Network LCA and SULCA - tools for life cycle assessment

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Welcome to webinar!
Agenda

Life cycle assessment (LCA)- Catharina Hohenthal
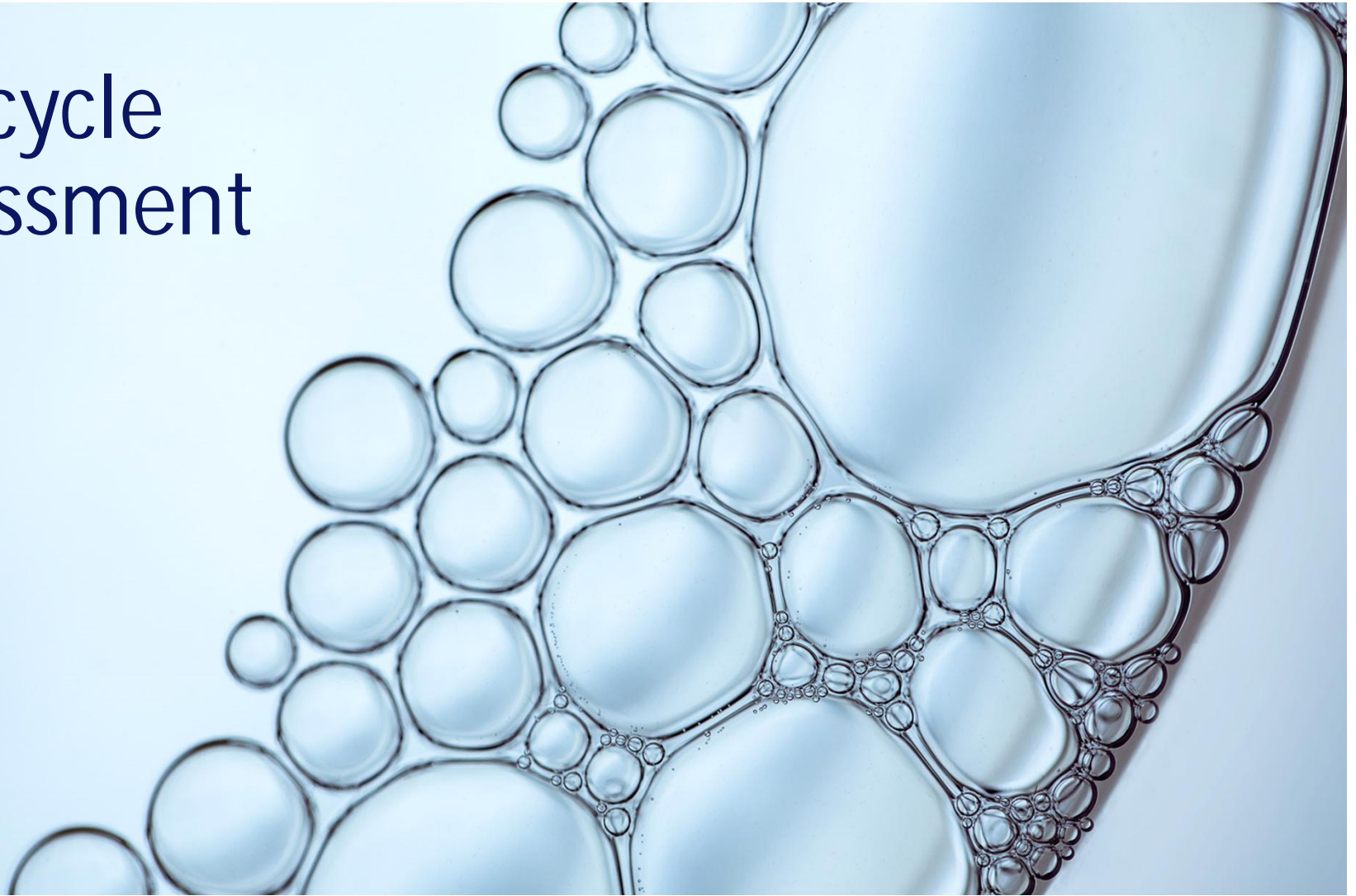
SULCA 5 - Marja Myllysilta

Network LCA - Reino Ruusu and Marja Myllysilta

Summary and future work - Sami Majaniemi

Life cycle assessment

Sustainability assessment at VTT- Products & services

METHODS AND TOOLS FOR SUSTAINABILITY IMPACT ASSESSMENT & COMMUNICATION

LIFE CYCLE ASSESSMENT
(ISO14040-44)

CARBON FOOTPRINT
(ISO14067)

WATER FOOTPRINT
(ISO 14046)

HANDPRINT

CRITICAL REWIEWS

ENVIRONMENTAL
PRODUCT
DECLARATION (EPD)
(ISO14025)

