

# State-of-the-art of Life Cycle Sustainability Assessment

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22 Nov, 2024





## Content

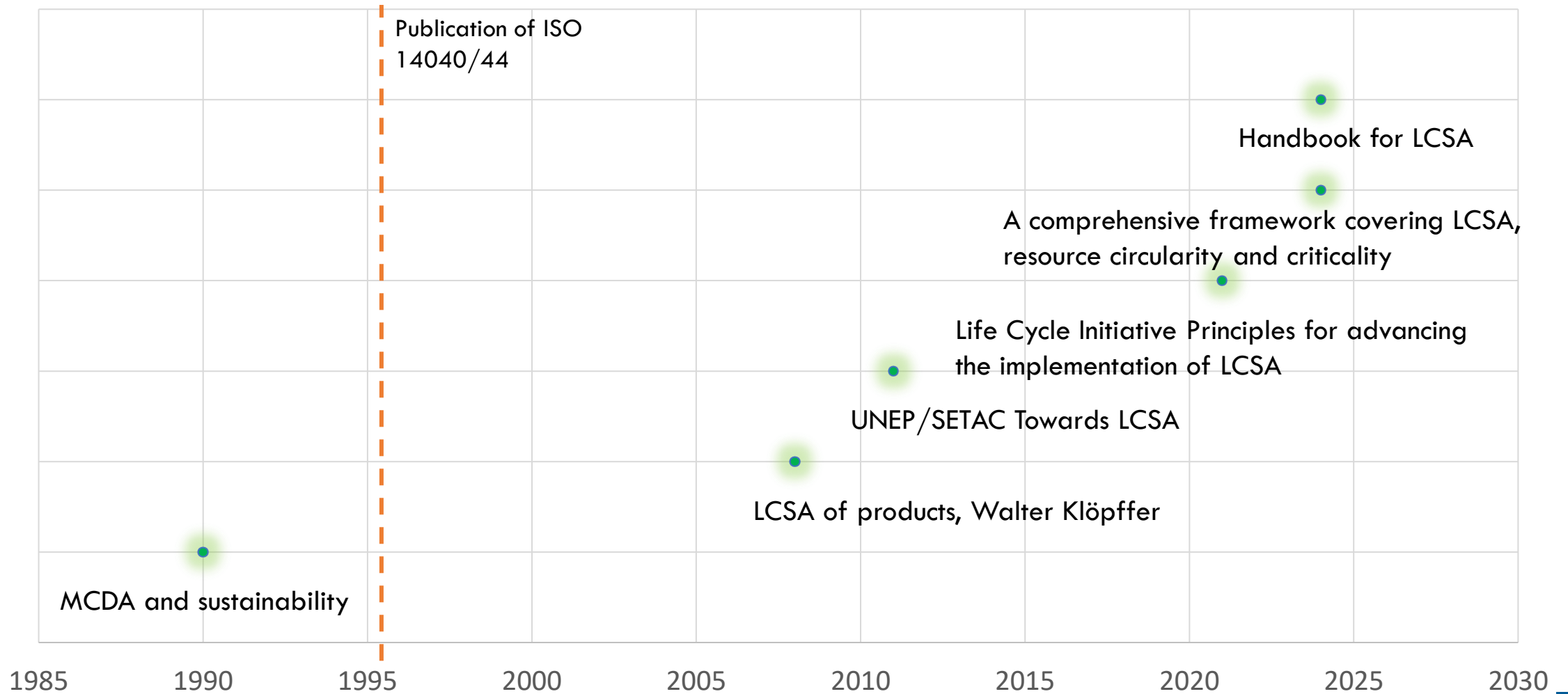
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- Evolution
- Alignment with the Ten Life Cycle Initiative's Principles
- Expansion of capacities based on current practices: Handbook on LCSA
- Outlook





