

# LCA of end of life options for two biodegradable packaging materials

**avniR**  
**6 - 7 Novembre 2012, Lille**



Vincent Rossi<sup>1</sup> (vincent.rossi@quantis-intl.com), Nina Cleeve-Edwards<sup>2</sup>, Urs Schenker<sup>2</sup>, Lars Lundquist<sup>2</sup>, Olivier Jolliet<sup>1</sup>, Carole Dubois<sup>1</sup>, Sebastien Humbert<sup>1</sup> (sebastien.humbert@quantis-intl.com, +41-79-754-7566)

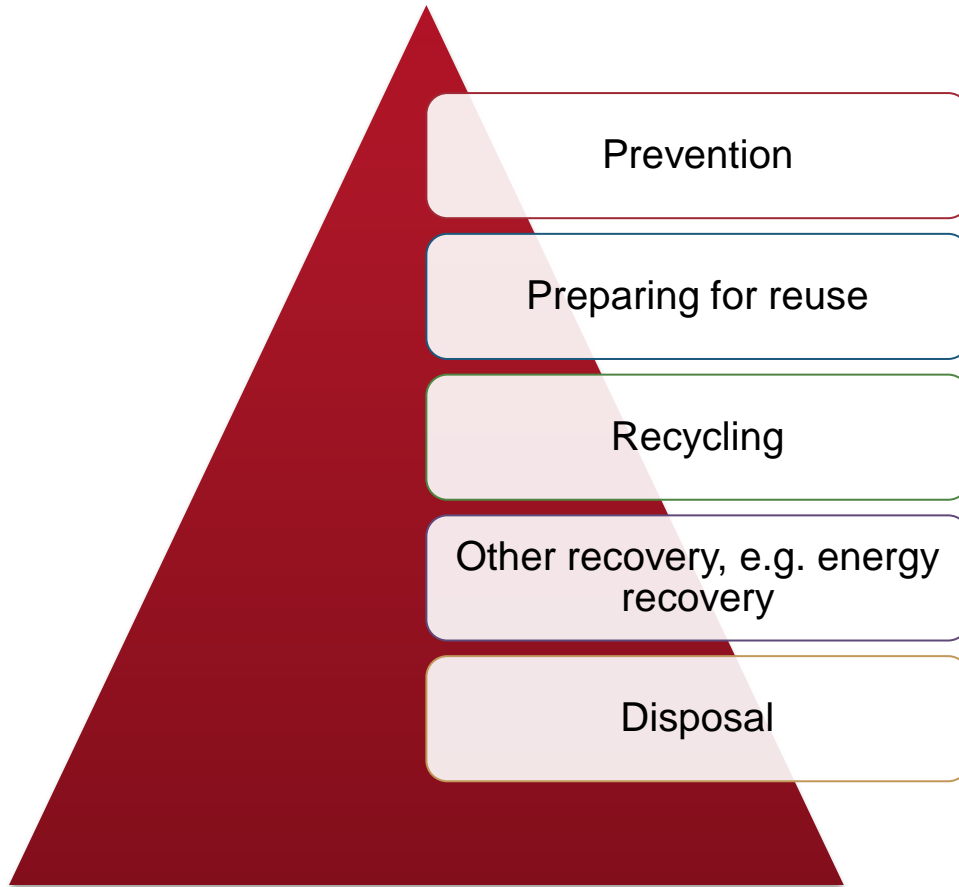
<sup>1</sup> Quantis, Switzerland; <sup>2</sup> Nestlé Research Centre, Switzerland

The European Waste Hierarchy in context

LCA methodology to study end of life options for packaging

Results & conclusions

# The European Waste Hierarchy is not a rigid structure



“When applying the waste hierarchy [...] take measures to encourage the options that deliver the **best overall environmental outcome**.

This may require specific waste streams **departing from the hierarchy where this is justified by life-cycle thinking [...]**”

Composting is considered as *recycling* in the EU waste hierarchy.

