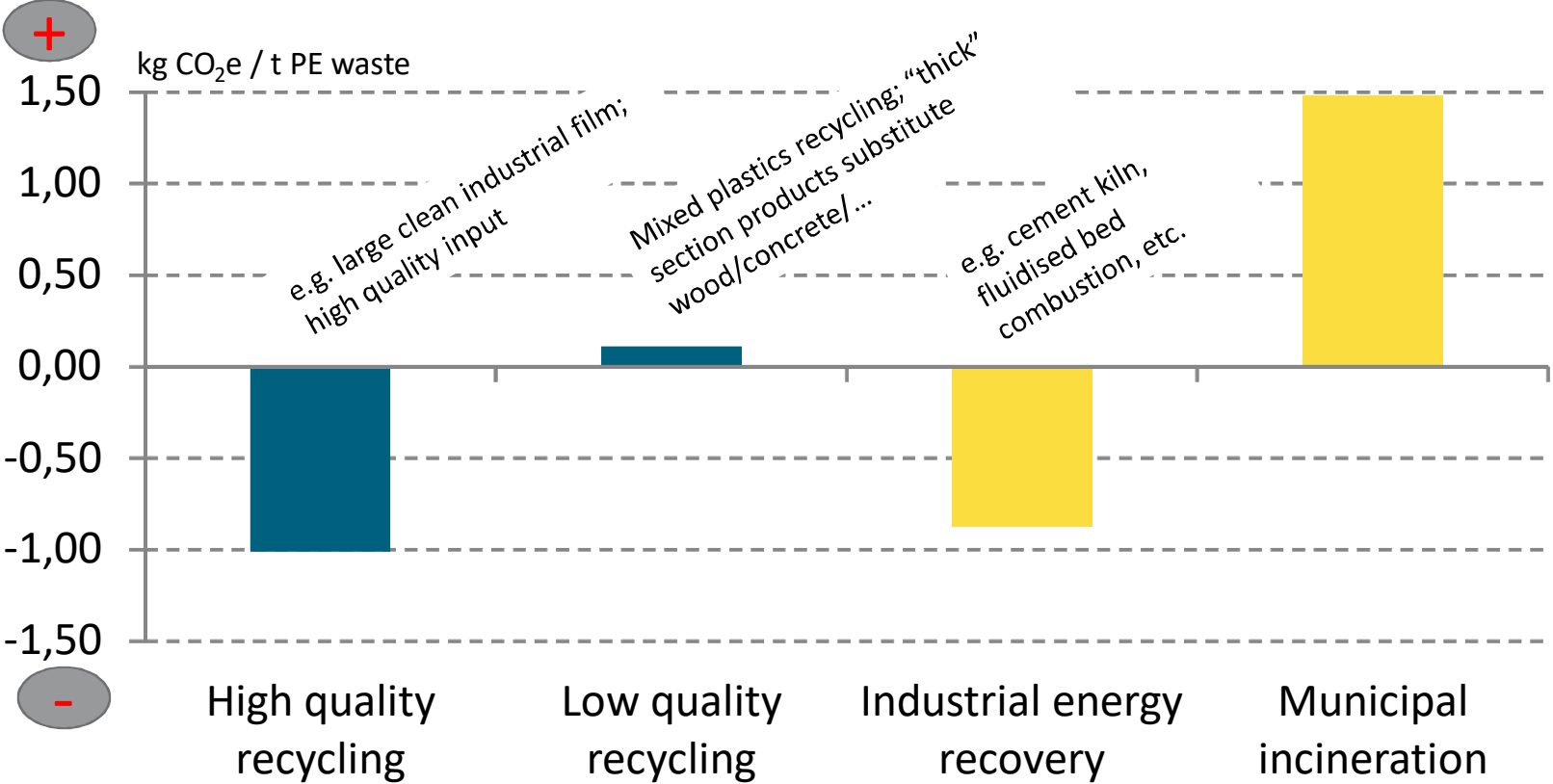
Development of a strategy based on facts

Environmental (and economic) assessment of total life cycle
Definition of measurable goals for reduced environmental impacts
Identification of eco-efficient measures

Achieved degree of circularity is NO indicator for sustainability!