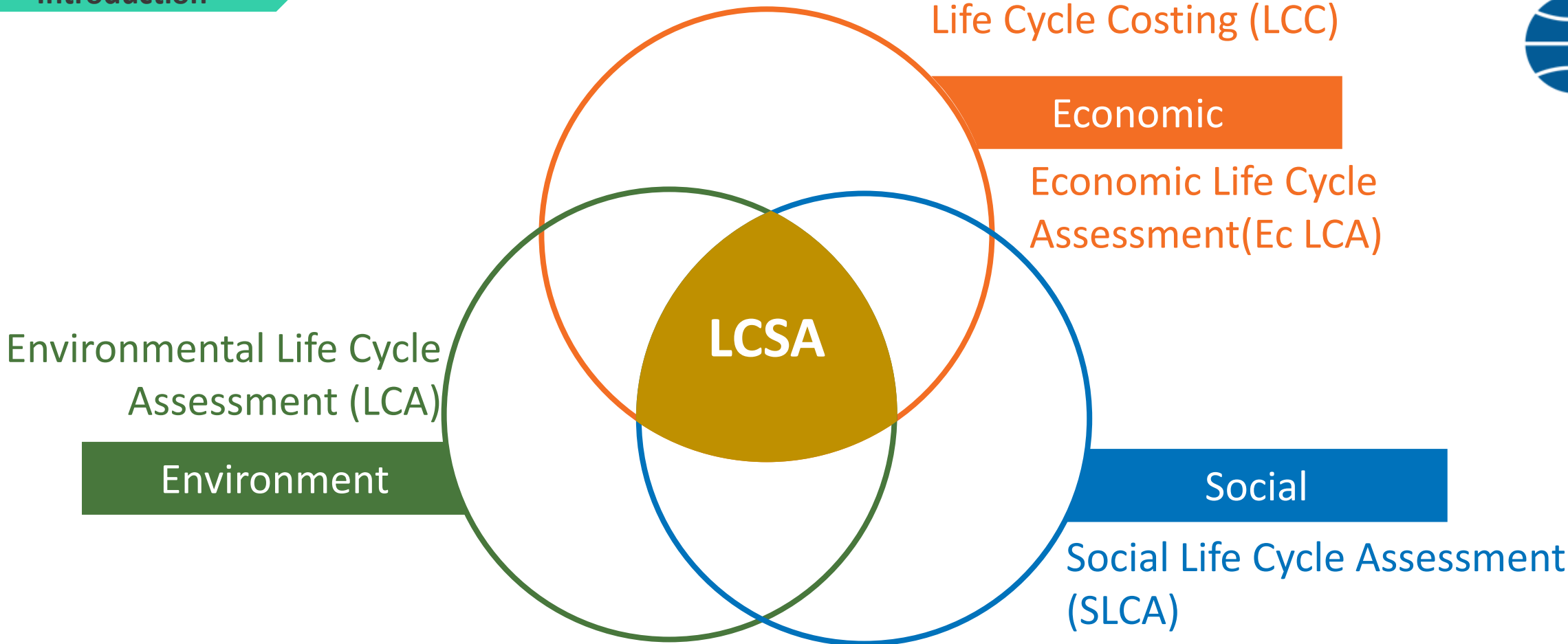
# Sustainability assessment practices over time



# Life Cycle Sustainability Assessment (LCSA)



## Introduction



The overall framework in line with Life Cycle Initiative principles\*

\*Valdivia et al, 2021, in The International Journal of Life Cycle Assessment



# Ten Life Cycle Sustainability Assessment Principles

## Principles for the application of life cycle sustainability assessment

[Sonia Valdivia](#) ✉, [Jana Gerta Backes](#), [Marzia Traverso](#), [Guido Sonnemann](#), [Stefano Cucurachi](#), [Jeroen B. Guinée](#), [Thomas Schaubroeck](#), [Matthias Finkbeiner](#), [Noemie Leroy-Parmentier](#), [Cássia Ugaya](#), [Claudia Peña](#), [Alessandra Zamagni](#), [Atsushi Inaba](#), [Milena Amaral](#), [Markus Berger](#), [Jolanta Dvarioniene](#), [Tatiana Vakhitova](#), [Catherine Benoit-Norris](#), [Martina Prox](#), [Rajendra Foolmaun](#) & [Mark Goedkoop](#)

*The International Journal of Life Cycle Assessment* (2021) | [Cite this article](#)



