

# Bringing green best-practice into hospitals with an LCA approach

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Discussion Forum Nr. 74

29<sup>th</sup> June 2020, online

# Green Hospital Project

- 4 year project (2017-2021) of the NFP 73 Programme "Sustainable Economy"

**FNSNF**  
FONDS NATIONAL SUISSE  
SCHWEIZERISCHER NATIONALFONDS  
FONDO NAZIONALE SVIZZERO  
SWISS NATIONAL SCIENCE FOUNDATION

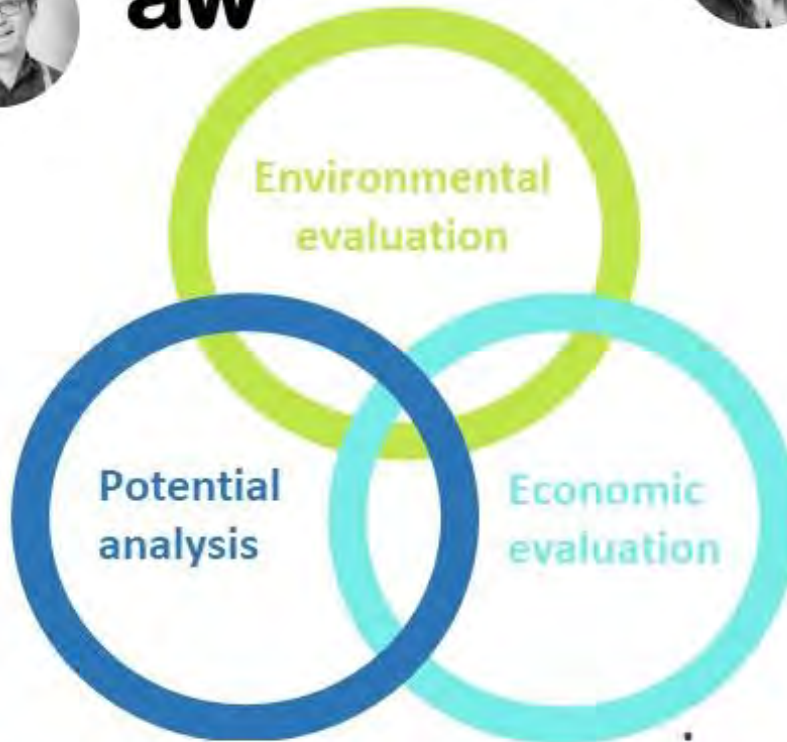




# Project team

Zürcher Hochschule  
für Angewandte Wissenschaften

**zhaw** Life Sciences und  
Facility Management

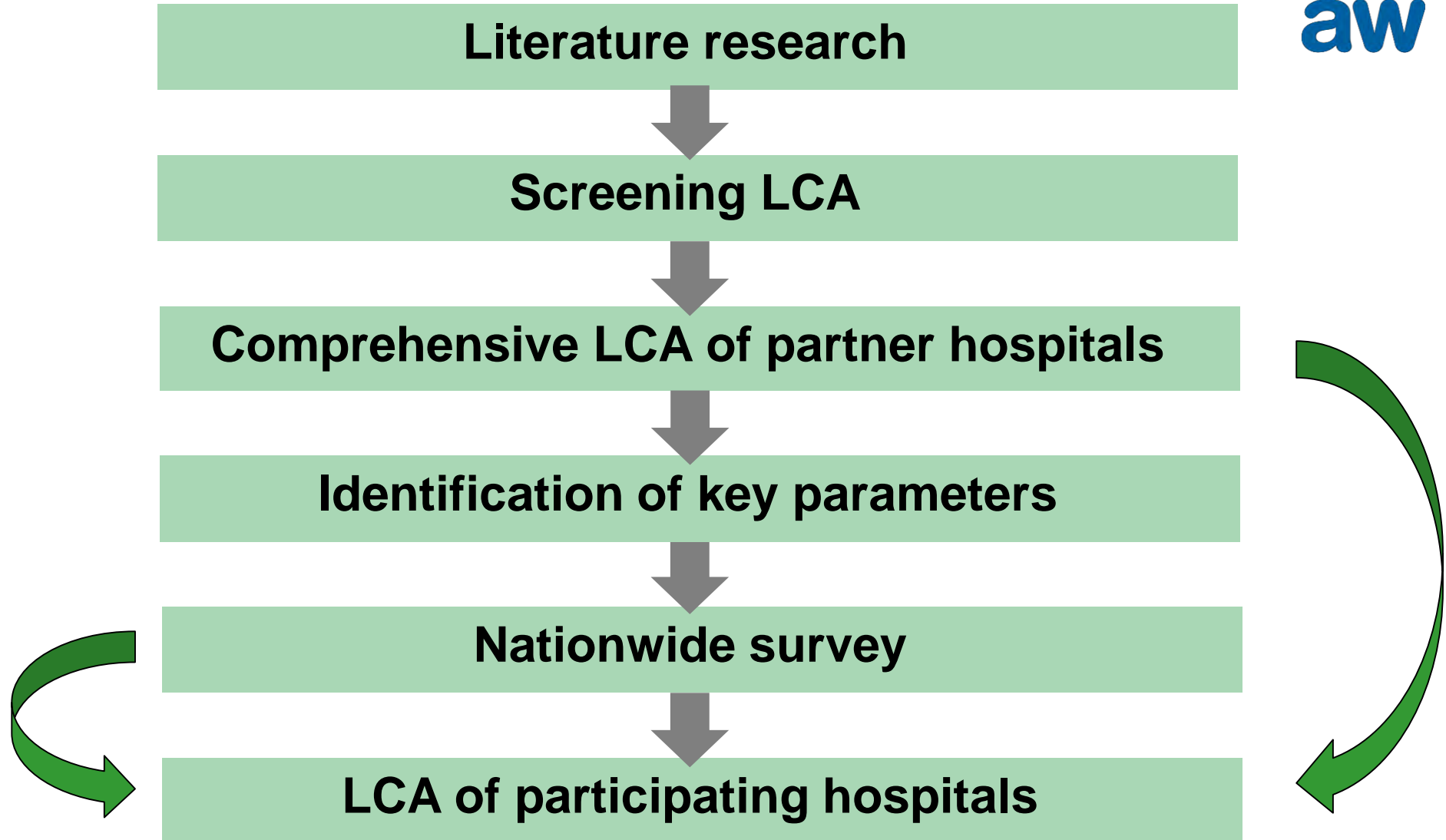


 **Fraunhofer**  
IML



IWSB – Institut für Wirtschaftsstudien Basel

## Methods



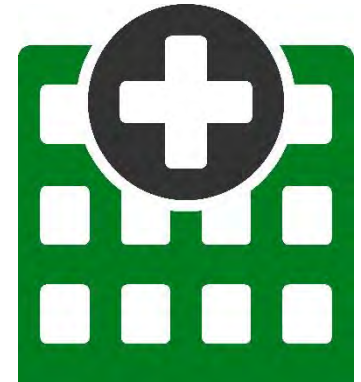
# Data available & modelling approaches

Type of data available		Examples, data collected	Modelling approach
Specific, detailed	Background data available	<ul style="list-style-type: none"> <li>• <b>Water use:</b> litre</li> </ul>	No special steps needed
	No suitable background data	<ul style="list-style-type: none"> <li>• <b>Disposable gloves:</b> quantity &amp; material</li> </ul>	Production of new datasets
Specific, not detailed		<ul style="list-style-type: none"> <li>• <b>Building infrastructure:</b> energy reference area</li> </ul>	Various approaches
Indirect data		<ul style="list-style-type: none"> <li>• <b>Pharmaceuticals:</b> CHF</li> </ul>	Various approaches
No data		<ul style="list-style-type: none"> <li>• <b>Waste water:</b> none</li> </ul>	Extrapolation, standard composition used