OK for organic materials

→ justified for biodegradable plastics?

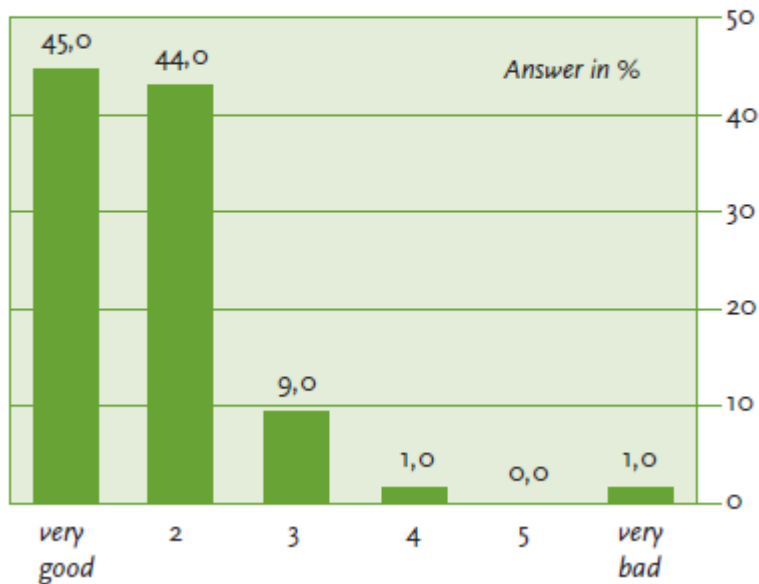
Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives

→ Art 3., al 17. "recycling" means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material

# Public perception coincides with the relative positions in the hierarchy

## Composting

What do you think of the idea of replacing conventional plastic packaging by compostable BDP packaging?



Source: Bidlingmaier *et al.*, 2003

## Incineration



Global Alliance for Incinerator Alternatives  
Global Anti-Incinerator Alliance

UK Without Incineration Network



Borough council says NO to incinerator

ALERTE-DANGER-ALERTE-DANGER  
**NON à l'incinérateur**



# New products promoted as biodegradable and “environmentally friendly”



The European Waste  
Hierarchy in context

Generally, public perception of composting is positive and of incineration is negative  
It applies to biodegradable plastics