### MENU

Life Cycle Initiative's LCSA Position Paper is 2022's most downloaded paper in IntJLCA  
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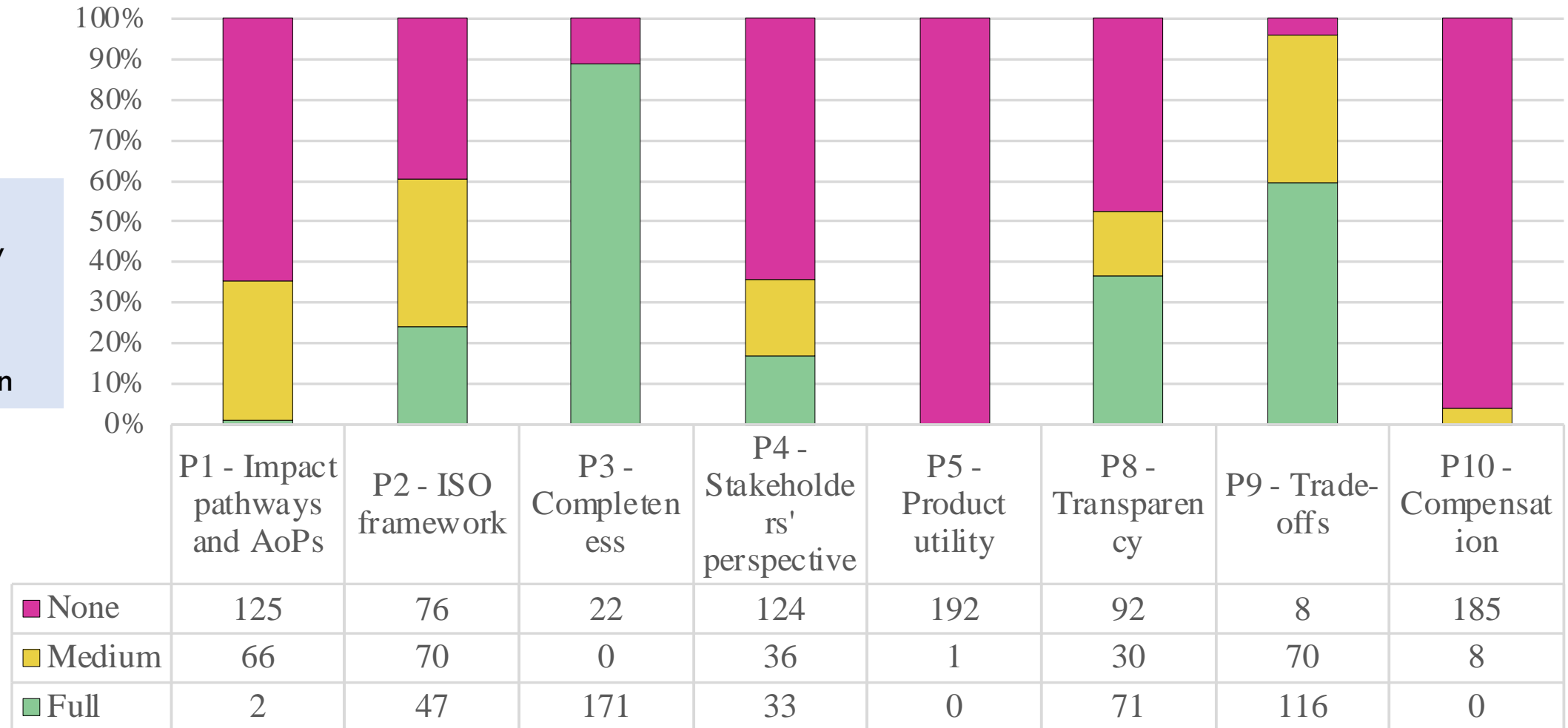
# Overview of Alignment of the LCSA Principles with the Practice

(Leroy-Parmentier, Valdivia, Loubet & Sonnemann, 2023)



Alignment of principles with existing practice (Basis: 193 LCSA studies)

