

The 10th International Conference on Life Cycle Management

Digital Business Solution – Life Cycle Models to create KPIs for industrial decision-making processes

**Example of biopolymer PHA
as a sustainable packaging concept for the cosmetic industry**

Overview

- **Methodical Approach – Life Cycle Models**
- Example of biopolymer PHA



Methodical Approach – Life Cycle Models

Holistic approach for customized software tools - multidimensional analysis

Perspective 7: Product and/or Life Cycle Costing (cost efficiency)

Perspective 6: Personal (qualification; demand)

Perspective 5: Life Cycle Assessment (Resource eff., ISO 14040)

Perspective 4: Material flows (material efficiency)

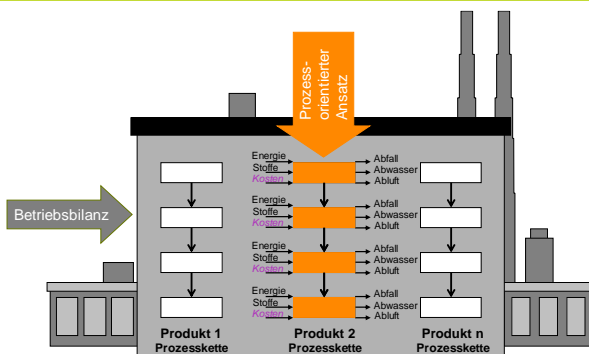
Perspective 3: Energy flows (energy efficiency, ISO 50001)

Perspective 2: Technical evolution status

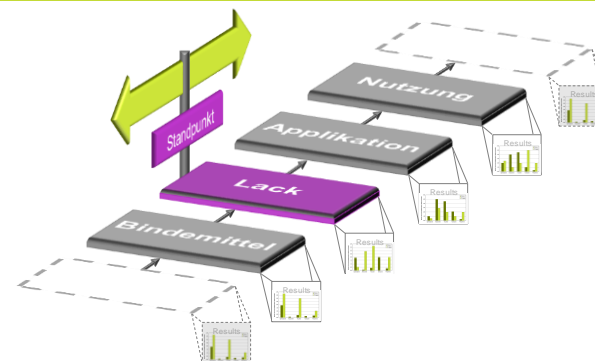
Perspective 1: Technical key performance indicators

Implementation Production

Implementation Life Cycle



Optimization and technology evaluation



Optimization and Added Values

Digital Business Solution – Life Cycle Models to create KPIs

Overview

- Methodical Approach – Life Cycle Models
- **Example of biopolymer PHA**



Example of biopolymer PHA

ACKNOWLEDGEMENT

The following results are part of the finished BMBF Research Project

- Cost-efficient production of biopolymer polyhydroxyalkanoates (PHA) for the manufacturing of tailor-made sustainable packaging concepts for the cosmetic industry
- Acronym: SusPackaging
- Timeline 2017 to 2021
- The project was founded with friendly support of BMBF (Federal Ministry of Education and Research), www.bmbf.de
- The final report (only in German) is available on request.