SULCA
LCA SOFTWARE

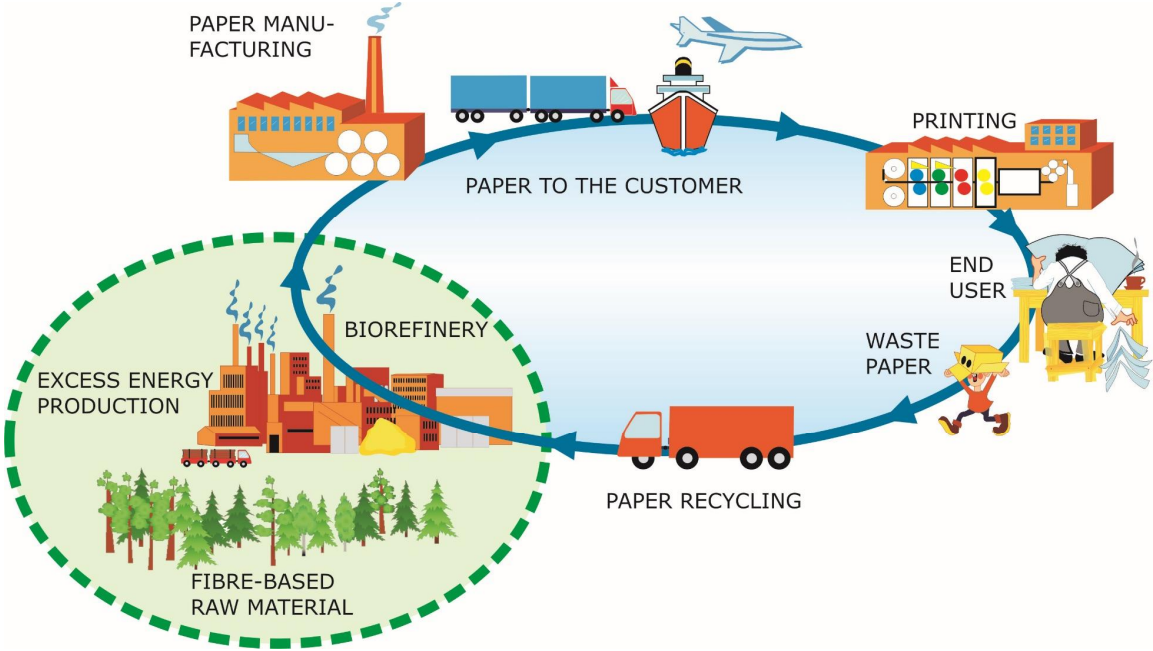| Define problem and life cycle steps | | Data collection | | Model and calculate impacts | | Analyse results and plan actions |

Life cycle assessment, LCA methodology

- LCA enables calculating the potential environmental impacts throughout product's life cycle, "cradle to grave". Sometimes the study is framed to "cradle to gate" or "gate to gate" phases. In LCA the direct and the indirect as well as embodied emissions, energy, wastes and materials will be taken into account.

- LCA is based on the ISO standards 14040 and 14044. The method has an iterative nature which means, for example, that the scope of the study can be adjusted due to limited data availability.

- Examples of the use of LCA are product and process development, communication and decision making. According to the standards, critical review is required if the results of LCA are intended to be used in public comparative assertions.

- Input data can be either specific, i.e. from the actual production processes, or average, i.e. from the life cycle inventory databases.

Define problem and life cycle steps → Data collection → Model and calculate impacts → Analyse results and plan actions

Life cycle approach: Quantified environmental impacts and benefits over the life cycle of a product

PAPER MANU-FACTURING

PAPER TO THE CUSTOMER

PRINTING

END USER

WASTE PAPER

BIOREFINERY

EXCESS ENERGY PRODUCTION

PAPER RECYCLING

FIBRE-BASED RAW MATERIAL

| Define problem and life cycle steps | Data collection | Model and calculate impacts | Analyse results and plan actions |

LCA databases

- Databases (ecoinvent, PlasticsEurope etc.) include average data for example on energy and waste treatment

- Aggregated or unit process data

- **Benefits**
  - Readily available data
  - Fills in the data gaps left by specific data
  - Saves resources