LCA methodology to study end of life options for packaging

Results & conclusions

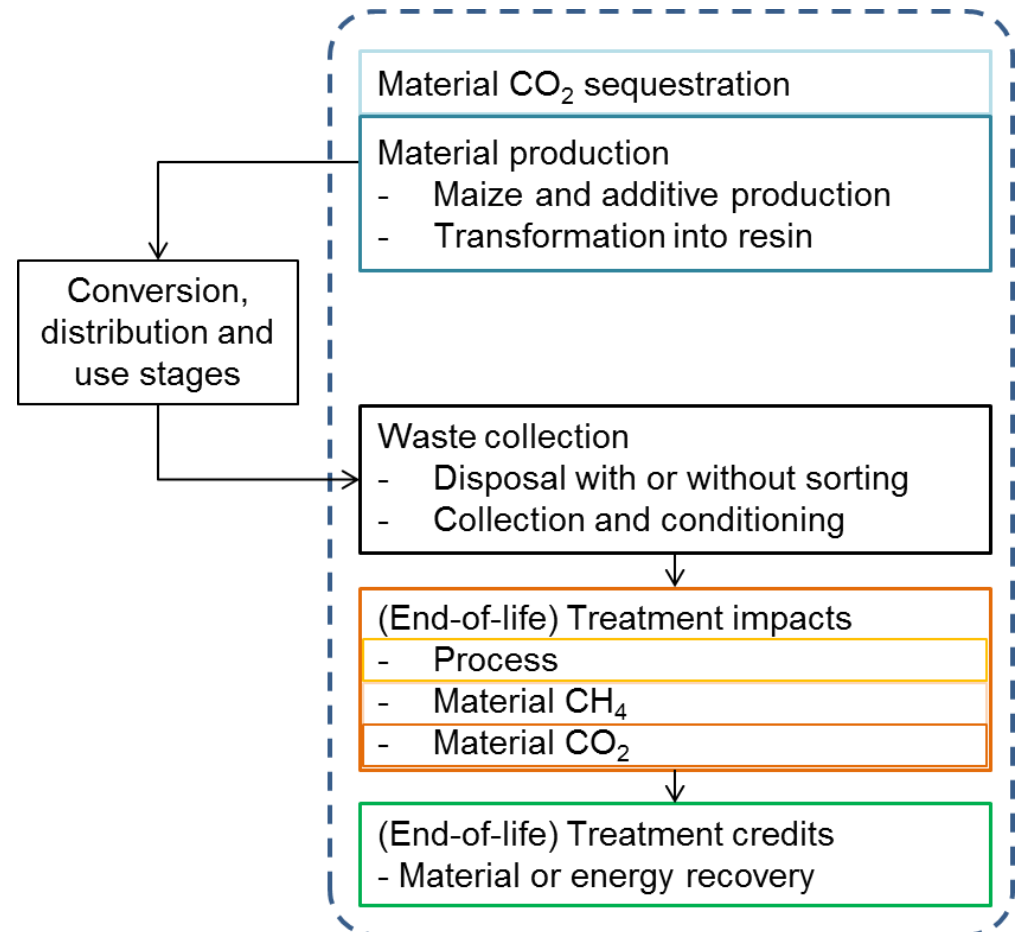
## An LCA has been performed on end of life options for packaging

- Packaging materials:
  - Polylactic acid (PLA)
  - Thermoplastic starch (TPS)
- End of life options:
  - Landfill
  - Municipal solid waste incineration (MSWI) with energy recovery
  - Direct fuel substitution
  - Anaerobic digestion (methanisation)
  - Industrial composting
  - Mechanical recycling

# The methodology used follows the ISO 14'040 series of standards for an average European scenario

- Functional unit:
  - 1kg of material, disposed of at a user's home
- Region for disposal:
  - Europe
- Life cycle impact assessment (LCIA):
  - Full set of indicators from IMPACT 2002+
  - Focus on global warming score and resource depletion

- System boundaries:





The European Waste Hierarchy in context

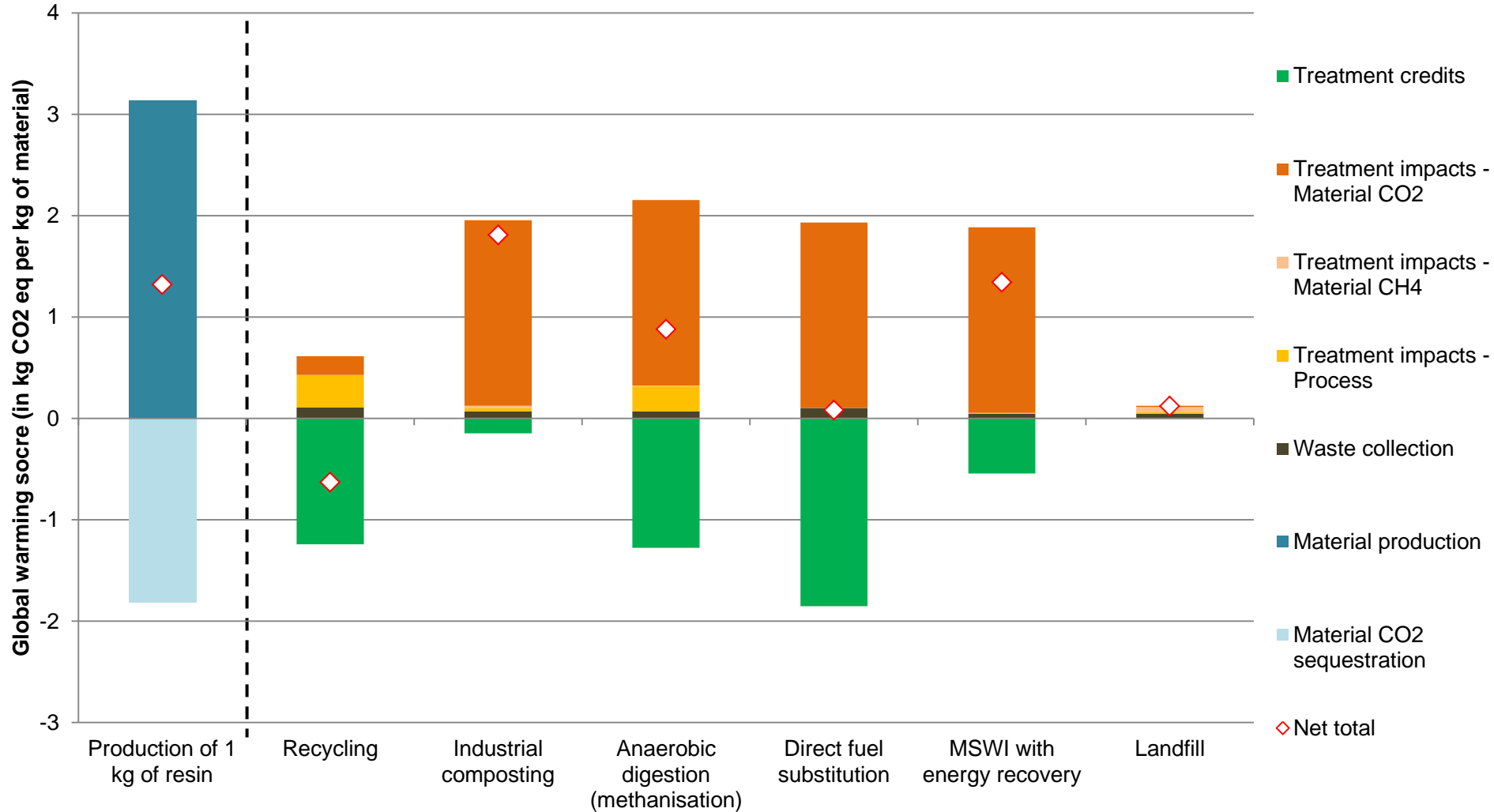
Generally, public perception of composting is positive and of incineration is negative