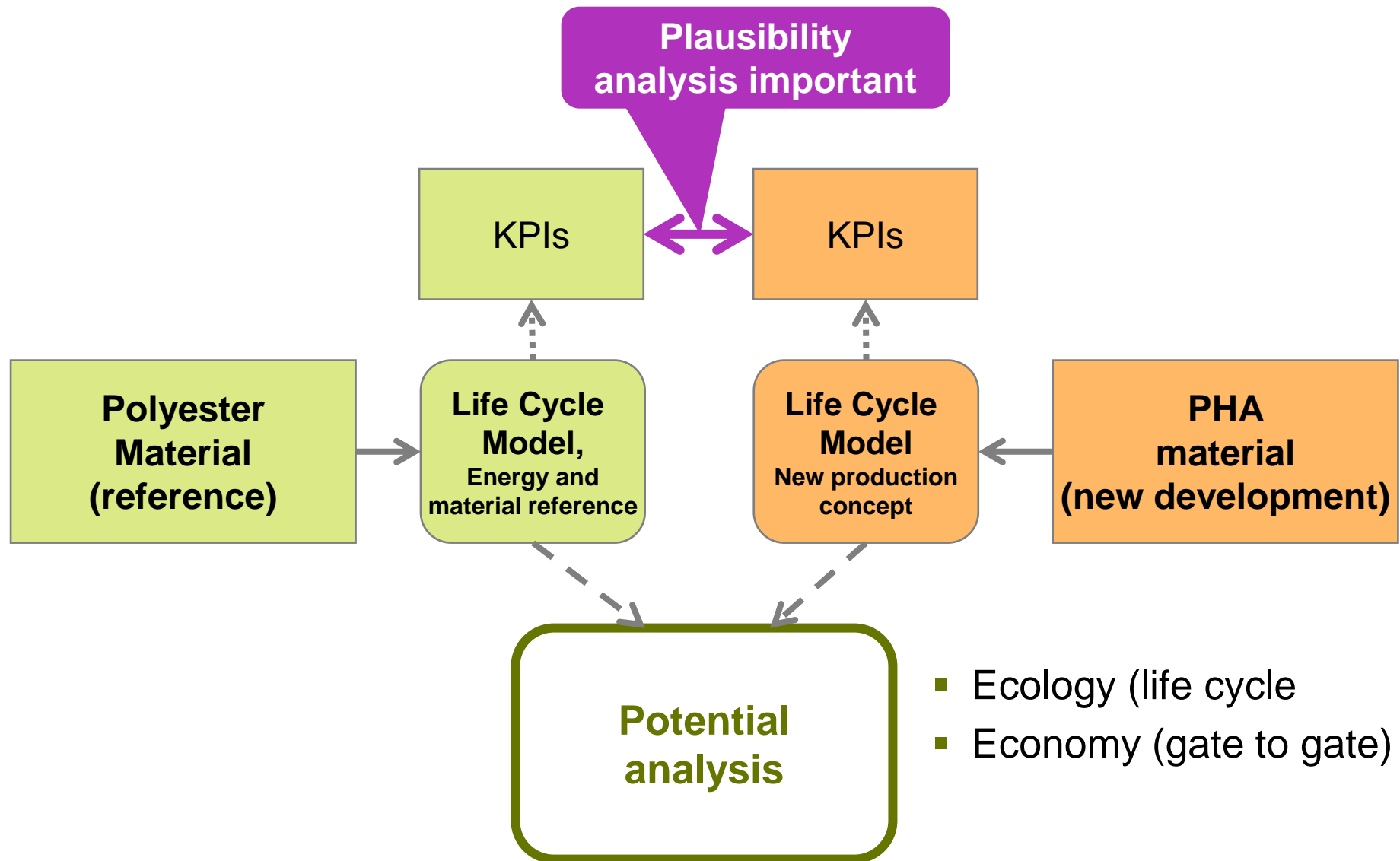
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Example of biopolymer PHA