# Modelling approaches

## Building infrastructure

- Background dataset unsuitable
- Approaches considered:
  - Adapt existing LCI data: elderly home, abroad, hotel, other non-domestic building
  - Construction invoices
  - Documents from tenders
  - Architects: project documents, Building Information Modelling (BIM) software



## Pharmaceuticals

- Few background data, many different drugs
- Approaches considered:
  - Using results provided in the literature (limited indicators)
  - Approximation based on expenditure
  - Modelling API by adapting LCI-dataset “fine chemical”
  - Analysis of active pharmaceutical ingredient (API) per expenditure
  - Using impact of economic sector based on EEIOT



# Impact assessment methods

## Ecological scarcity method 2013, v.1.06

*(Frischknecht et al., 2013)*

## Global Warming Potential 100 years

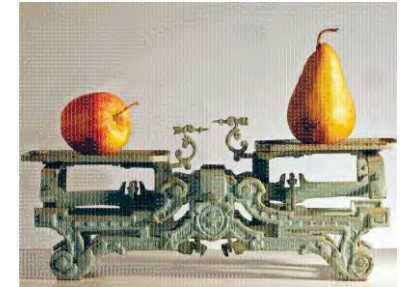
*(IPCC, 2013)*

## Environmental Footprint 2018, 11 midpoints

*(Fazio et al., 2018)*

Ozone depletion; human toxicity; particulate matter (PM) / respiratory inorganics; ionising radiation; photochemical ozone formation; acidification; eutrophication, terrestrial; eutrophication, aquatic; ecotoxicity, freshwater; land use

