Business from technology

Optimizing life-cycle environmental performance of a value chain with MultiDesign approach

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Why environmental performance as a design criteria?

- In today's society and business environment a needs to focus on **overall acceptability** of the activity
  - Not only performance, properties and cost
- **Sustainable business and design** manages corporate social responsibility towards stakeholders, including parties interested in **environmental aspects**
  - energy and resource efficiency, pollution prevention, climate change etc.
- Important to understand and assess environmental impacts in as early design phase as possible
  - **Design for Environment** is integral part of MultiDesign

Design for Environment

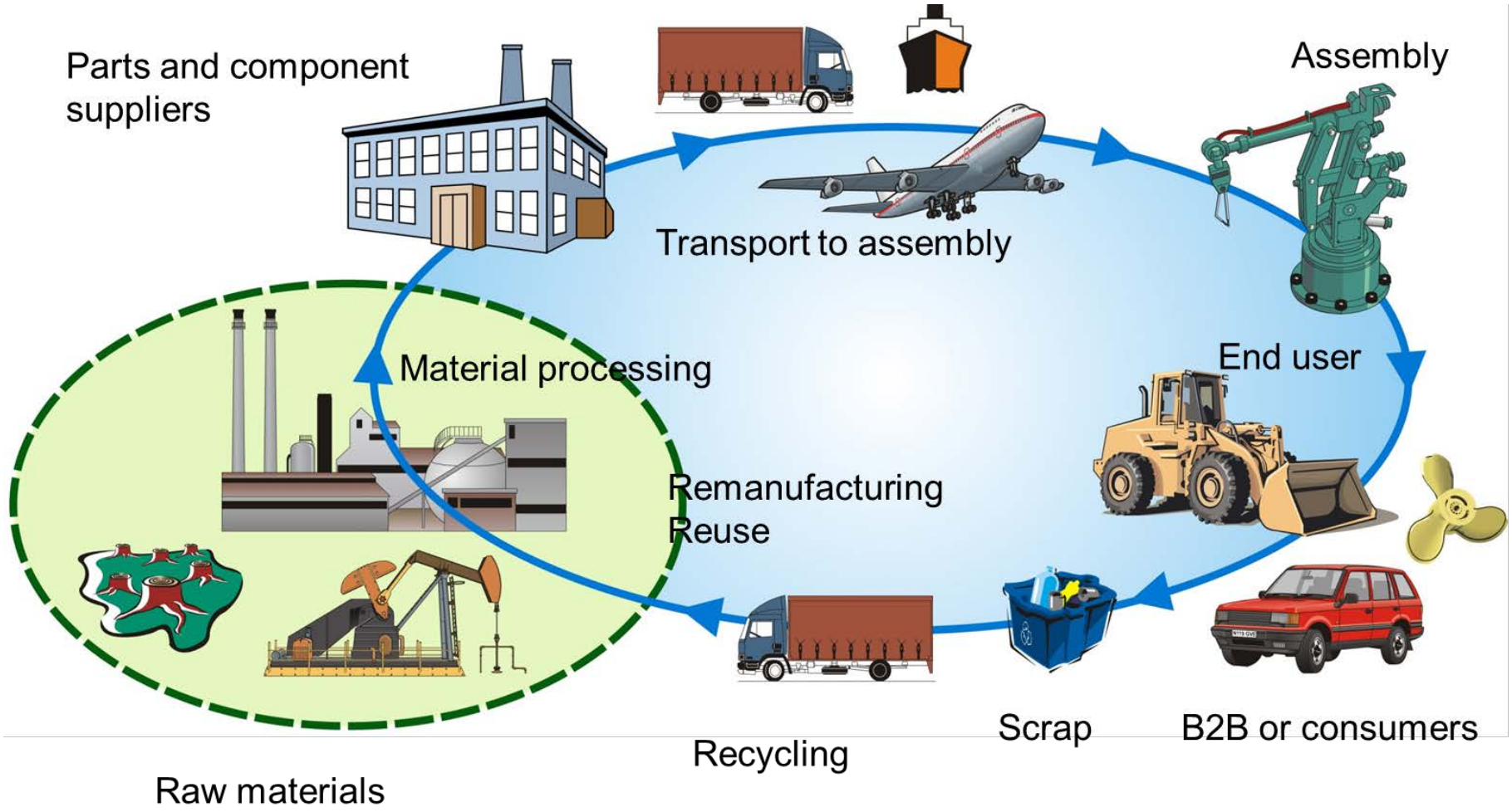
”Early identification and planning enables organizations to make effective decisions about environmental aspects that they control and to better understand how their decisions may affect environmental aspects controlled by others”