Specific Life Cycle Model approach for potential analysis



Example of biopolymer PHA

Definition of Goal and Scope - Reference packaging product

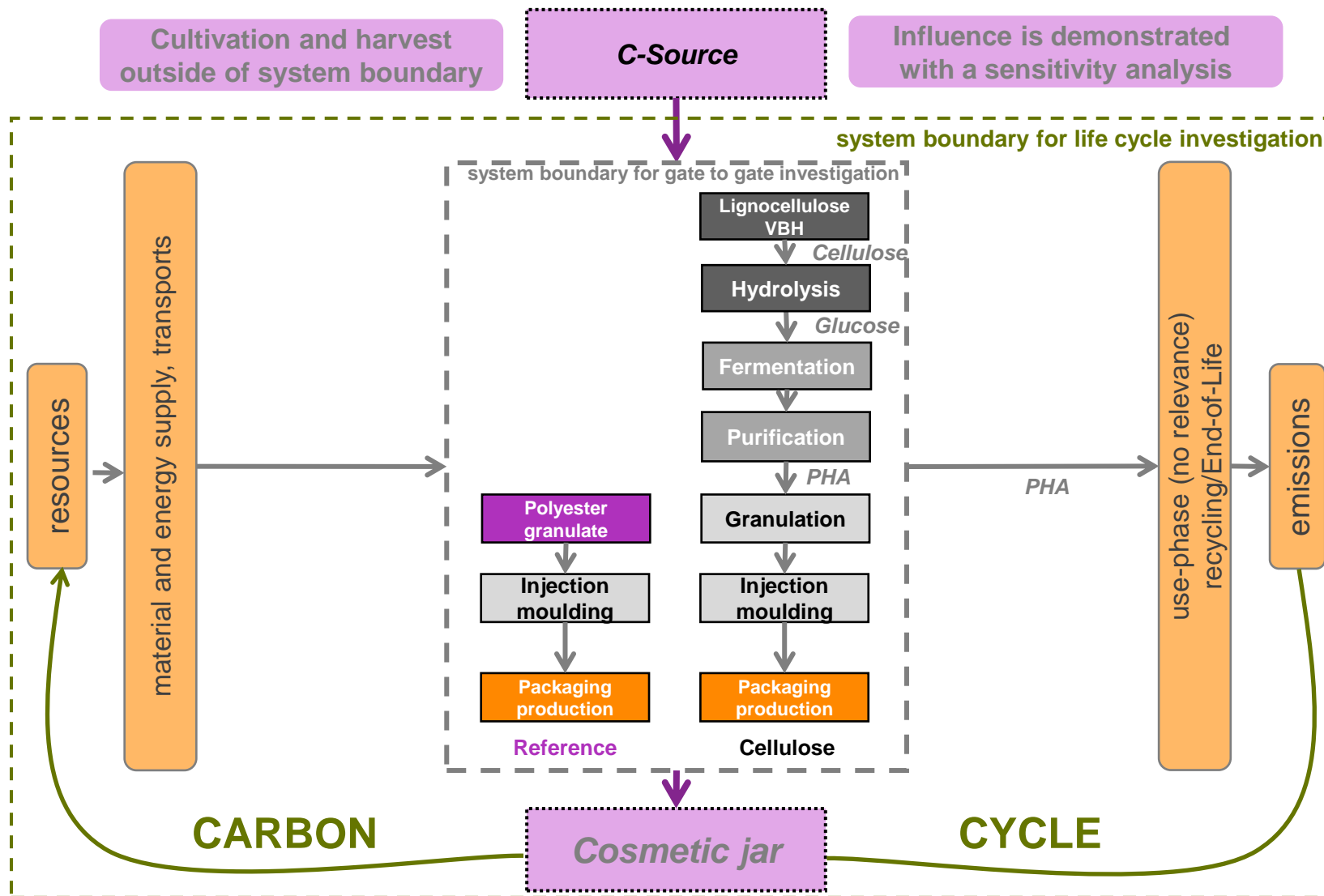
Functional unit

- **Jar** for cosmetic products
- Weight: Jar 26 g; Seal 11 g
- Quantity: 100.000 per year
- Reference material is polyester