- **Challenges**
  - Transparency
  - Data age
  - Compatibility of different databases
  - Average data might not represent the product under assessment
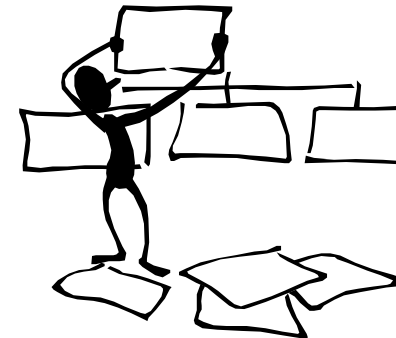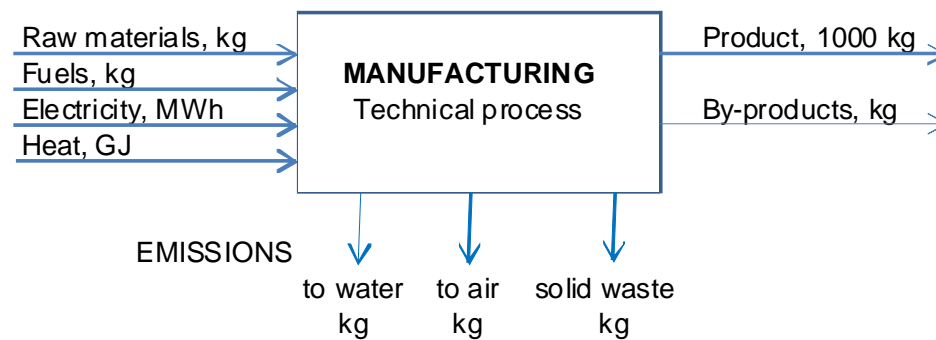
LCA specific data

