

University of Stuttgart

Institute for Acoustics and Building Physics
Department Life Cycle Engineering (GaBi)



Fraunhofer

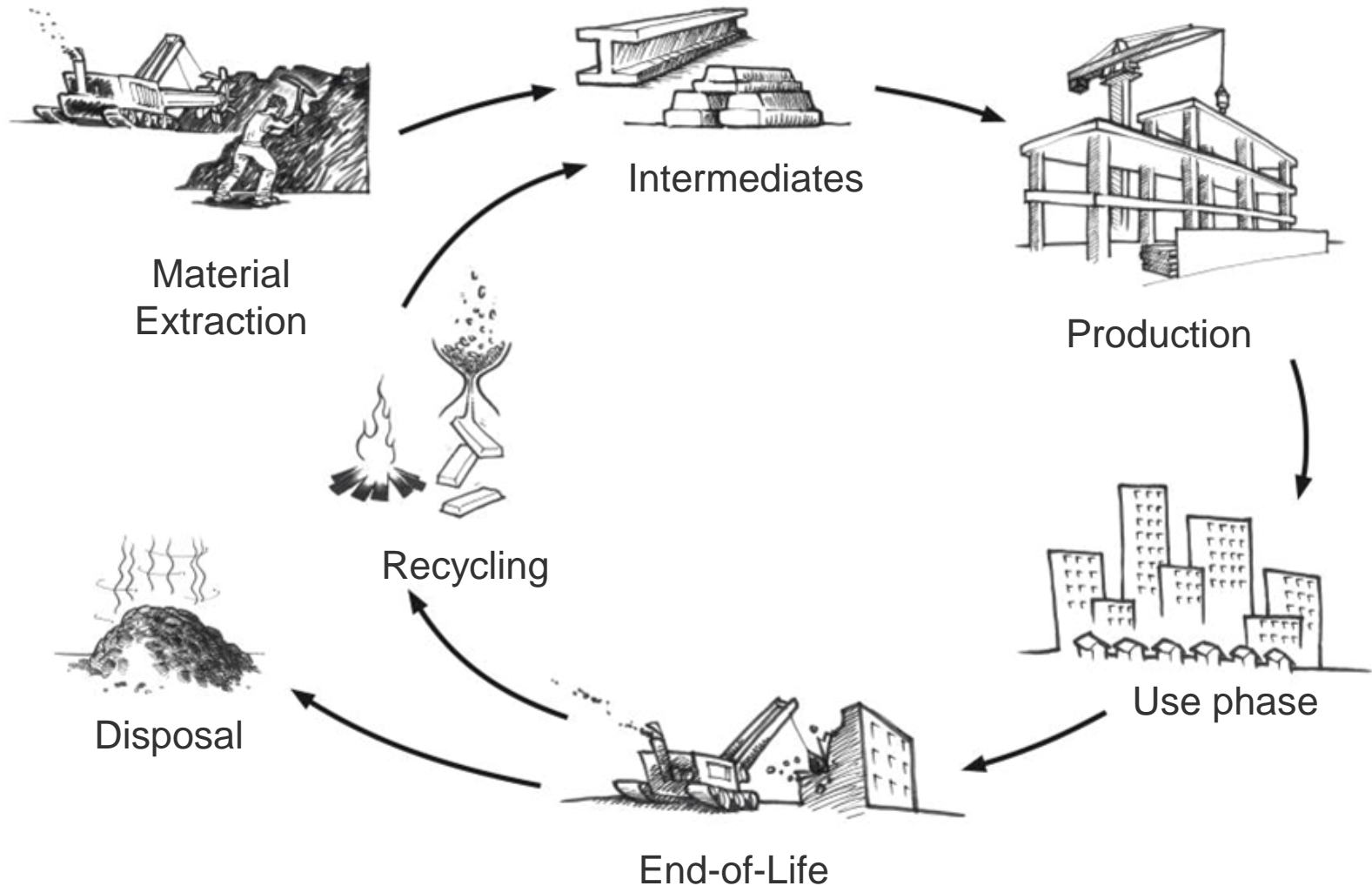
IBP GaBi



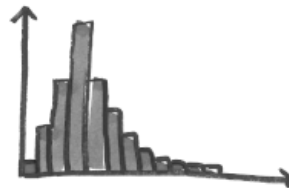
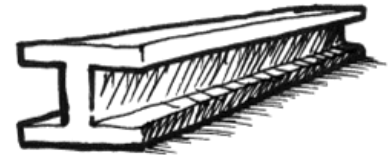
2019 Research topics in Life Cycle Engineering