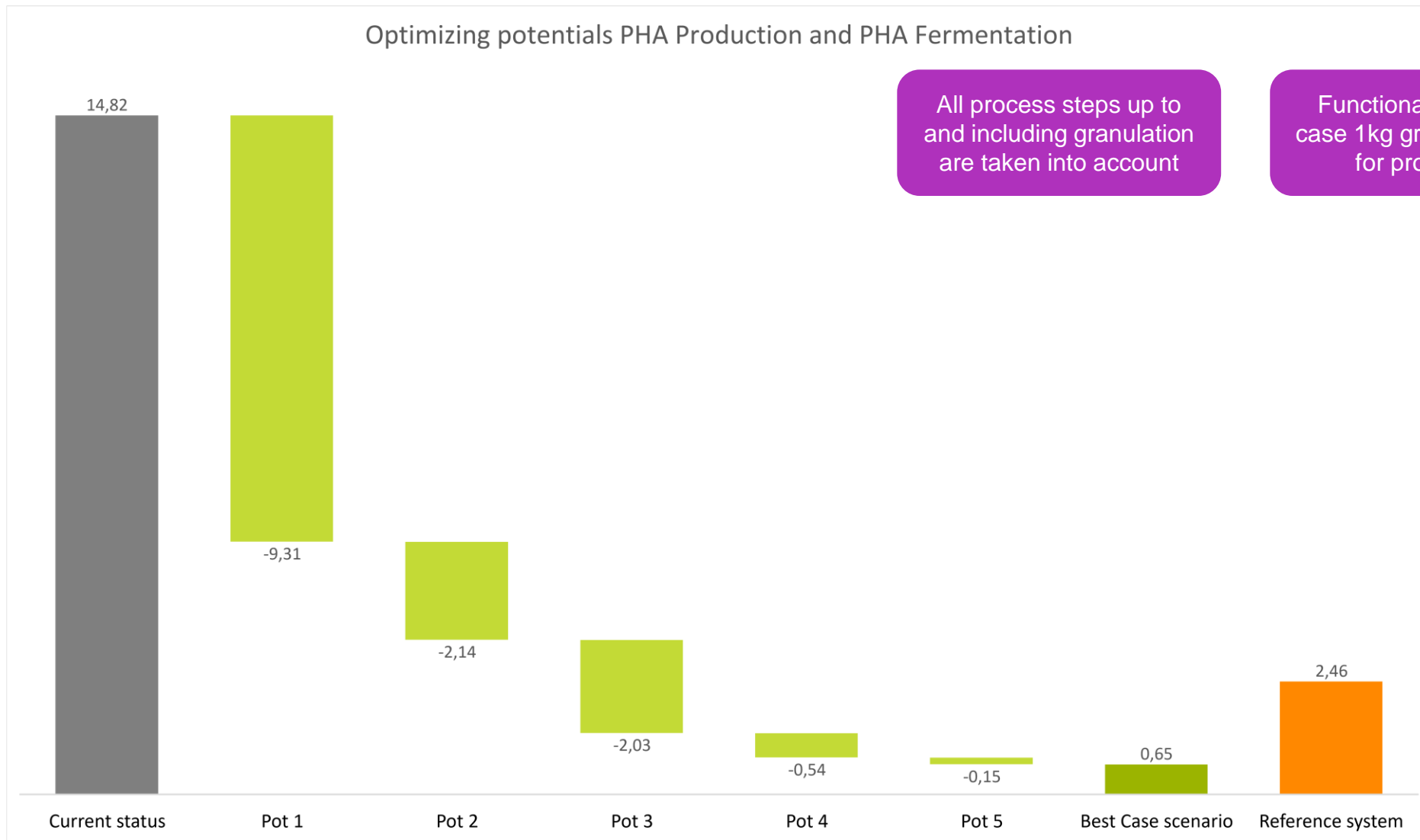
Example of biopolymer PHA

System boundaries