- Collected typically with raw material suppliers questionnaires
  - Consists of e.g. cover letter, documentation, inputs and outputs
- Inputs and outputs are the materials, emissions, wastes, energy consumption etc. from the real manufacturing processes
- **Benefits**
  - Represents the product under assessment
  - Up-to-date
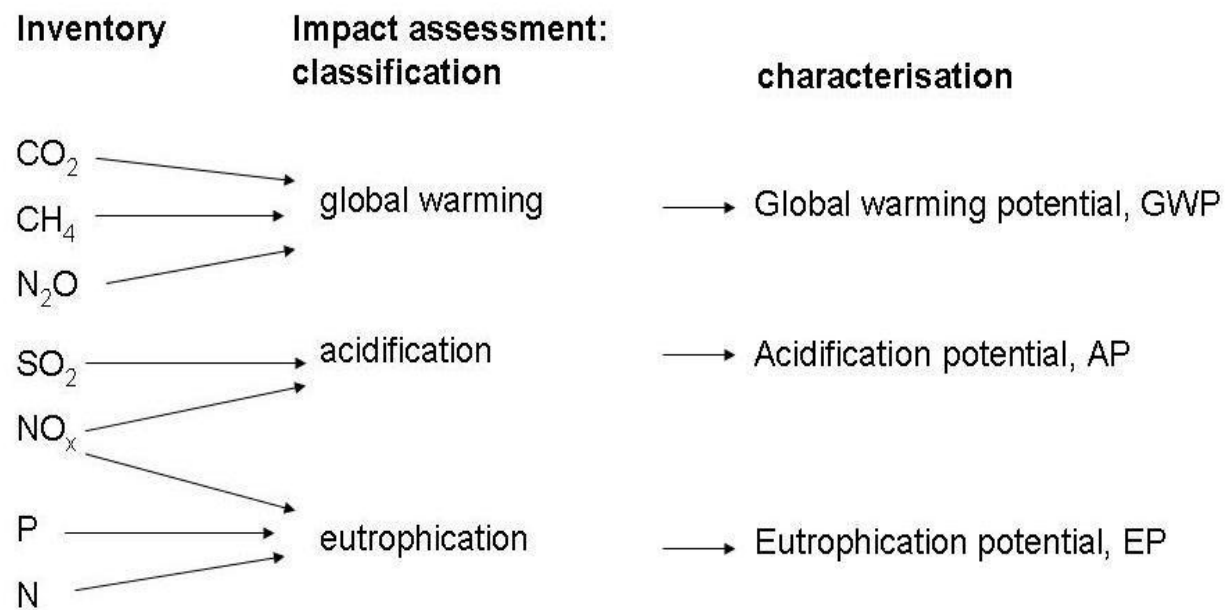 - Supplier engagement
- **Challenges**
  - makes data collection more time consuming
  - data quality might vary
  - supplier engagement
  - resources required vs. benefits received
  - Input data privacy
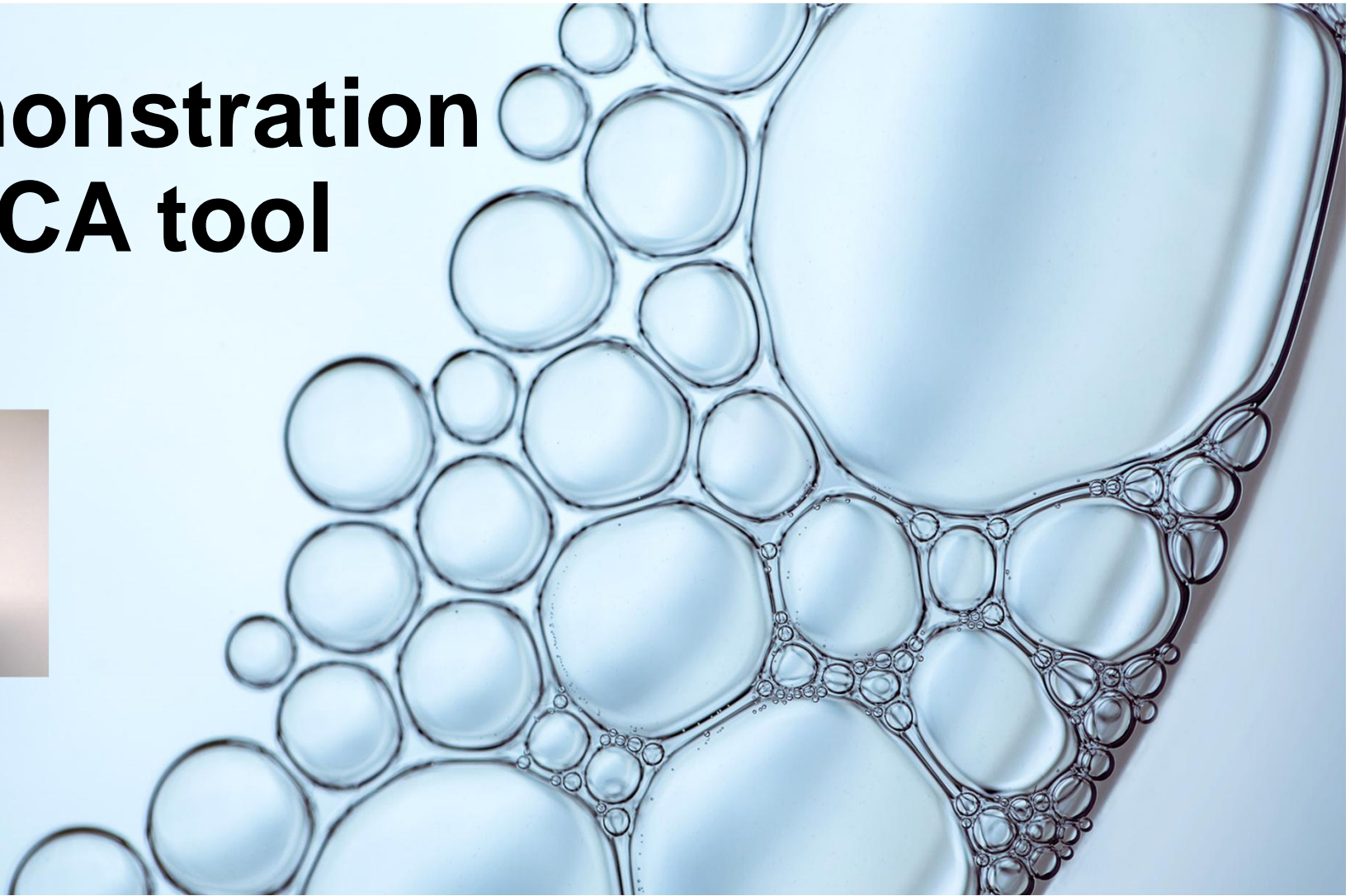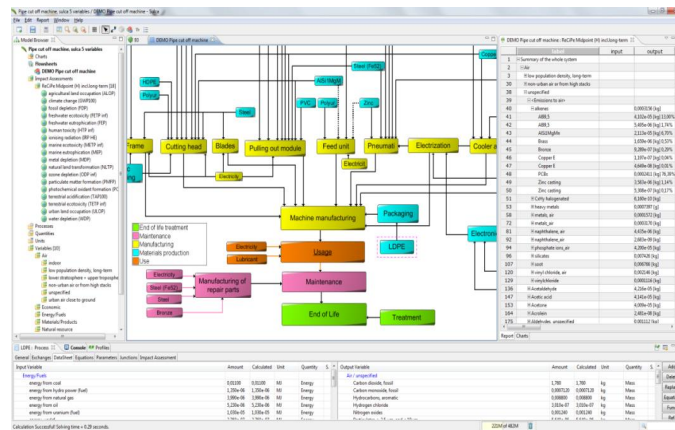 - lack of common terminology between various operators

Raw materials, kg
Fuels, kg
Electricity, MWh
Heat, GJ

MANUFACTURING
Technical process

Product, 1000 kg
By-products, kg

EMISSIONS

to water kg   to air kg   solid waste kg

Calculations of emission inventory and environmental impacts will be carried out with the LCA software tools

Inventory   **Impact assessment: classification**   **characterisation**

CO_2
CH_4 → global warming → Global warming potential, GWP
N_2O

SO_2 → acidification → Acidification potential, AP
NO_x

P → eutrophication → Eutrophication potential, EP
N

LCA software tool SULCA 5.0

- SULCA is an LCA software developed and maintained by VTT. Owned by THTH Association

- Interacts with Life cycle inventory databases (such as ecoinvent) and impact assessment methods.