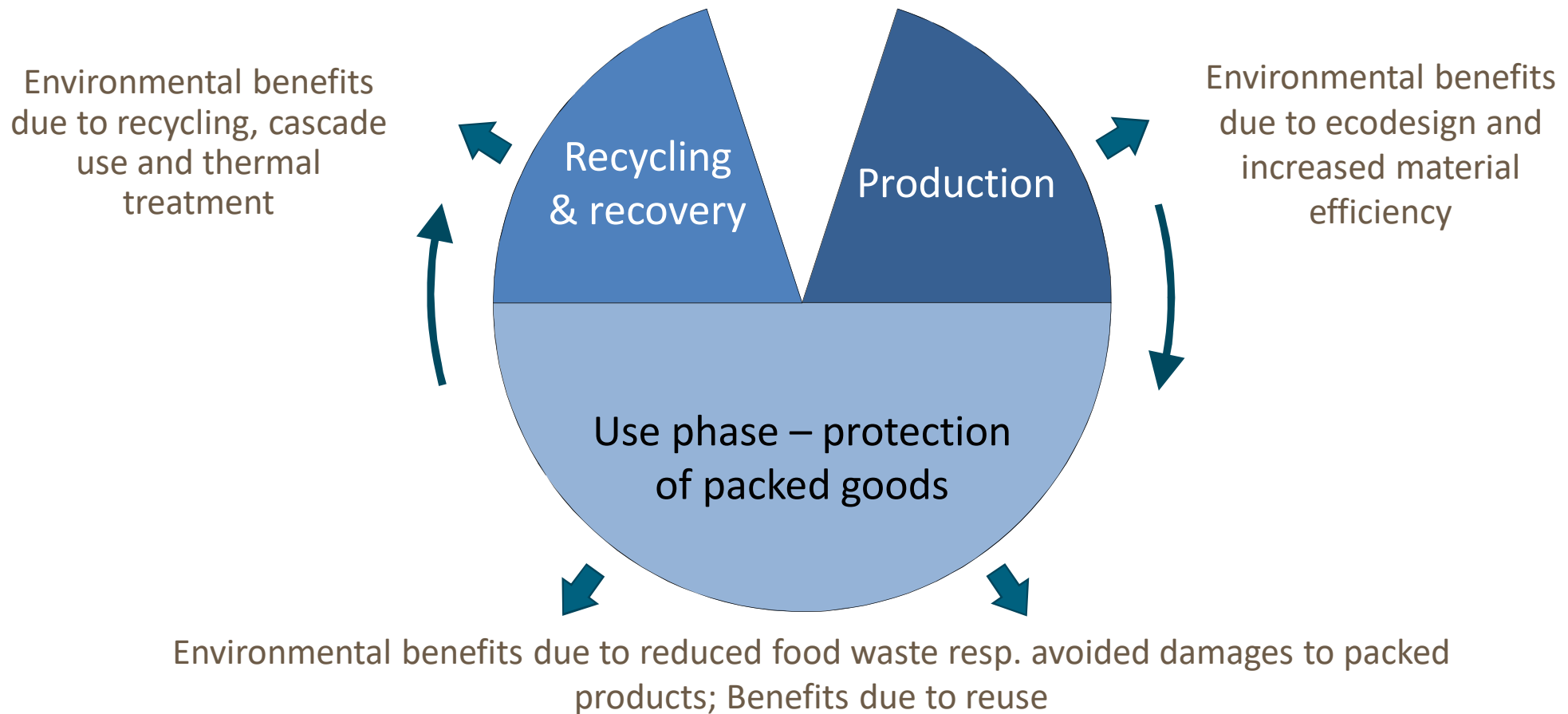
GHG net benefit (impact) of various recycling & recovery options for polyethylene



Source: Denkstatt (2016)

No simple "waste management hierarchy" can be derived
Industrial energy recovery better than mixed plastic recycling

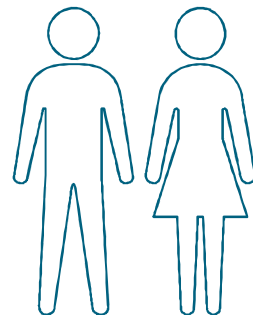
Dimensions of packaging ecology in the total life cycle



Conflicting Targets – Protection of product versus packaging recyclability

PlasticsEurope Stakeholder's views on "Eco-design with Plastics" concluded that Ecodesign should be a product specific balance, taking into consideration (amongst others):

- Optimised production (energy efficiency, material use)
- Functionality and use phase benefits
- Recyclability and share of recycled content
- Increased reuse and recycling



Functionality!

**Optimized function of packaging
is the most important
environmental benefit**

Quantify and communicate the ecological benefit
of the packaging function

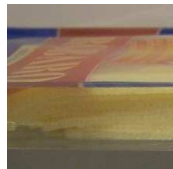
How Packaging Contributes to Food Waste Prevention (2015/2017)

Recorded reductions in food waste levels as a result of packaging changes



Sirloin steak:

12 % → 3 %



“Bergbaron” cheese:

5 % → 0.14 %



Yeast bun:

11 % → 0.8 %



Garden cress:

42 % → 3.4 %



Cucumber:

9.4 % → 4.6 %

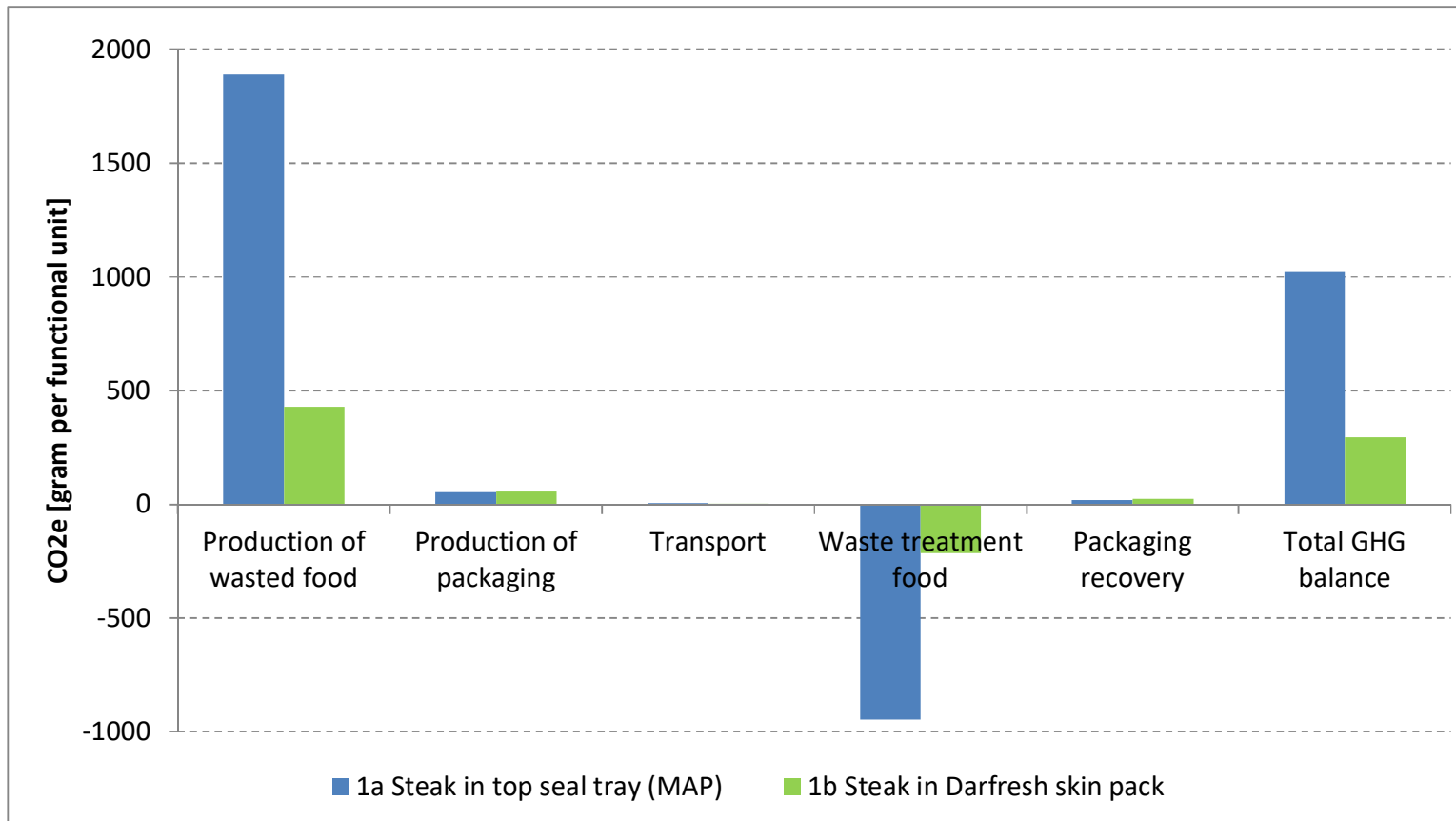
Example Sirloin steak

Darfresh vacuum skin packaging extends the shelf life from 6 to 16 days, compared to MAP tray packaging;
enables steaks to be cut and aged in pack, eliminating separate packaging for aging;
reduction of food waste by 9 percentage points



Photo: denkstatt

Carbon footprint of packed Sirloin steak (consumed food excluded)



functional unit = consumed amount = 330 g Sirloin steak

- Meat waste at retailers was reduced by 75 %
- Benefit of reduced meat waste is 10 times higher than impact of total packaging
- Differences regarding production and recovery of packaging are comparably small