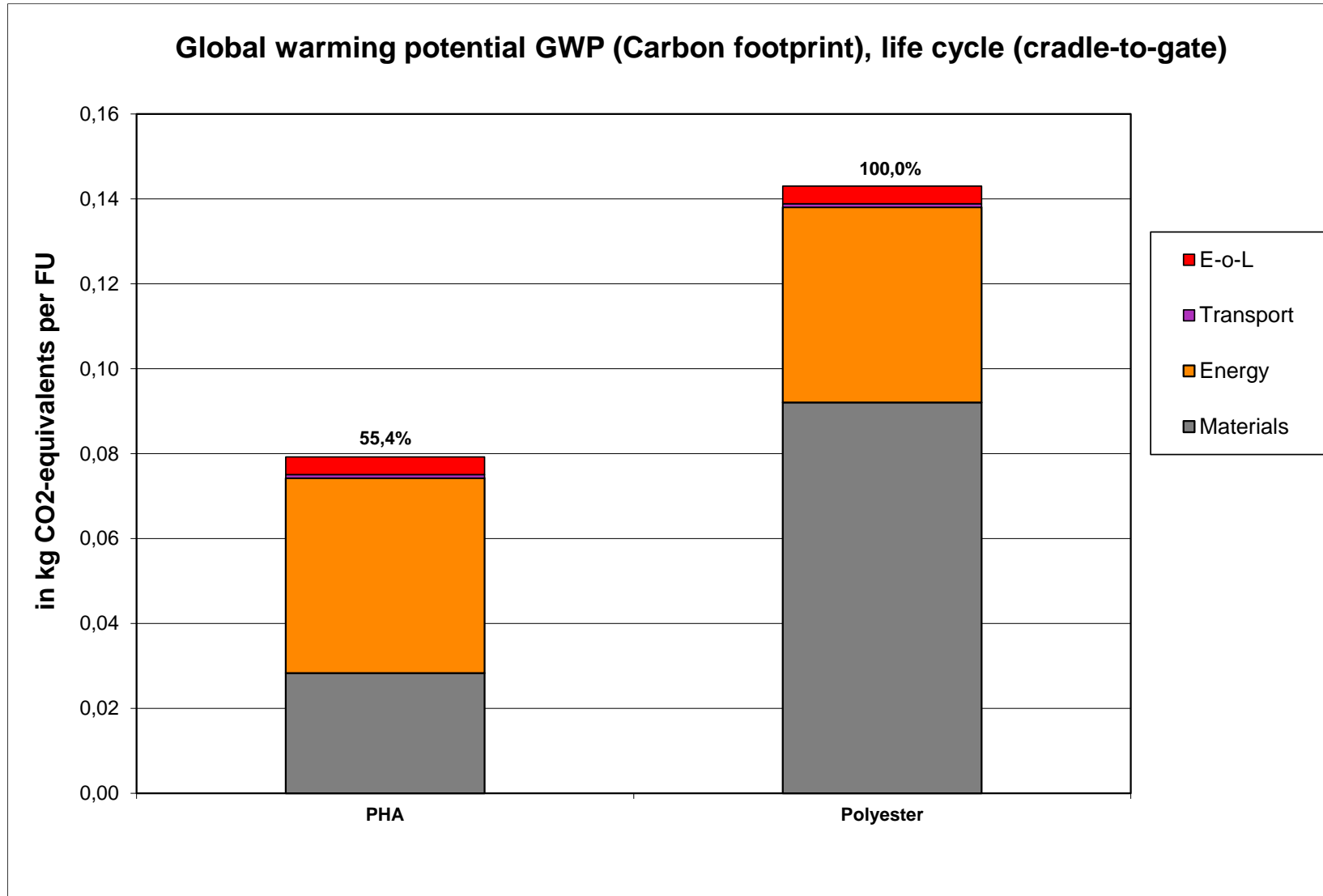


Example of biopolymer PHA

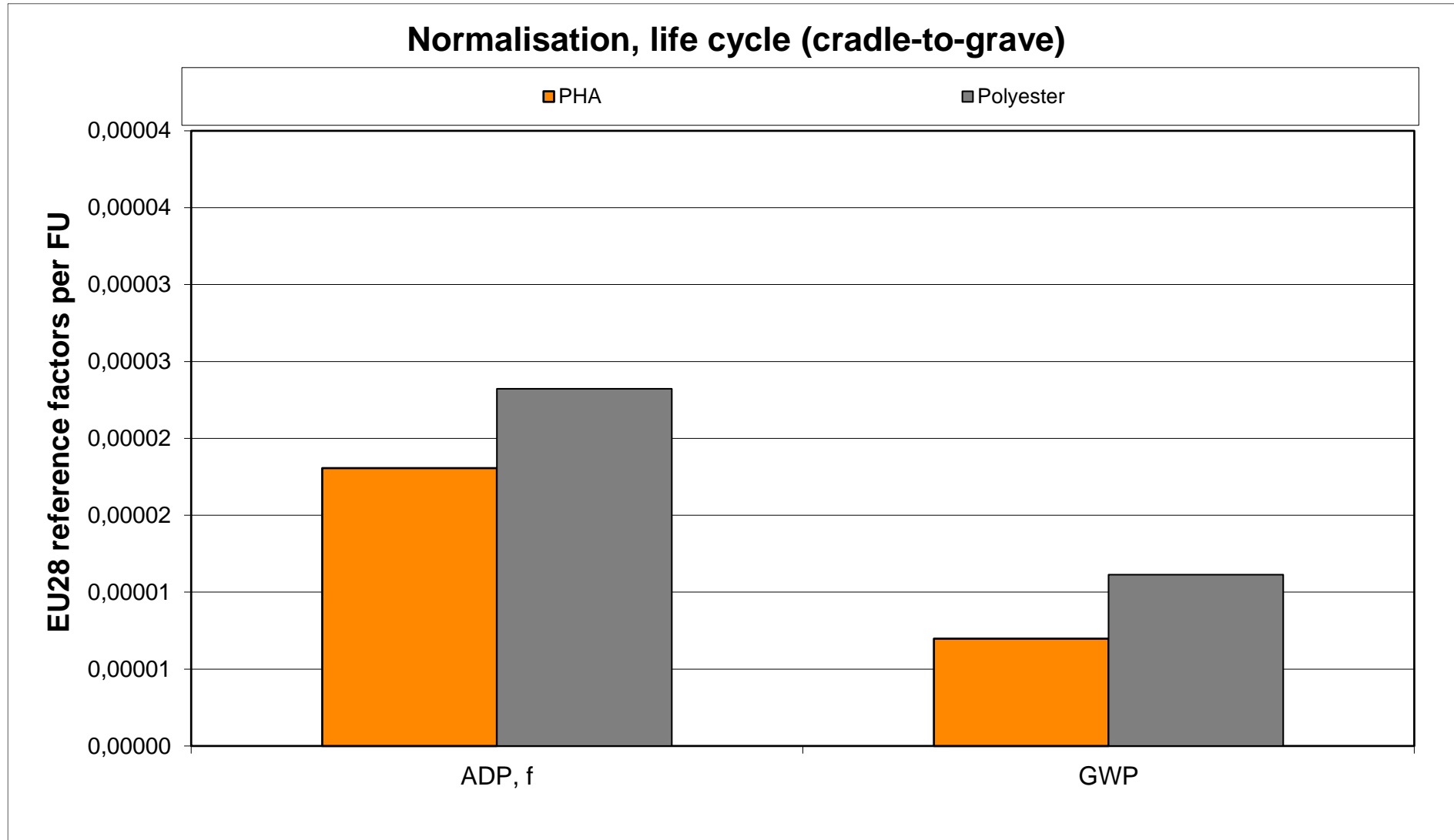
Optimization analysis „waterfall diagram“ – Eco-indicator Global Warming Potential (GWP)