- VTT conducts LCA calculations and organizes training for SULCA tools.

| Life cycle modelling | Data collection | Calculation and impact assessment | Analysis and interpretation of results |

SULCA

Software for calculation of LCA, Carbon- and Water footprints
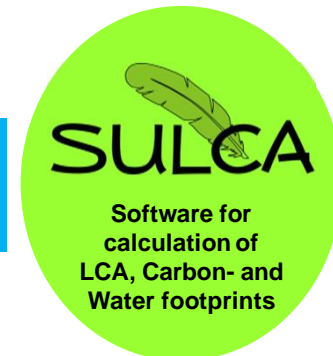
Coffee Mug Model

Goal and scope definition

Create case specific variables

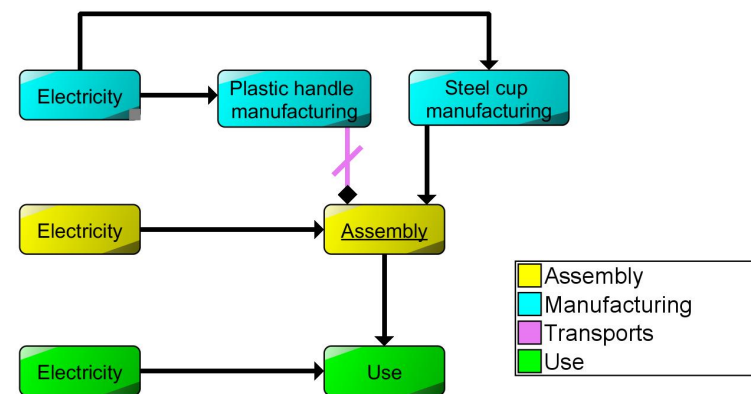Create case specific processes

- Plastic handles
- Steel cups
- Assembly
- Use

Use average processes where applicable

- Electricity
- Transports

Calculation *and interpretation* of results

Demonstration→

Demonstration Network LCA

Network LCA tool - background

- Circular economy requires tools which facilitate collaboration between various value chain partners

- The network LCA tool has been developed in the EIT Raw Materials project Modelling Factory

- The network can be built inside an organization or from various network actors from different organizations
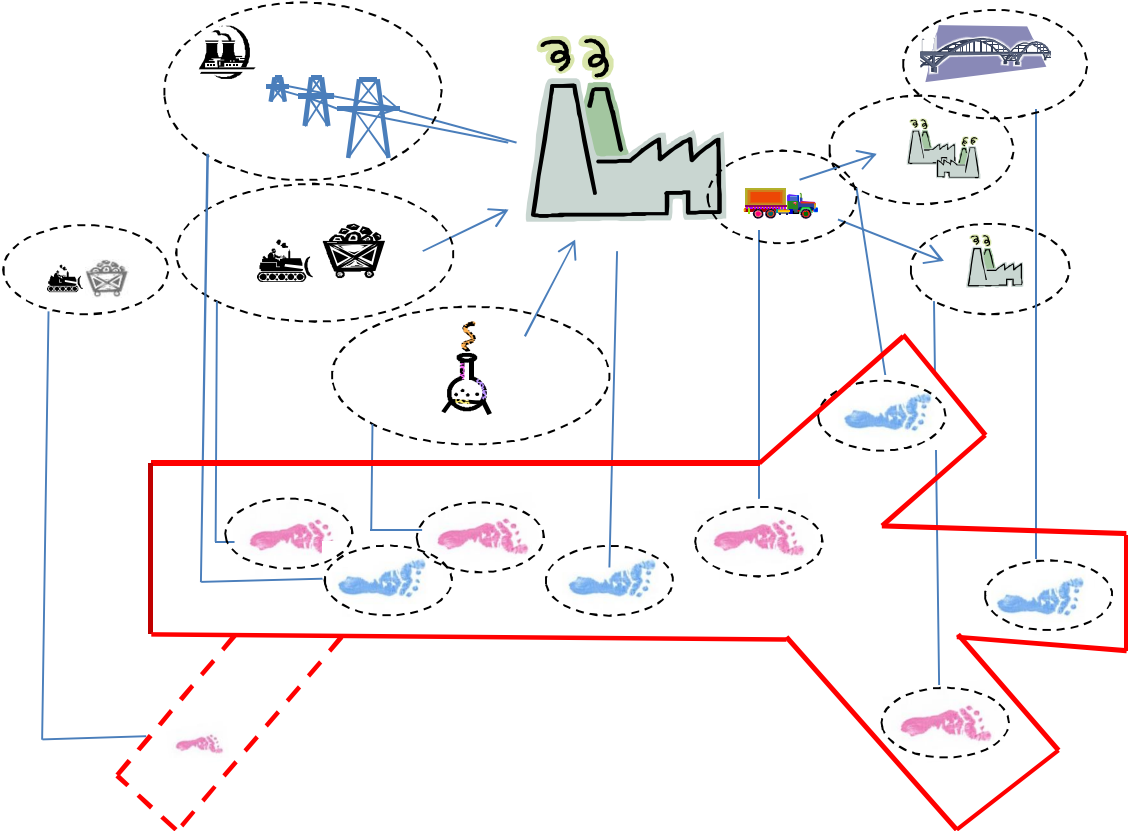
Total vs. local environmental impact