Example sliced cheese

5 % waste rate on retailer level if sold via delicatessen counter

0.14 % waste rate on retailer level if sold via self service shelf

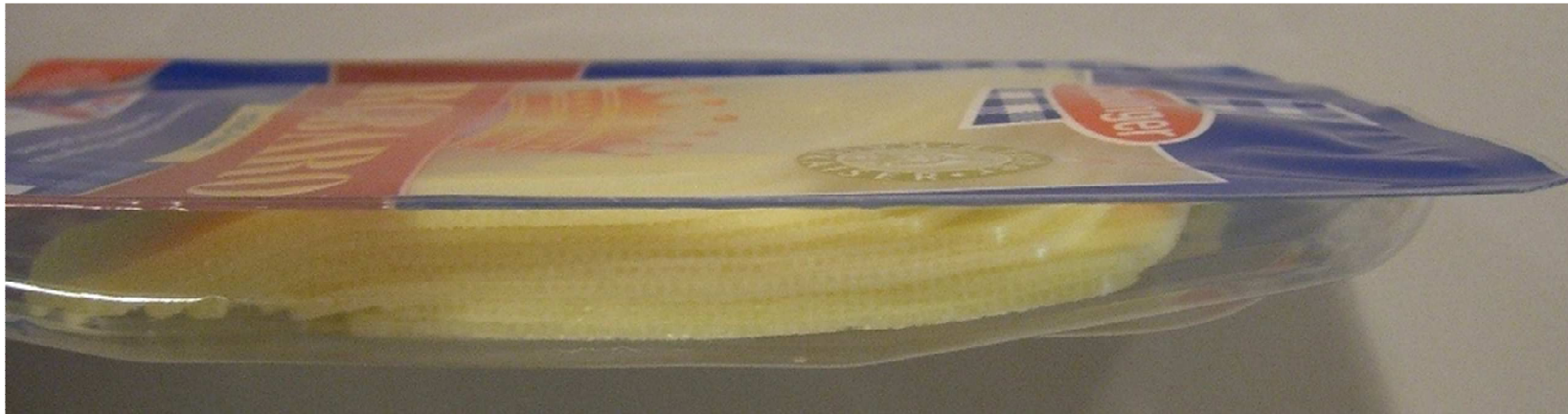
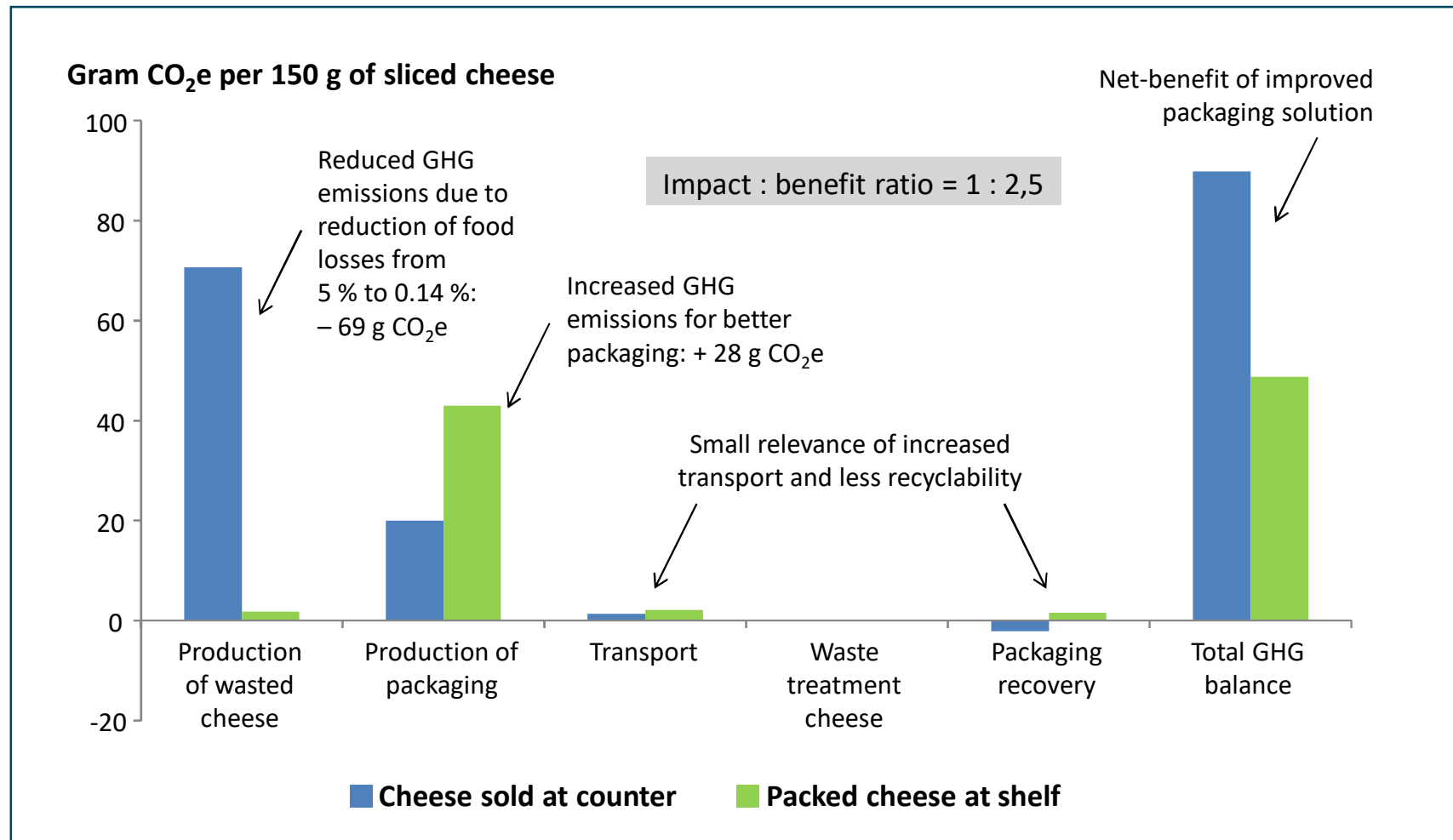


Photo: denkstatt

Carbon footprint of sliced cheese (consumed food excluded)