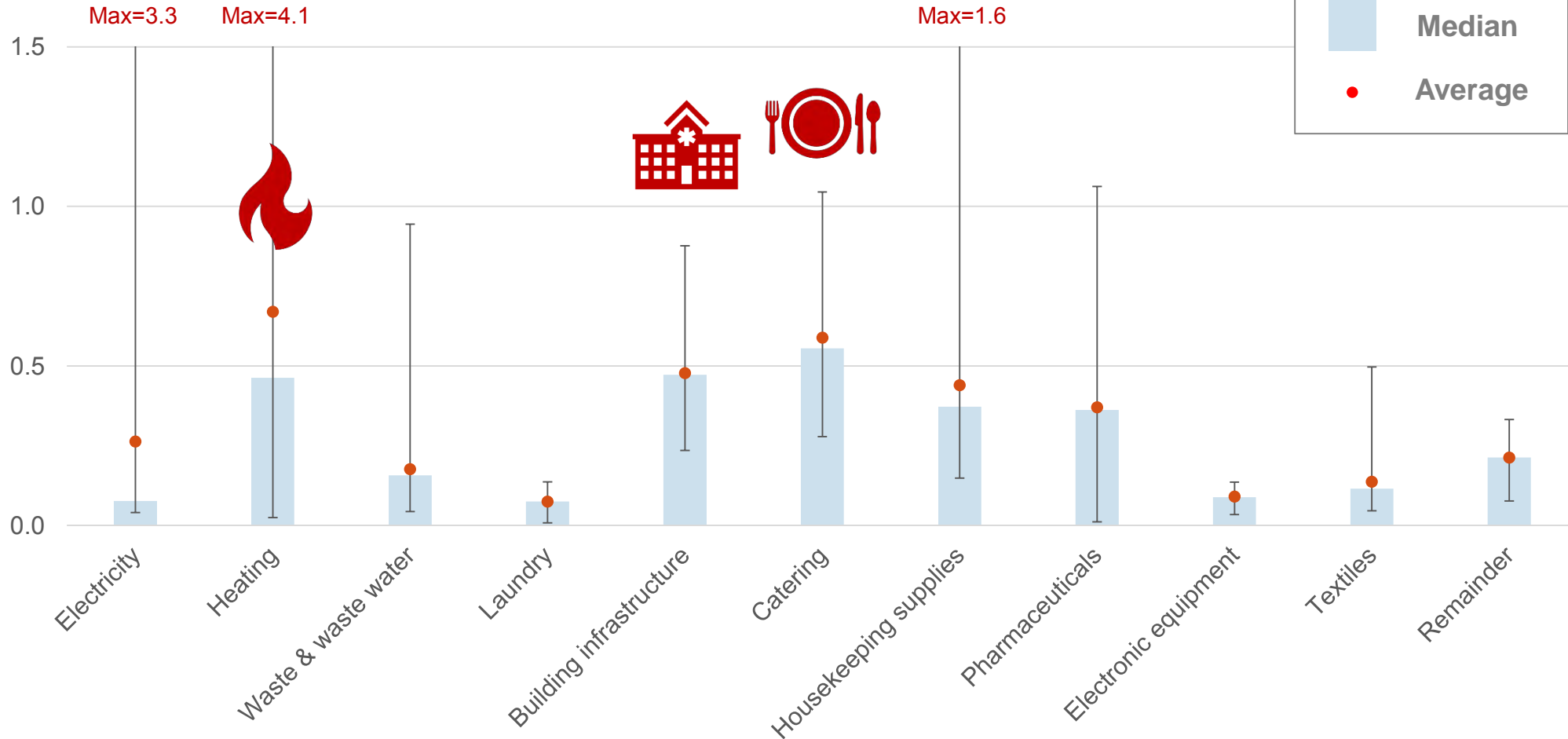
*Not included in this presentation*





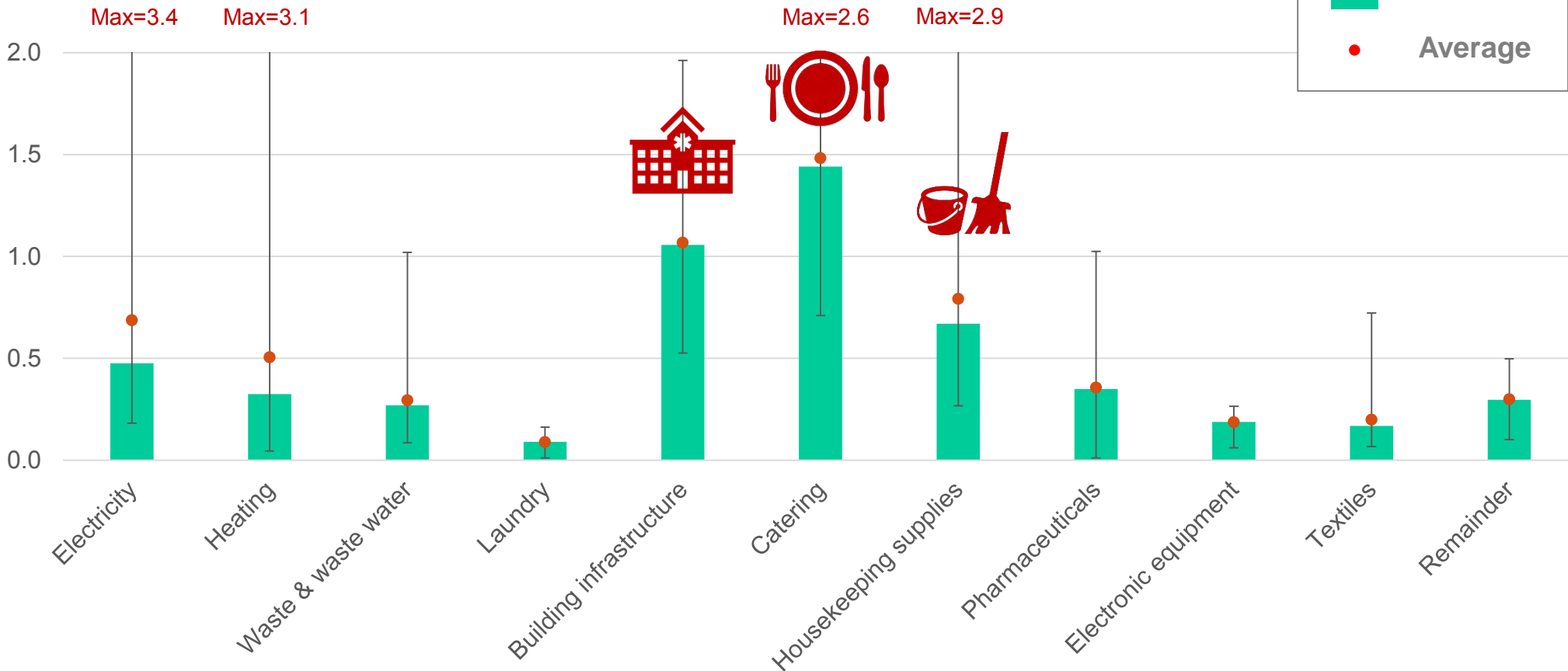
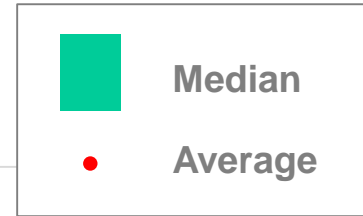
# Global warming potential (IPCC, 2013)