1+1+1=?

1+1+1=?

©Tuoppi

Network LCA tool- concept

- Network LCA is tool for LCA data collection, data analysis and sharing the LCA results inside the network.

- Operators/value chain partners inside the network feed own process data via web browser without software installations.

- Trusted operator assigns the data and result view rights to appropriate operators

- Network partners can test independently of the trusted operator how the changes to their local data affects their local and the network level results => process design & optimization
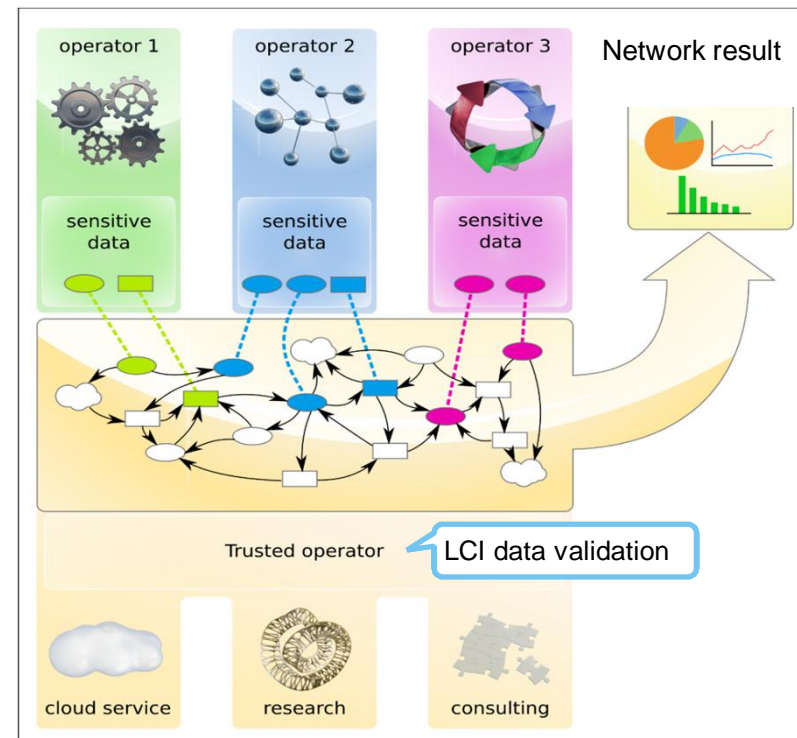
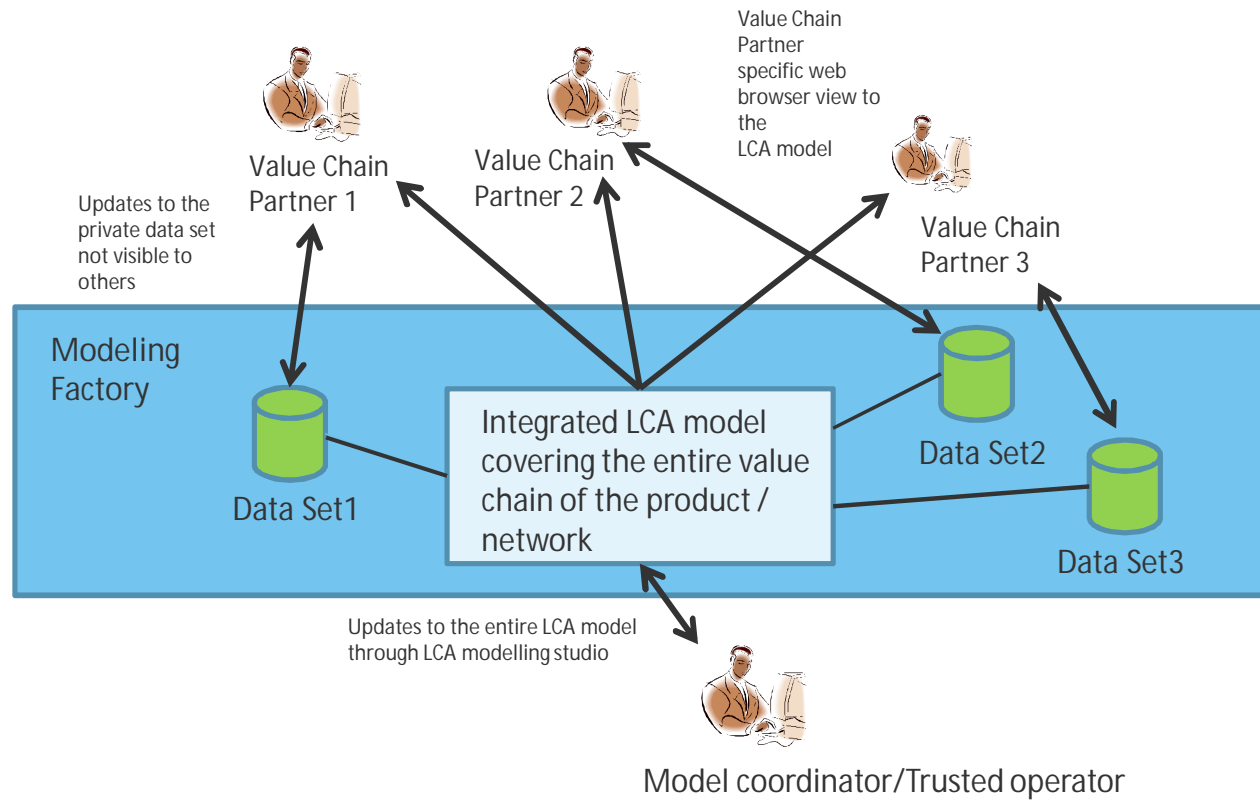# Demonstration of Network LCA: steel coffee mug with plastic handle