functional unit = consumed amount = 150 g Bergbaron cheese

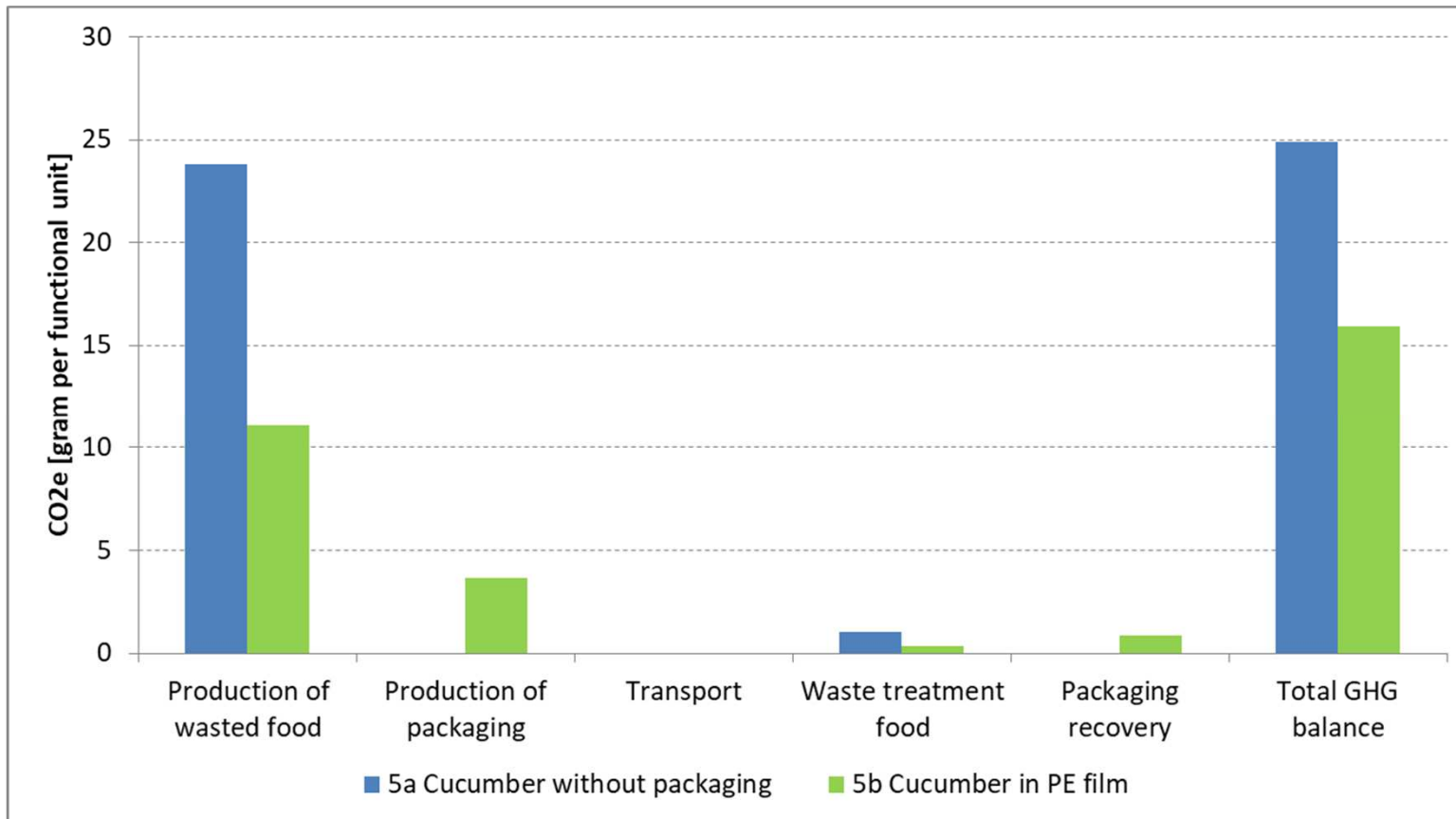
Example Cucumber

No packaging versus PE film
(prolonged shelf life, less moisture loss)
4,6 % food waste instead of 9,4 % (at the retailer)



Foto: denkstatt

Carbon footprint of packed and unpacked cucumber (consumed food excluded)



functional unit = consumed amount = 480 g cucumber

- Cucumber waste at retailers was reduced by 50 %
- Benefit of reduced cucumber waste is 3 times higher than impact of packaging
- Unpacked option is better if seasonal “field cucumbers” from regional sourcing are used, and if total waste rate (retailers, consumers) due to missing packaging protection does not rise by more than 6 %



lebensmittel cluster niederösterreich



cluster niederösterreich



STOP Waste- SAVE Food

Quantitative assessment of the impacts of improved processing and packaging on food waste reduction

A 3 year multi stakeholder project
October 2016 – September 2019



FFG

Abfallvermeidungs-Förderung
der österreichischen
Sammel- & Verwertungssysteme
für Verpackungen

rethinkrefusereducer
rethinkrefusereducer
rethinkrefusereducer



Europäische Union



Investitionen in Wachstum & Beschäftigung. Österreich.

STOP Waste- SAVE Food



Lebensmittel cluster niederösterreich



cluster niederösterreich



create sustainable value

Premium Partners



Active Partners



Supporting Partners



IK Industrievereinigung Kunststoffverpackungen e.V.



MINISTERIUM FÜR EIN LEBENSWERTES ÖSTERREICH



PlasticsEurope Austria

InKind Partners



Investitionen in Wachstum & Beschäftigung, Österreich.

Case studies

Meat packaging

- Vacuum skin packaging versus Modified Atmosphere Packaging for beef

Fruit and vegetables

- Tomatoes, strawberries, cut salad, etc.: Influence of packaging systems on food losses (conventional vs. biodegradable films; gas mixtures and perforation; etc.)
- Reducing food losses by improved vegetable processing

Consumer level

- Influence of packaging on food waste; effects of portion size; awareness raising