- Gaps in
- Product utility
  - AoPs
  - Stakeholders
  - Compensation



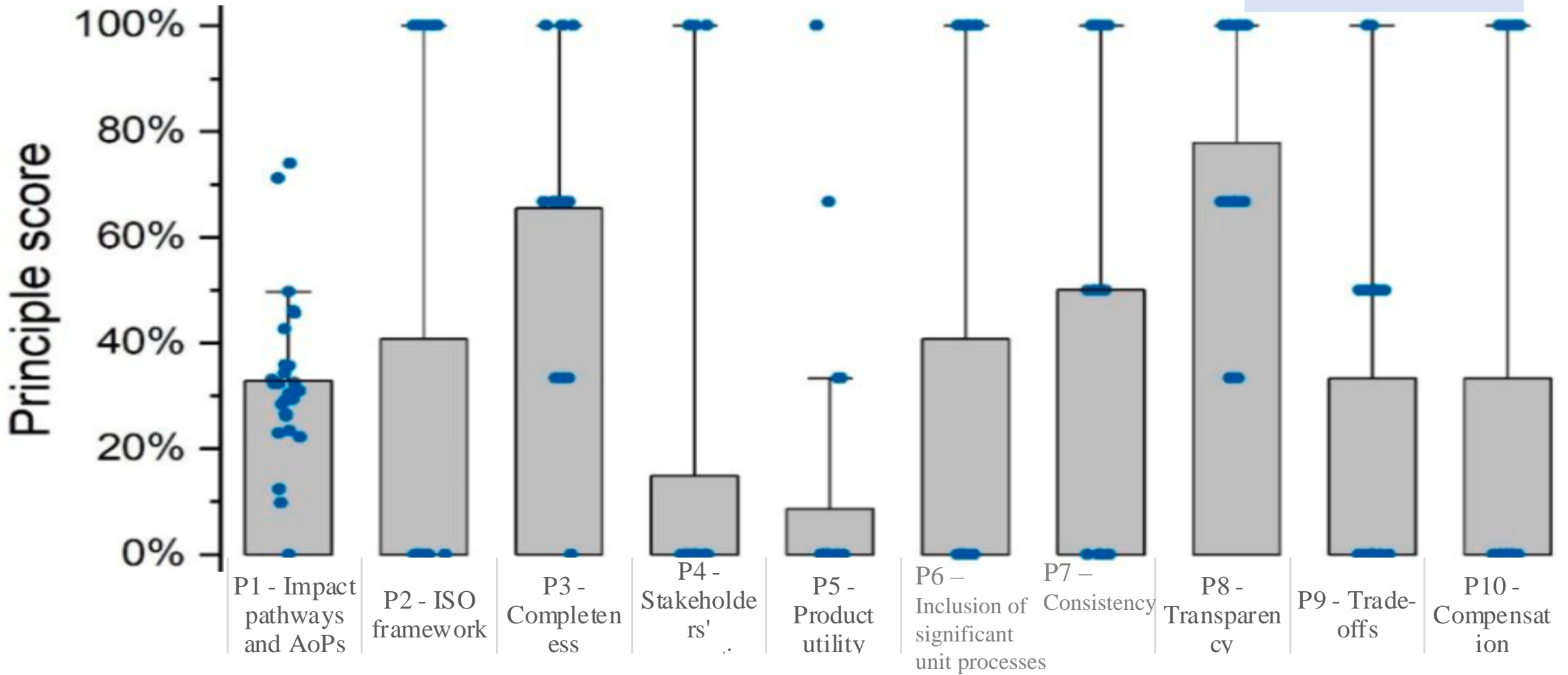
# Towards the principles of LCSA: An integrative review for the construction and building industry



(Yahong Dong, S. Thomas Ng, Peng Liu, 2023)

- Gaps in
- Product utility
  - Stakeholders
  - AoPs
  - Compensation
  - Trade-offs

Average scores (bars) of the 10 principles. The blue dots refer to reviewed studies (Basis: 27 studies).





## Learnings

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- 'Product utility' principle is less relevant. If there were a revision of the principles this could be left out
- The principle on 'stakeholders' perspective' needs to be strengthened.
- The principle on 'Areas of Protection definition' for LCSA is less understood and applied. Enhanced consensus on adequate AoPs is needed.



# Handbook on LCSA

By Edward Elgar Publishing.

Independent Publisher of the Year and  
Academic and Professional Publisher of 2023

## 30 chapters by leading authors in the field

- State-of-the-art of LCSA practice (Part II)
- Guidance for implementation (Part III)
- Principles and Data for LCSA (Part III)
- Interpretation & communication of results (Part III)
- Emerging topics, upscaling and outlook for future work (Part IV)
- Supports putting in place life cycle sustainability management (Part IV)



# HANDBOOK ON Life Cycle Sustainability Assessment

Edited by  
**Sonia Valdivia** • **Guido Sonnemann**



ELGAR HANDBOOKS IN DEVELOPMENT

# Publication Handbook on Life Cycle Sustainability Assessment

Data for LCSA: State of the Art and Outlook

Authors:

↳ Thomas Sonderegger  
↳ Emilia Moreno Ruiz

↳ Marco Bianchi  
↳ Rosan Harmens

Edited by Sonia Valdivia and Guido  
Hagemann



The authorship composed of 59 individuals is **gender balanced** from **North America, Latin America, Africa, Europe and Australia**