- Administrator requests missing data entries from two companies. Administrator sees all operators' data and has access to LCA software.

- Company A: provides data on steel cup and analyses results after Admin grants the rights.

- Company B: provides data on plastic handle and analyses results after Admin grants the rights.
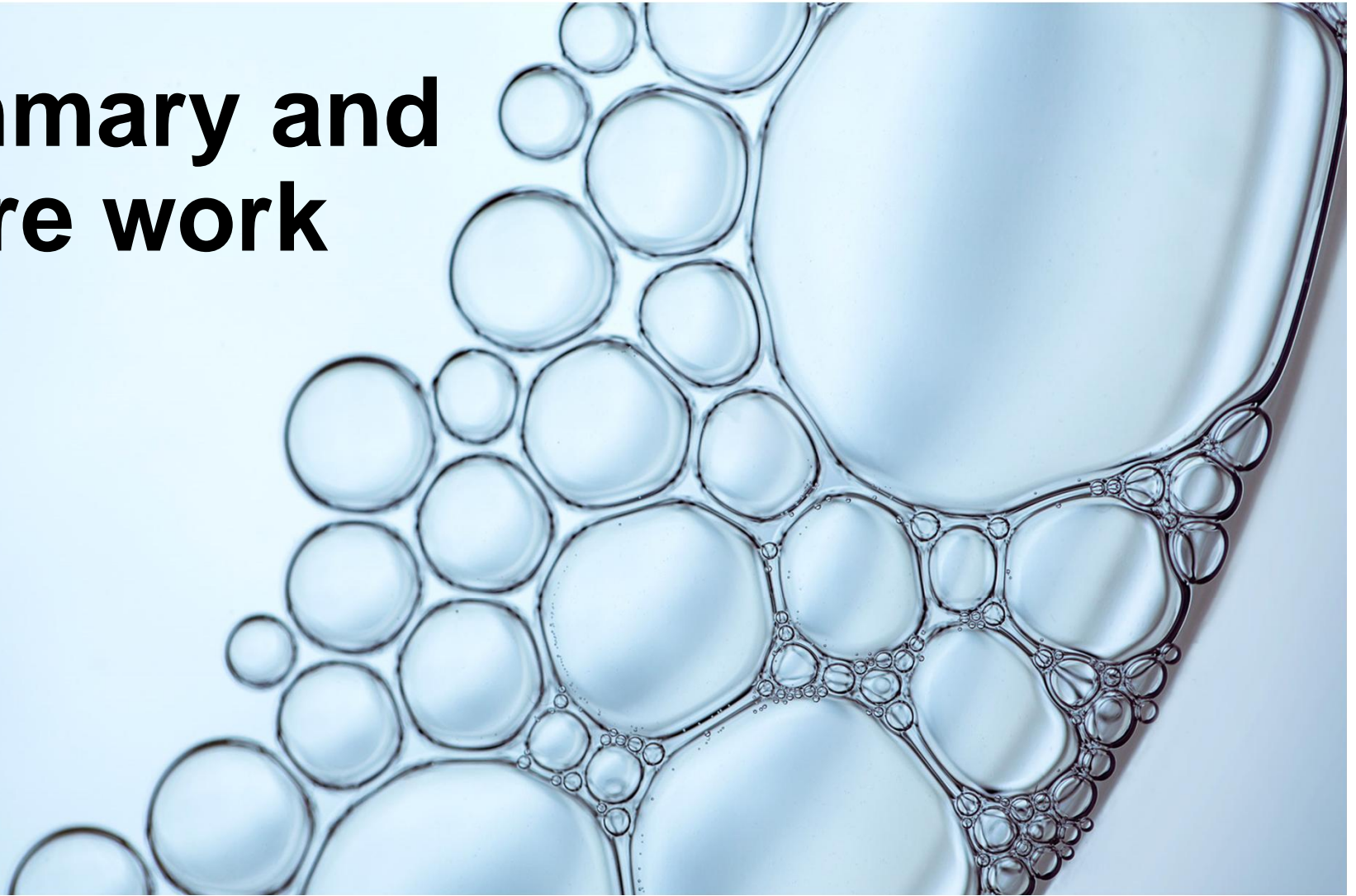
Demonstration of Network LCA: steel coffee mug with plastic handle