Eggs

- Influence of different materials on fracture rate

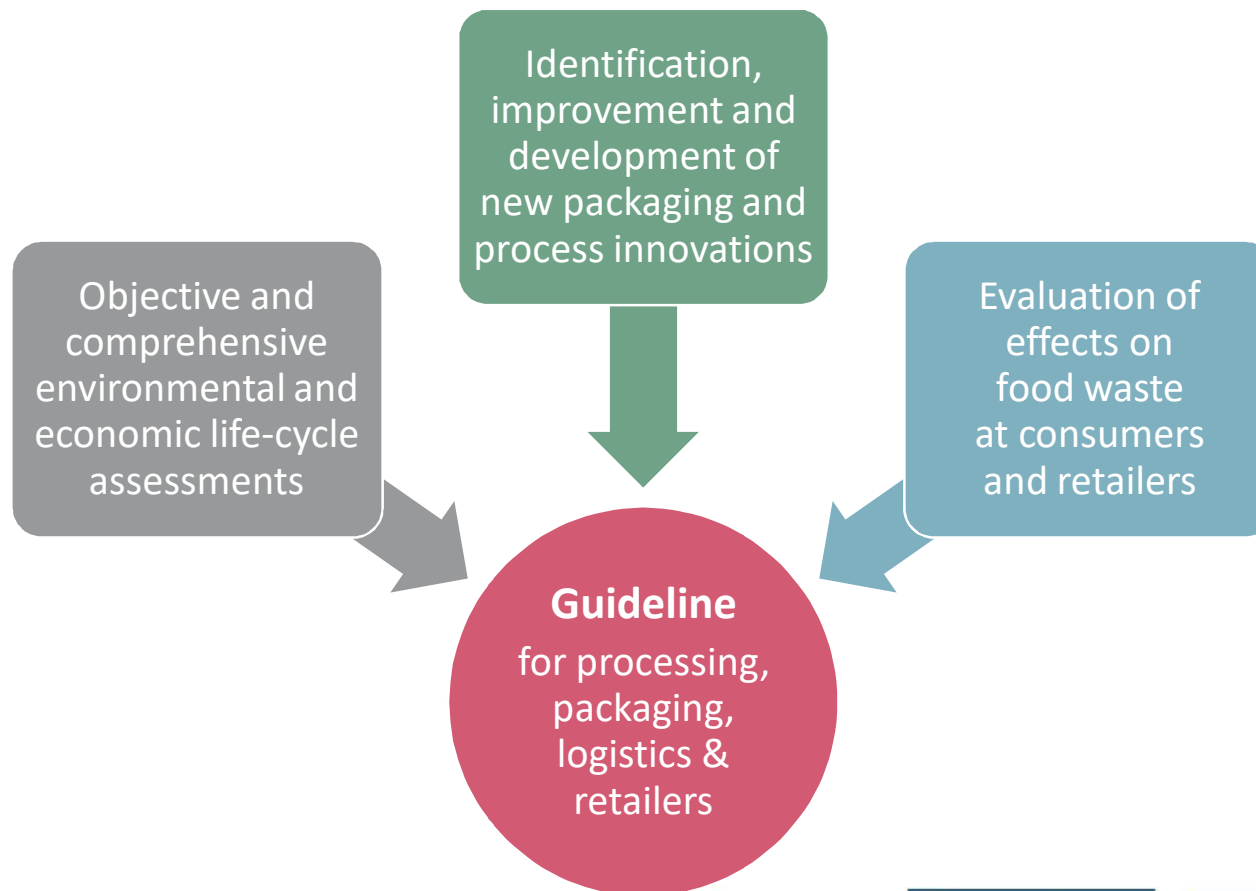
Barrier design

- Avoiding over-performance (example coffee capsule); recyclability versus protective function