- ISO/TR 14062. Integrating environmental aspects into product design and development

Design for Environment contains

- Defining a product’s **environmental profile over life cycle**
- **Continuous measurement** of product’s environmental impacts
- Setting objectives and giving instructions and **feedback to product designers**
- Environmental information management and **stakeholder communication**

What is life cycle of a product?

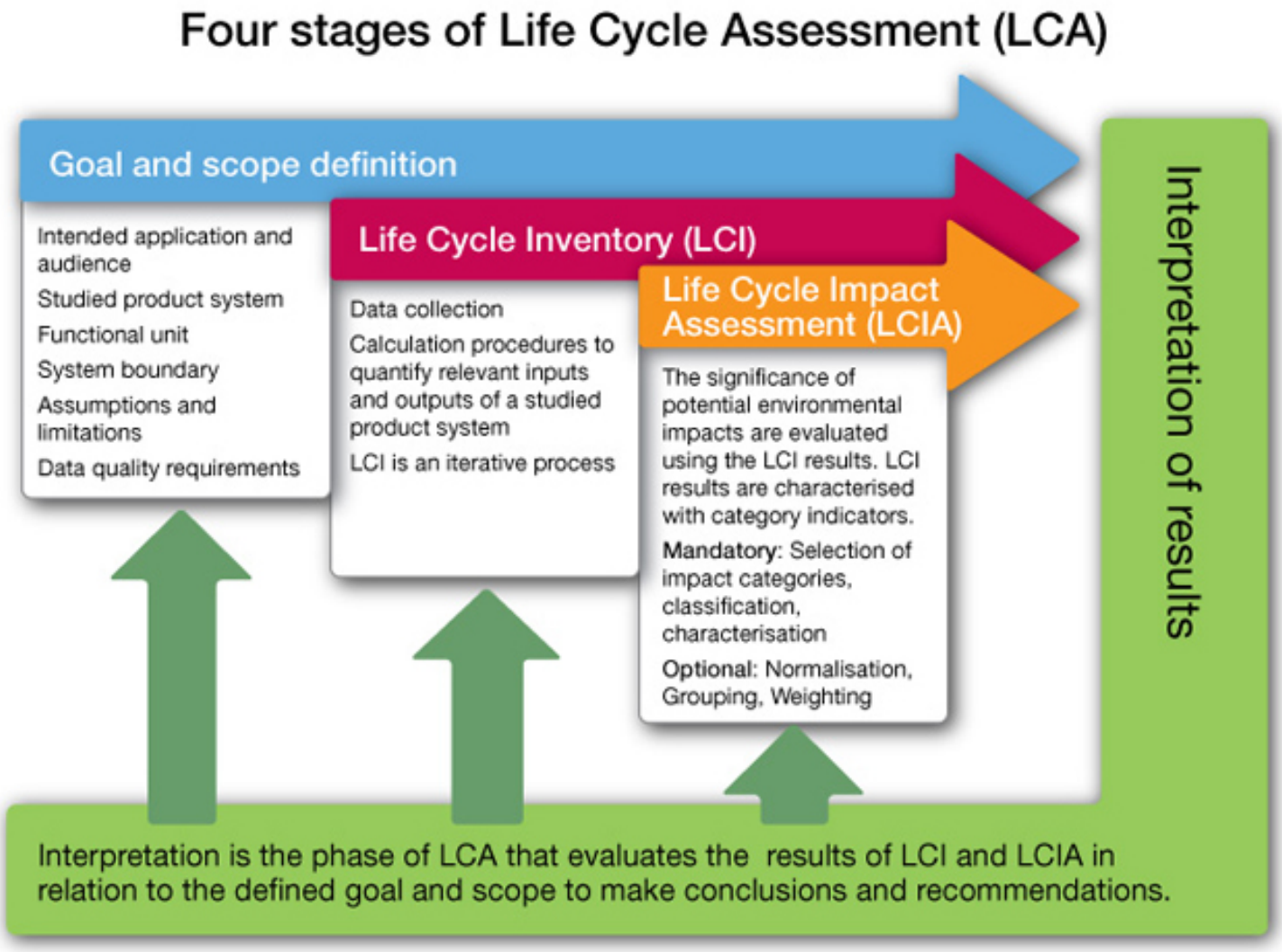


What is life cycle assessment?

- The goal is to calculate the environmental impact created during product's life cycle ("cradle to grave")

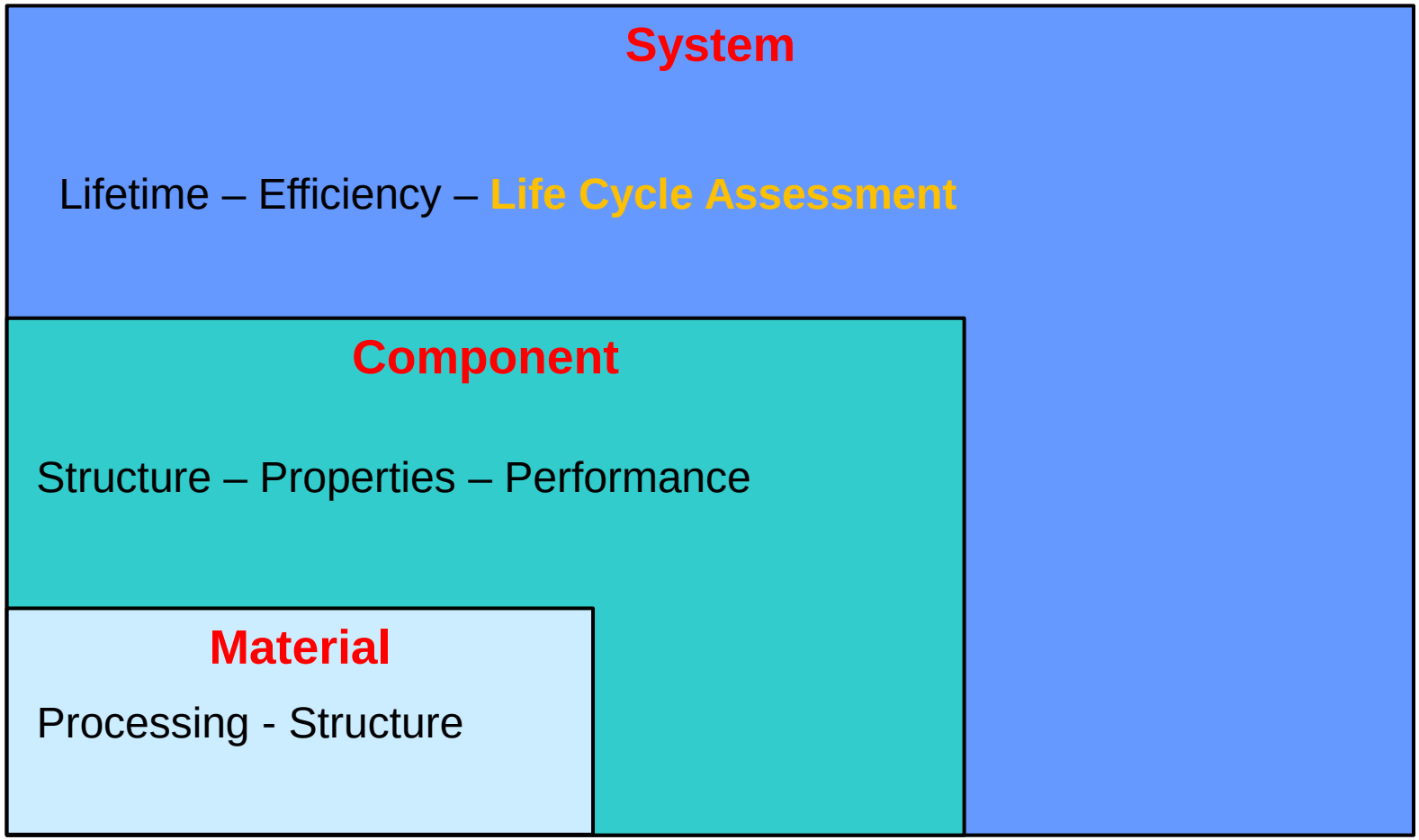
For which purposes?