12. February 2020

The Life Cycle Perspective



Department Life Cycle Engineering (GaBi)



Department Life Cycle Engineering (GaBi)



© Setthaphan Rummanee/shutterstock

Life Cycle Assessment
(LCA)



© Minerva Studio/shutterstock

Life Cycle Costing (LCC)



© Itsra Sanprasert/shutterstock

Social Indicators (LCWE)



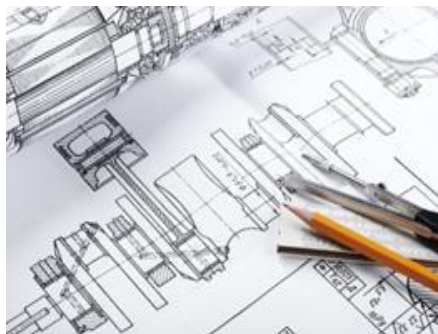
© faithie/shutterstock

Sustainability
Assessment

Land Use & Biodiversity



© Peera_stockfoto/shutterstock



© Scorpp/shutterstock

Design for Environment
(DfE)



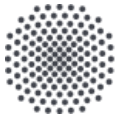
© stockphoto mania/shutterstock

Material Flow Analysis
(MFA)



© Vadim Ratnikov/shutterstock

Technology
Benchmarking



University of Stuttgart

LCA of the automotive sector in the future

Master thesis

LCA of the German vehicle fleet under consideration of rising numbers of alternative drivetrains

Project

- Research on the transition phase of introducing e-fuels into the German market
- Rising number of Synthetic Natural Gas Power to Gas facilities
- Rising number of alternative drivetrains as battery electric and e-fuels

Topics

- The overall German vehicle fleet is simulated for any year up to 2050
- A LCA of this simulation has to be done on how the environmental impact is changing



LCA of platforms of future automobile

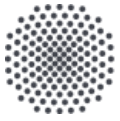
Project

- Designing the powertrain of the future and evaluating its sustainability
- Developing a general model for automobile platforms

Topics

- Vehicles with different drivetrains are simulated for the year 2040
- A LCA of this simulation has to be done to show how the environmental impact is changing





University of Stuttgart

LCA of the transition towards large scale use of Power- to-Gas e-fuels in Germany

Master thesis



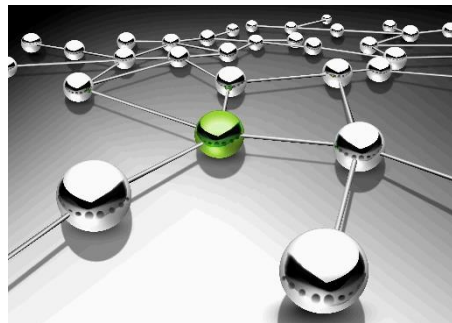
LCA of the transition towards large scale use of Power-to-Gas e-fuels in Germany

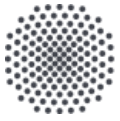
Project

- Research on the transition phase of introducing e-fuels into the German market
- Rising number of Synthetic Natural Gas Power to Gas facilities
- Impacts on Gas grids, power plants, households and vehicles expected

Topics

- The introduction and transition of synthetic natural gas in Germany is simulated for any year up to 2050
- A LCA of this simulation has to be done on how the environmental impact is changing





University of Stuttgart

Land use impacts on Biodiversity

Research
project

Land use impacts of electricity on biodiversity

- With a focus on land use, make a comparison of two electricity generation technologies (e.g. coal vs solar) for different locations.
- Focus on the location perspective using GIS
- Working together with a PhD student developing method for inclusion of land use impacts on biodiversity in LCA
- Possibility of writing a scientific paper for publication in scientific journal