LCA methodology to study end of life options for packaging

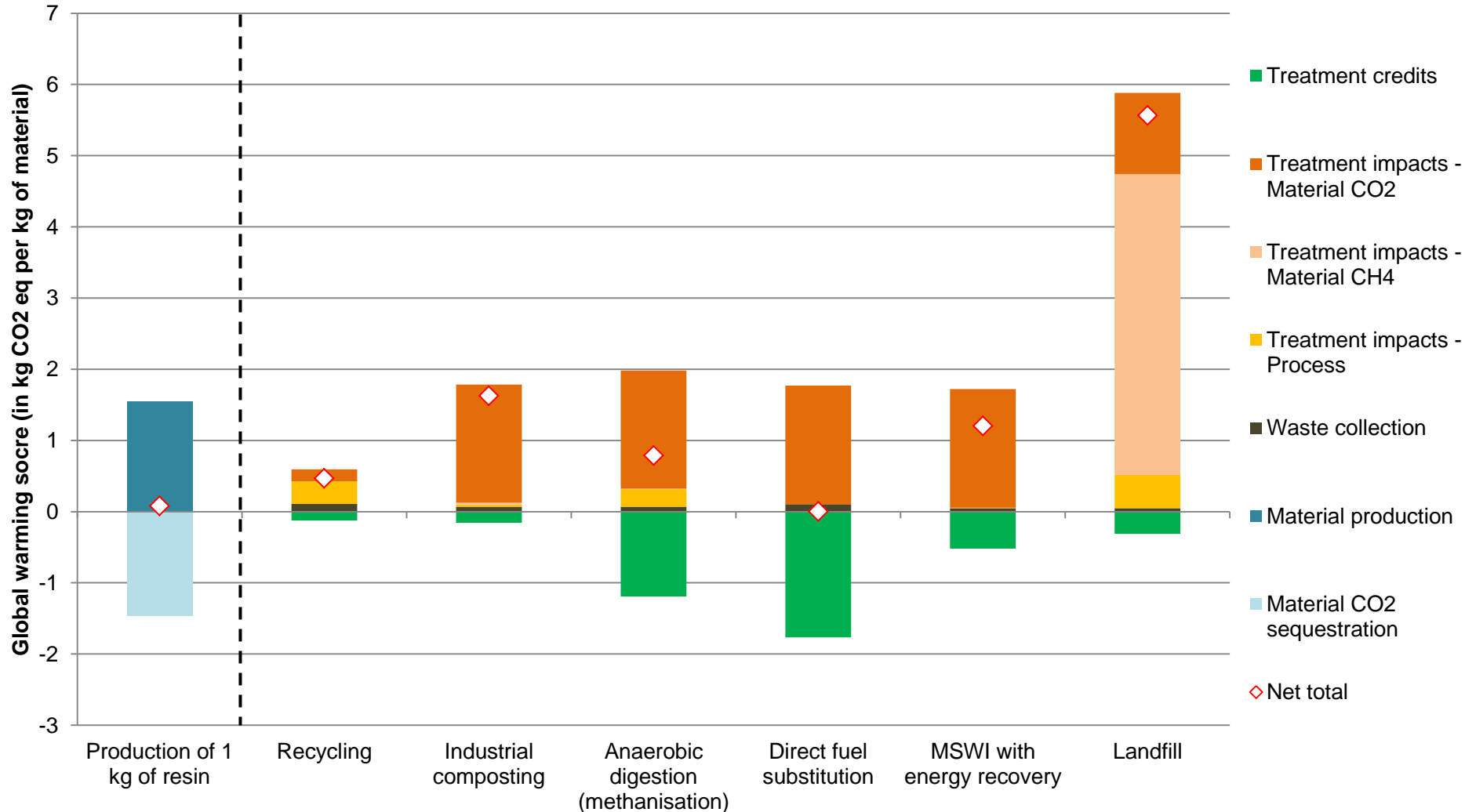
An LCA comparing two materials in formats that can go through all widely available end of life options was performed