- Internal
  - Strategic decision making
  - Product and process development
  - Comparison of environmental impacts in different products
  - Environmental management (EMAS, ISO 14001)
- Environmental communication to external stakeholders



ISO standardized (ISO 14040, 14044) methodology

Environmental impacts: Different levels



Stainless steel tank LCA-case example

Aim

- To clarify the relation between the raw material manufacturing and the use phase of semi-trailer truck with stainless steel tank

Method

- LCA methodology was applied according to the requirements of ISO 14040 standard series.
- Carbon footprint was utilized to describe the energy efficiency and climate impacts of the studied product system.

A bitumen road tanker using LDX 2101®
Photo courtesy of manufactured by Officine Meccaniche B.S. S.r.l.

Made in co-operation with Outokumpu Oyj.
Study published in SOVAMAT 2011 conference proceedings:
http://www.sovamat.org/sam-conferences/documentDetail.php?docId=137

Stainless steel tank: environmetal impacts in different levels

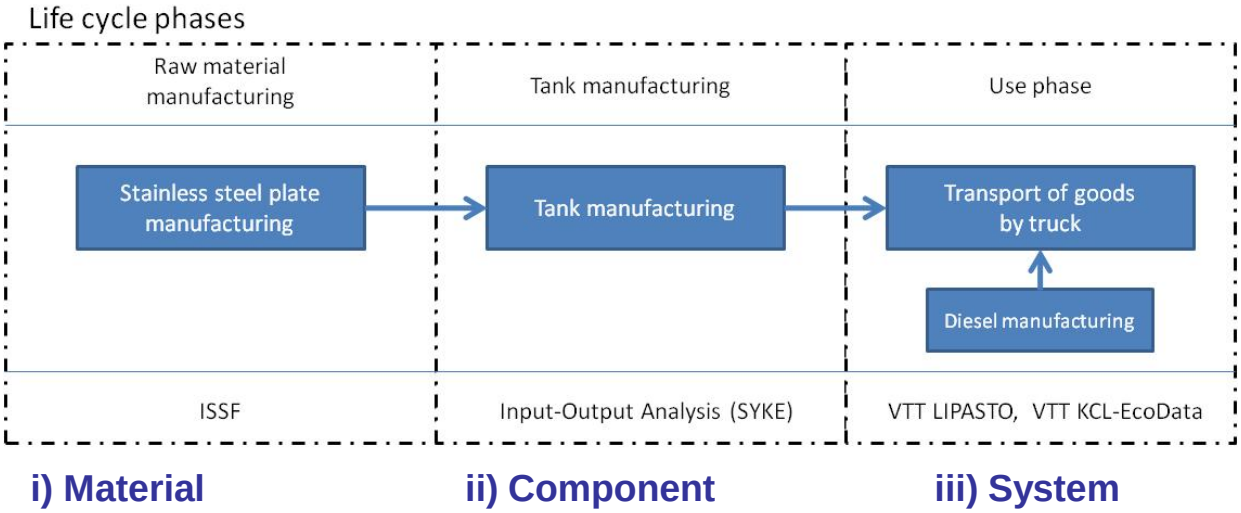
Three levels:

- Materials: Duplex 2205 (EN 1.4462) and Austenitic 304 (EN 1.4301) steels.
- Components: Two alternative tanks for semi-trailer truck
- System level: Freight traffic application

Stainless steel coil from Outokumpu

A bitumen road tanker using LDX 2101®
Photo courtesy of manufactured by Officine Meccaniche B.S. S.r.l.

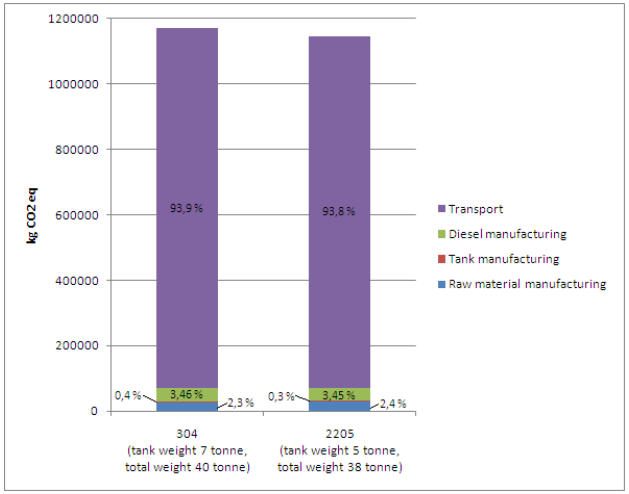
System boundary: Three levels

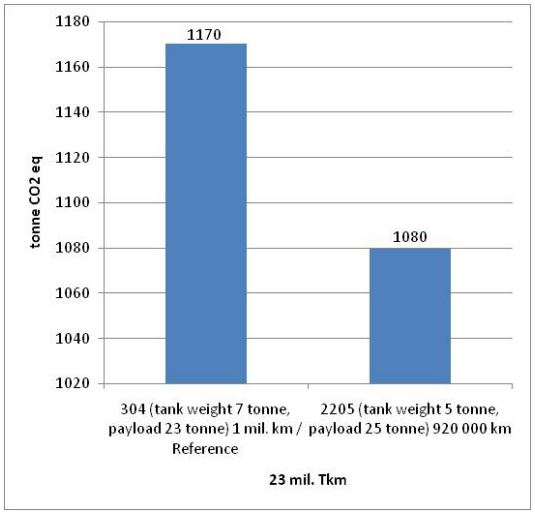


Three possible system boundaries

1. Cradle-to-steel works gate (material level)
2. Cradle-to-tank manufacturer gate (component level)
3. Cradle-to-final application (system level)