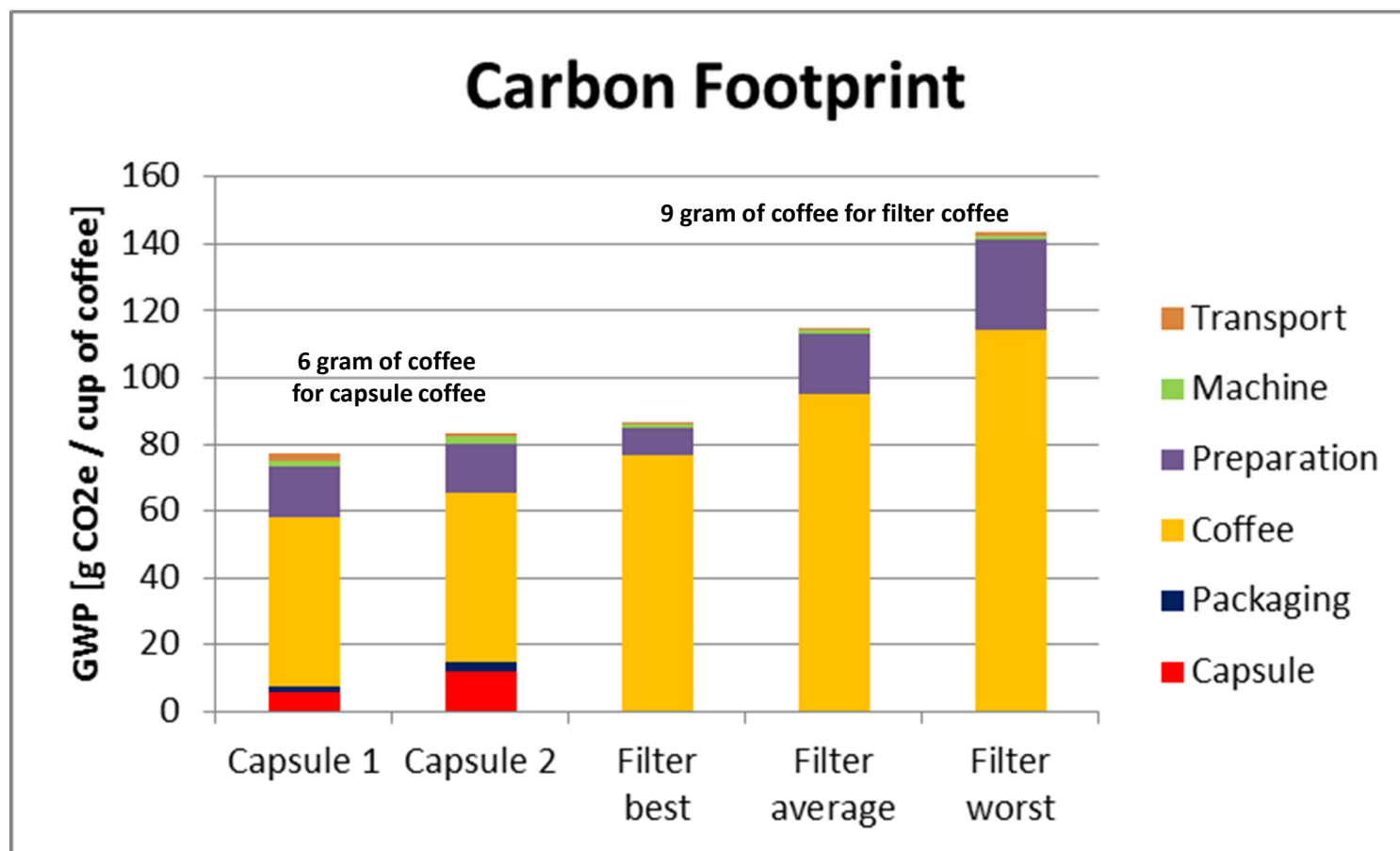
Transport

- Optimised transport packaging for cooled goods

Optimized food packaging and processing are reducing food waste, which results in environmental and economic benefits



Carbon footprint of a cup of coffee



Filter coffee over-preparation:

- Best case: 0 %
- Average case: 25 %
- Worst case: 50 %

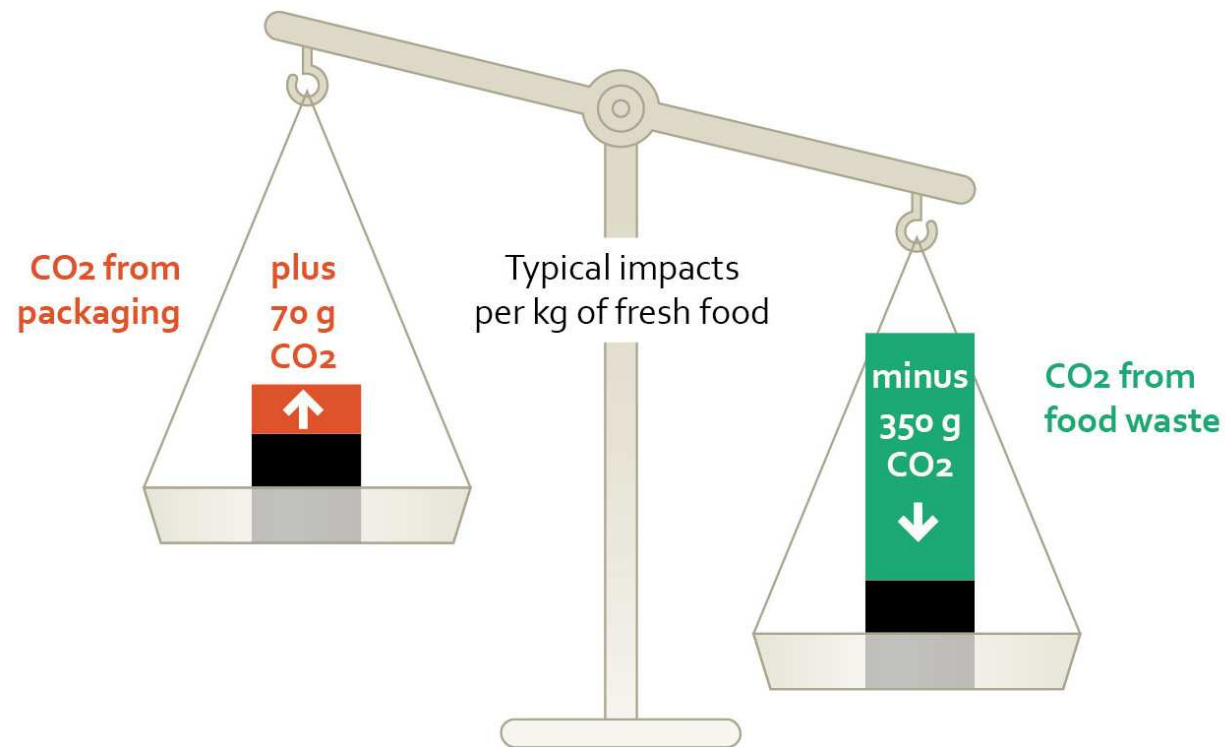
Filter coffee heating:

- Best case: no heating
- Average case: 20 minutes
- Worst case: 40 minutes

Packaging = Packaging without capsule

Conclusions (I)

1. Optimized packaging often provides environmental advantages. The reason is that benefits of prevented food waste are usually much higher than environmental impacts of production or optimization of the packaging involved.



Conclusions (II)

1. **Protection function** of food packaging is in the main more important than influence of different packaging materials, also regarding recyclability
2. **The more premium** a product, the better the product should be protected by packaging
3. **Not packed** is better, if the whole supply chain (incl. consumption) does not cause more food waste than with packaging
4. **In follow-up projects** additional examples shall be identified and assessed.