Results & conclusions

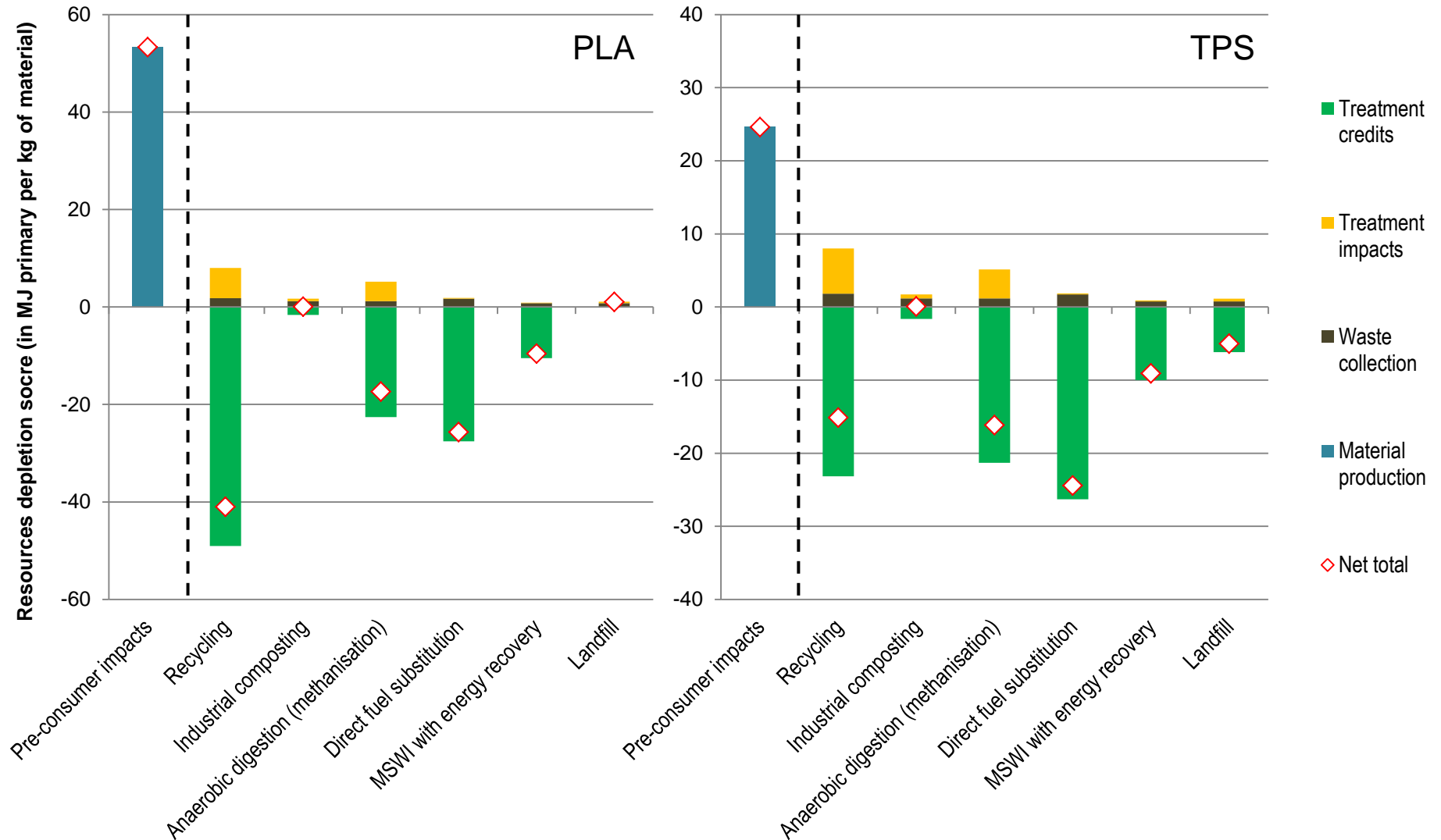
# PLA results for global warming score show high impacts of industrial composting



# TPS results for global warming score show dominance of methane production impacts in landfill



# Results for impacts on resources show high impacts for industrial composting



## Summary of the results

- Composting generally has among the highest impacts
  - This is due to the fact that the composting of the studied materials does not improve the quality of the compost and the industrial composting process does not recover energy
- Landfill impacts can be high and are dependant on the material
- Operations which recover energy perform well
- A rigid application of the EU Waste Hierarchy for industrial composting of biodegradable plastics is likely to generate one of the highest environmental impacts of the studied end-of-life options
- Composting should not be considered as recycling in the EU Waste Hierarchy when applied to biodegradable plastics

## Conclusion

The European Waste Hierarchy in context

Generally, public perception of composting is positive and of incineration is negative

LCA methodology to study end of life options for packaging

An LCA comparing two materials in formats that can go through all widely available end of life options was performed

Results & conclusions

Contrary to public perception, composting is not necessarily the best alternative  
Our results support the flexible application of the European Waste Hierarchy

Thanks for your attention



Parc scientifique EPFL

PSE - D

CH - 1015 Lausanne

[www.quantis-intl.com](http://www.quantis-intl.com)

+41 (0)21 693 91 92

# Life cycle perspective of the products studied (example)





# Product systems boundaries