Example of biopolymer PHA

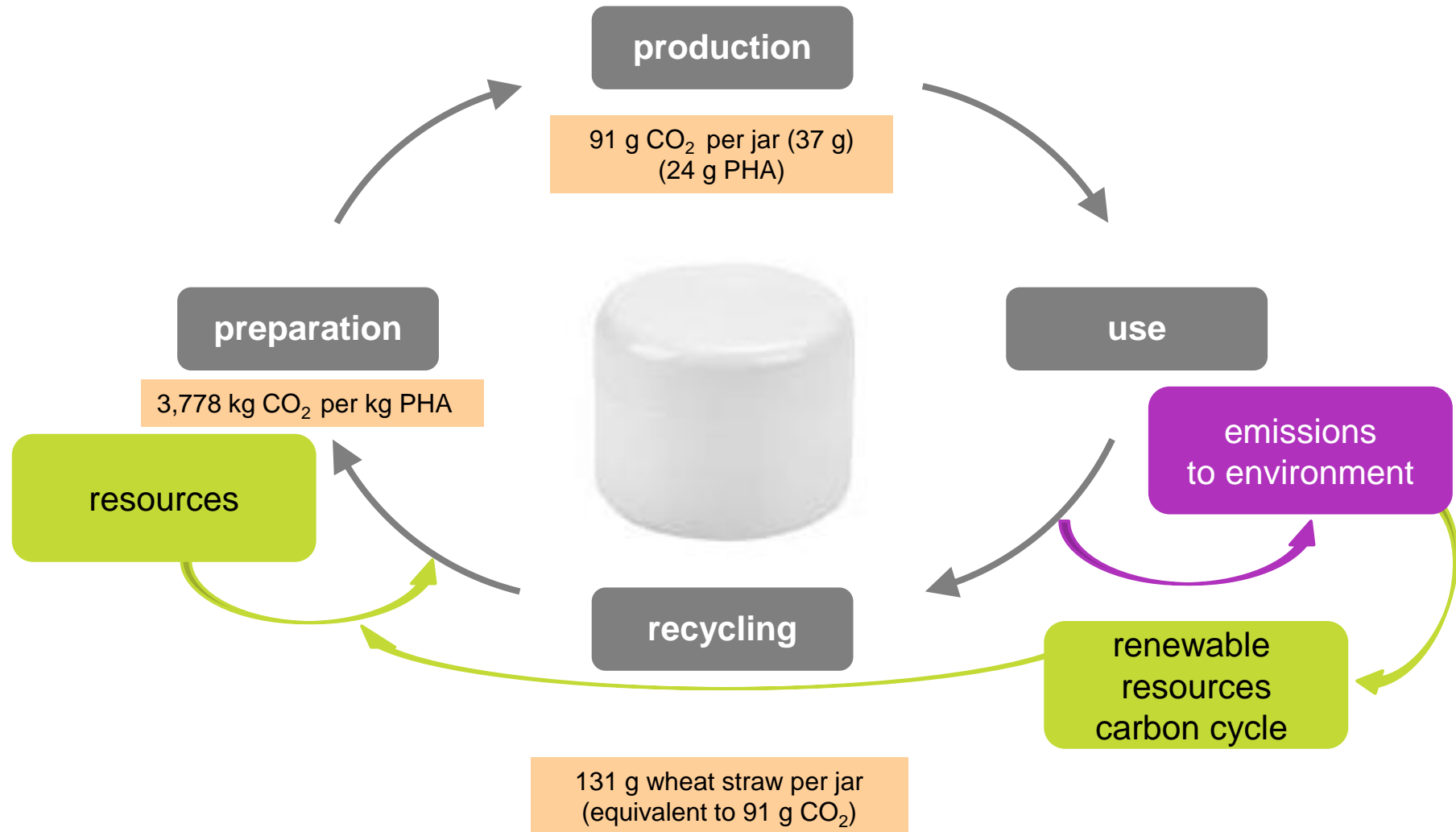


Example of biopolymer PHA



Example of biopolymer PHA

Visualization of carbon cycle



Outlook

Application of Life Cycle Models

- Life Cycle Models create transparency in supply chains due to modeling of single process steps with all important technical, economic and/or environmental parameters.
- These insights ideally support decision-making processes for development or implementation of sustainable products or technologies.
- Allow for a more stable basis and better comparability between different technology systems and show strengths and weak points of technologies based on Key Performance Indicators (KPIs).
- Life Cycle Models are customized software tools for own specific calculations like carbon footprint, resource efficiency, etc.



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