Design guidelines for a circular, resource-efficient economy

Sustainable design “formula”:

$$\begin{aligned} &+ \text{ optimised material production} \\ &x \text{ small material demand per functional unit} \\ &+ \text{ High functionality / quality / use-benefits} \\ &+ \text{ optimal recovery/recycling-mix (determined by CBAs!)} \\ \hline &= \text{ Low eco-footprint, economic \& social impact} \end{aligned}$$

Priority for functionality,
then raw material and recycling aspects

Design for Recycling?

YES, ...

- **IF** the function of the packaging is not affected (i.e. NO disadvantages in the use phase)
- **IF** the mass of the packaging is not significantly increased (additional production impacts do NOT exceed recycling benefits)
- **IF** additional costs of production, collection, sorting and recycling do NOT exceed (monetary) the recycling benefit

Further factors!

Dialogue with all actors

Ambitious voluntary goals of industry sectors

Keep in mind the whole picture

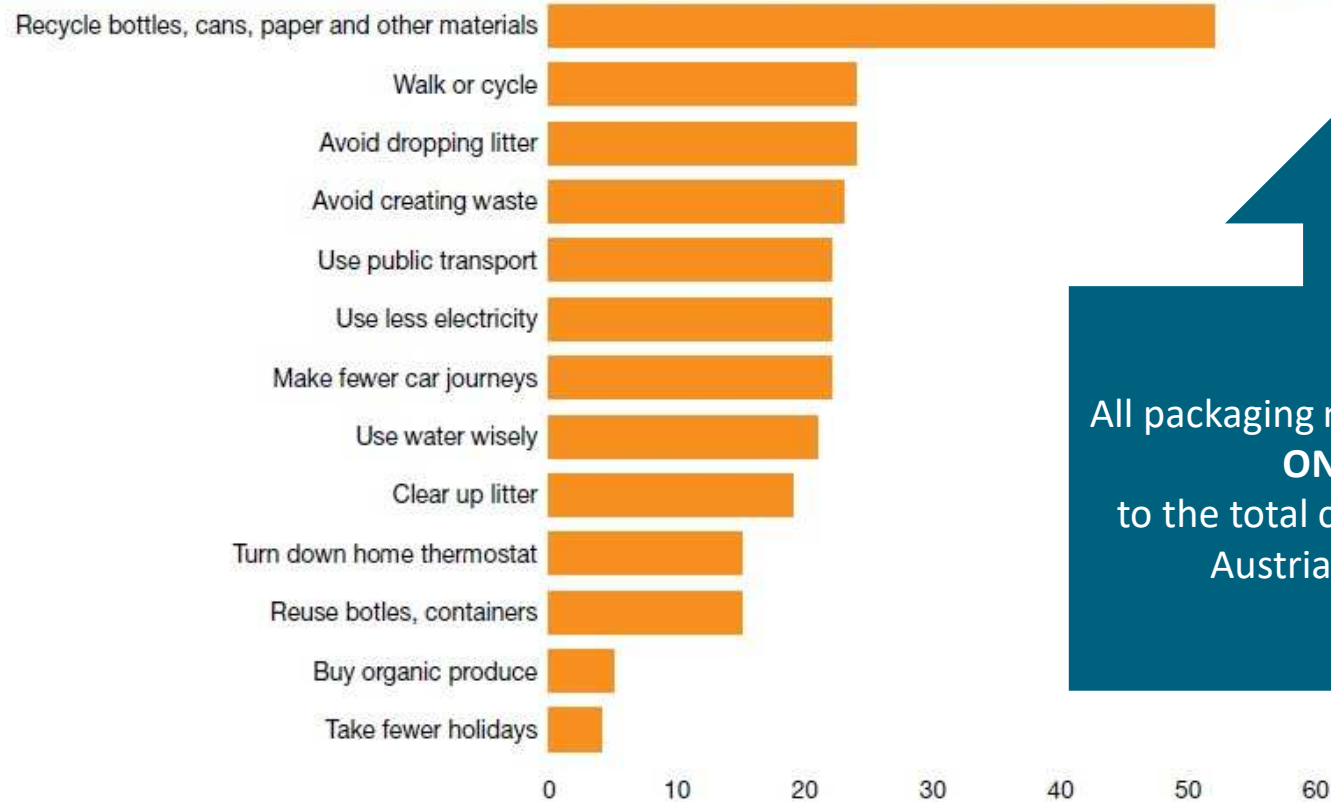
Optimization together with all involved parties

Voluntary sustainability programs

Do not overstate packaging impacts

Consumers' view of contributing to more sustainable environment

Figure 1: Consumers' view of contributing to more sustainable environment



All packaging materials contribute
ONLY 1,3 %
to the total carbon footprint of
Austrian consumers

Source: IPSOS MORI Packaging poll 2011

Source: PWC 2012 Sustainable Packaging

Let's not forget about the relevance or context

How many car kilometres are compensating the CO₂ benefit (per capita) of

- 1 year abstaining from plastic shopping bags
14 car km
- 1 year buying water in PET refillable bottles instead of PET one-way bottles
38 car km
- 1 year of separate collection & recycling/recovery of plastic packaging
70 – 100 car km

Keep a product specific balance of all relevant aspects in total life cycle



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