t CO<sub>2</sub>eq/ FTE & year



# Environmental impact according to the Ecological Scarcity Method *(Frischknecht et al., 2013)*

million ecopoints/ FTA & year



## Next steps

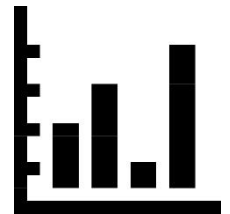
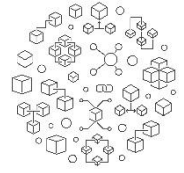
- Extrapolation of survey results to quantify the environmental impact of **all Swiss hospitals**.
- **Econometric analysis:** analysis of environmental and financial efficiency.
- Application of a **newly developed functional unit**
  - Existing FUs (FTE, patient days) do not sufficiently consider inpatient & outpatient treatment.
  - New FU: **standardised revenue**.
  - Aggregation into a single measure of hospital output.

# Using LCA in the hospital sector for a sustainable economy

- **How can decision makers use LC-based approaches?**
  - Priorities based on concrete hotspots
  - LCA-benchmarking, competitors provide motivation
- **Which LC-based approaches are best suited?**
  - Analyses of complex sectors:
    - *Multi-stage analyses.*
    - *Combining bottom-up analyses with extrapolation.*
  - No one-size-fits-all solutions.
  - Comparison of existing options in an LCA case study.
  - Key parameter model → use insights for other cases.
- **Instruments that combine environmental, economic & societal aims:**
  - Combine different disciplines, i.e. process optimisation & LCA.
  - Show economic & social benefits of environmental optimisation.

# Conclusions

1. Hospitals are highly complex, highly regulated with various environmental impacts.
2. High variability of resource intensity & environmental impact per FTE implies a large potential for environmental optimisation.
3. Environmental hotspots of Swiss hospitals are: catering, building infrastructure, housekeeping supplies, & energy provision.
4. A successful sustainability strategy needs to generate:
  - environmental benefits
  - additional value for stakeholders.



# Questions?

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## Life Cycle Assessment

Rohstoffabbau ► Herstellung ► Nutzung ► Entsorgung | Recycling

## Acknowledgements

- This research project is part of the National Research Programme "**Sustainable Economy: resource-friendly, future-oriented, innovative**" (NRP 73) of the **Swiss National Science Foundation (SNSF)**.



**Sustainable Economy**  
National Research Programme

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