- Network LCA short link to join https://bit.ly/2rYsgbg

- Feed in data (figures from the attached word document) and follow instructions from tutor

- Inspect global warming potential results and try to find answers in following questions:

  - How many handles needs to be produced to receive the same global warming potential in Manufacturing as in Use phase?

  - How big increase in energy consumption is required in Assembly to receive the same global warming potential results in Assembly and Manufacturing?

Network LCA Concept

Value Chain Partner 1

Value Chain Partner 2

Value Chain Partner specific web browser view to the LCA model

Value Chain Partner 3

Updates to the private data set not visible to others

Modeling Factory

Integrated LCA model covering the entire value chain of the product / network

Data Set1

Data Set2

Data Set3

Updates to the entire LCA model through LCA modelling studio

Model coordinator/Trusted operator

Summary and future work

Summary

- Life cycle assessment provides science-based numeric indicators for decision making, comparing different alternatives and communication.

- SULCA tool has been developed by VTT for footprint analyses for all kinds of products, energy systems and services.

- Network LCA (work on progress) is s tool on top of SULCA which enables footprint data collection, sharing footprint results and local data analyses through web browser.

Benefits of Network LCA

- ✓ Possibility to access to footprint assessment model through web-browser without software installations.

- ✓ Pre-defined variable and unit lists helps in combatibility in nomenclature

- ✓ Management of input data collection form versions

- ✓ Publishing selected parts of LCA results, input data and model to the network members

- ✓ Running data experiments individually with or without network level footprint assessment (local and network level optimization)

- ✓ Network LCA service is cloud-based. If required, it can be transferred to intranet service and run solely from organisation's own servers.

Future work

- Network LCA consortium continues network LCA tool development.
  - Password authentication
  - Minor changes in functionalities
  - Small changes in layout and formatting

- After these changes will be made, VTT aims testing Network LCA with LCA case study in a research project.

- The next invited demonstration will be organized in the fall 2018. One conference presentation to come.

- Any feedback and comments welcome!

Thank you!

#VTTpeople

FAQs

- Shouldn't all the data in network be public or open?

- Is VTT always administrator in network LCA data collection?

- Can the data collection carried out in such way that my input data would be handled as complete "black box"?

- How does the administrator validate data?

- Where is the data collected stored?

- What is the benefit of using network LCA as data collection platform vs. using MS Excel?

- How are the different variables connected in network LCA?

- How can I know which is the correct variable to choose in the variable lists ? For example, there are dozen of different naming alternatives for copper.

- Can you assess uncertainty in network LCA?

CIRCULAR ECONOMY – recent projects

Our research portfolio related to circular economy covers a large variety of topics from different industrial sectors. Research topics include **indicators for resource efficiency, impacts of recycling** and **re-manufacturing**.

MORE - Real-time Monitoring and Optimization of Resource Efficiency in Integrated Processing Plants
EU FP7, 2013 – 2016
http://www.more-nmp.eu/

REFFIBRE - Tools for resource efficient use of recycled fibre materials,
EU FP7, 2013 – 2016
http://www.reffibre.eu/

Reman Path Finder – Project develops learning material to European industry about the path to remanufacturing
EIT Raw material KIC, 2018-2019

https://www.vtt.fi/sites/remanpathfinder/reman-path-finder