Land use impacts of food production on biodiversity

- Methodological work on biodiversity impact assessment
- Project on lamb meat production running out, further focus on food production systems
- Food impact assessment as a new field in LCA
- Working together with a PhD student developing method for inclusion of land use impacts on biodiversity in LCA



University of Stuttgart



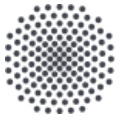
Plastic packaging disposal routes

Research
project

Plastic disposal paths

- The goal is to support decision-making with LCA of waste plastic packaging scenarios
- Based on regional statistics for plastic disposal (e.g. Europe, OECD)
- Identification of disposal rates for different disposal types (incineration, landfilling, recycling)
- Estimation of littering rates in different regions

$$\textit{Litter} = \textit{Produced plastics} - (\textit{Incineration} + \textit{Landfilling} + \textit{Recycling})$$



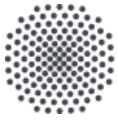
University of Stuttgart

Resource efficiency of the German energy transition

Research
project

Resource efficiency of the German energy transition

- Research project started last week
 - Energy transition (electricity, heat, transport) from resource perspective
 - Greenhouse gases, primary energy demand
 - Rare earths, copper, sand
 - Focus: energy system scenarios → product systems
- Potential master thesis topics:
 - LCA of an energy system component (e.g. power-to-heat, storage systems)
 - Indicator development



University of Stuttgart

Uncertainties in Life Cycle Assessment

Research
project

Uncertainties in Life Cycle Assessment

- **Background**

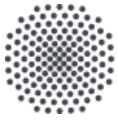
- Products get more and more personalized, thus environmental impacts show higher variance
- Historically LCA is strongly focused on results as a single number

- **Challenge**

- Showing environmental impacts as a more realistic result range

- **Master thesis**

- State-of-the-Art of uncertainty in LCA (methodology, tools, etc.)
- Case study including uncertainty in LCA



University of Stuttgart

Digital approaches for LCA applications

Student job

Digital approaches for LCA tools

- **Background**

- Product development is often uncertain about ecological consequences from decisions in early design stages.
- Identifying uncertainties is challenging in LCA.

- **Challenge**

Detecting uncertainties/hotspots in product development with regard to ecological consequences of decisions.

- **Possible tasks:**

Generate tools and data for identifying hotspots in product development

- **Benefit:**

Opportunity to learn e.g. data processing in an „hands-on“-



University of Stuttgart

Life Cycle Assessment of Events

Thesis

Life Cycle Assessment of Events

A comparison of process LCA and Input-Output LCA

- **Background**

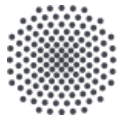
- Events cause significant emission, with the emissions being hard to allocate (as deriving from many different areas)

- **Challenge**

- Identification of the different contributors within a reasonable effort based on two different LCA approaches

- **Master thesis**

- State-of-the-Art of LCA of events, comparison between process and IO LCA
- Detailed process LCA of an event (probably concert) with on-site data collection
- Screening Input-Output LCA



University of Stuttgart

Working At GaBi

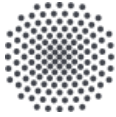


Why choose the Department of Life Cycle Engineering (GaBi)

Student job, student research project and/or master's thesis

- Learn a new software (GaBi)
- LCA is very relevant now and in the future
- Progression from a *student job* to a *research project* and/or a *master thesis*
- Great working environment
 - There's a student office
 - Time flexibility
 - Friendly and supportive employees
 - Free coffee (and delicious)
 - Invitation to the Christmas party





University of Stuttgart

Institute for Acoustics and Building Physics
Department Life Cycle Engineering (GaBi)



Fraunhofer

IBP GaBi

Thank you and good luck with your master thesis!

Contact:

Andreas Geß

andreas.gess@iabp.uni-stuttgart.de

+49 711 970 3165

Applications:

bewerbung-gabi@iabp.uni-stuttgart.de