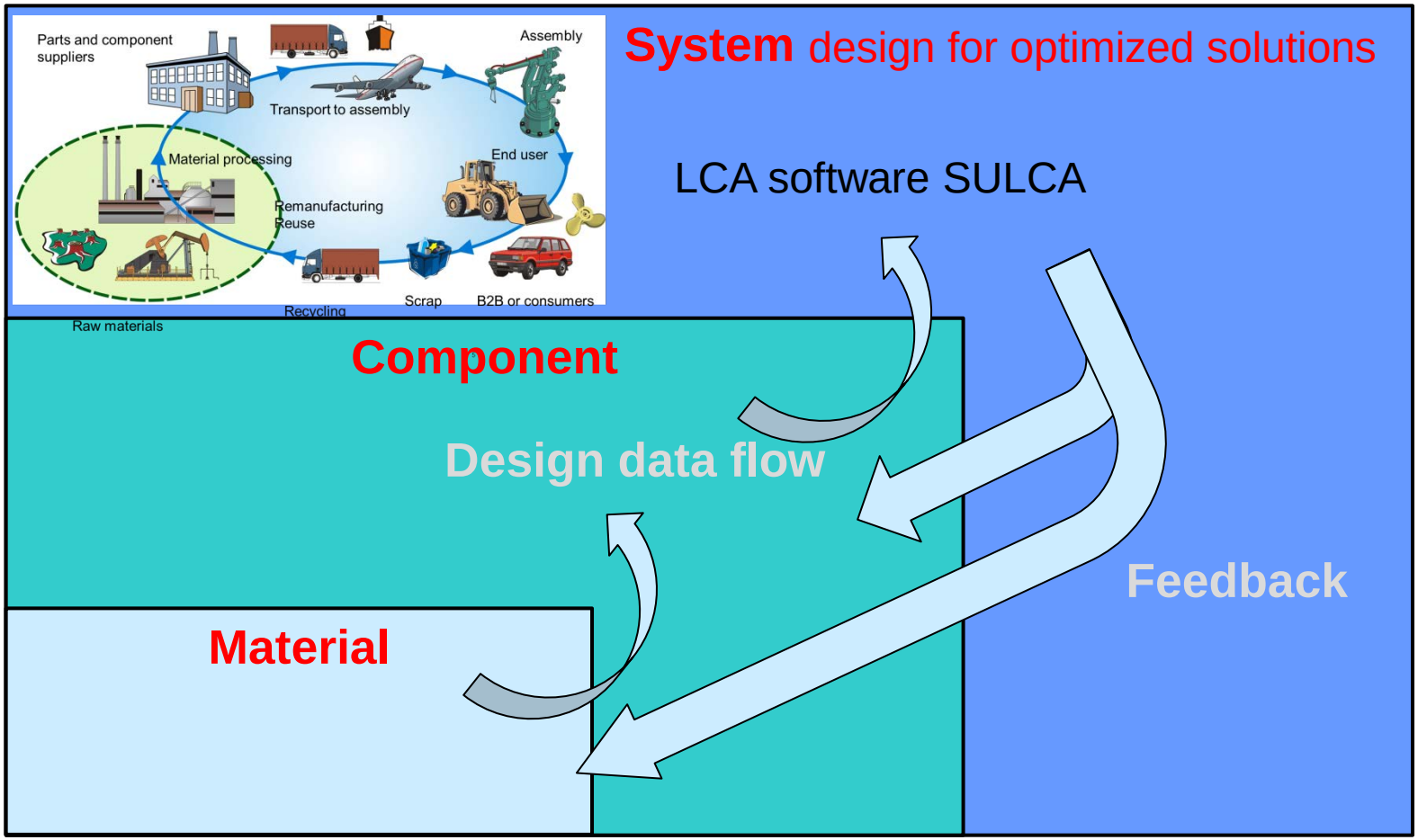
Case results and conclusions





1. Duplex (2205) has higher strength properties, but **higher** climate impact in *raw material manufacturing level*
2. Lower amount of Duplex is needed per one tank, thus climate impacts **equal** per tank (*component level*)
3. Duplex steel tank allows increase of payload, thus leads to **lower** fuel consumption and climate impacts per ton-km of payload (*system level*)

Future possibilities and benefits: integrated modelling



Future possibilities and benefits

VTT developing LCA software tools on Simantics platform

- Facilitates integration of LCA modelling with e.g. component, process and system level design tools
- Allows use and creation of shared databases for multiple purposes

Dynamic two-way flow of modelling data

- Output from e.g. component models as input for LCA tool
- Environmental impact scores from LCA as direct feedback to e.g. material designers

Benefits

- Allows reduced resource needs in modelling
- Use of multidisiplinary expertise and integrated tools at VTT

Thank you!

Questions?

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