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université de BORDEAUX



## PART III: Life Cycle Sustainability Assessment: Sectoral and policy applications

- 19. LCSA: how to carry it out and integrate and communicate its results – illustration with four case studies. Mike Ashby, Cambridge



- 21. Application of the ten LCSA principles of the Life Cycle Initiative: the perspective of the building sector Olubukola Tokede and Anastasia Globa, Australia



Repick/Reload Data

### LCSA TRACKER

Life Cycle Sustainability Assessment

Tracker Mapping Geo-Data

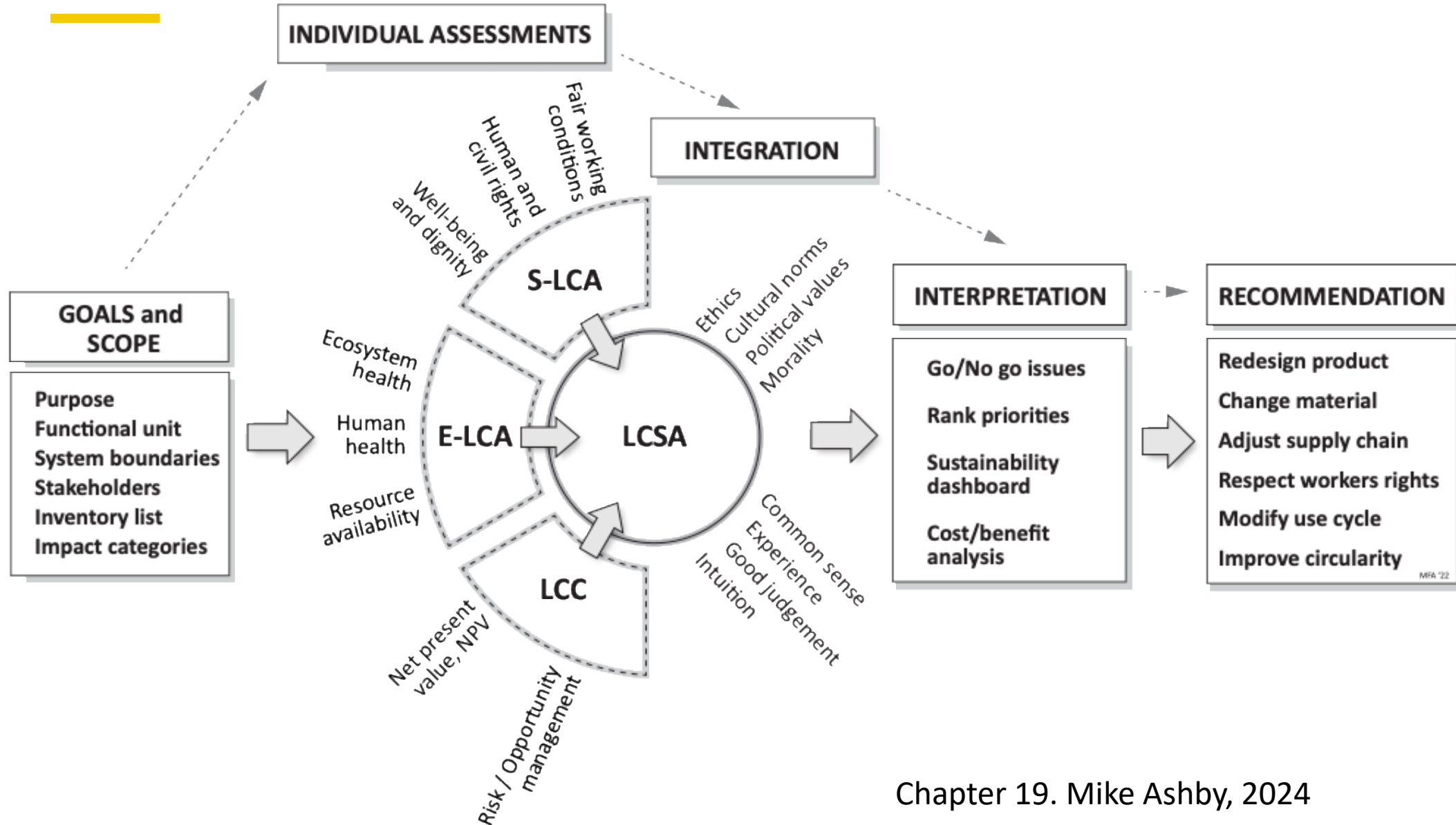


- 24. Policy implications, Bernard Mazijn, Belgium





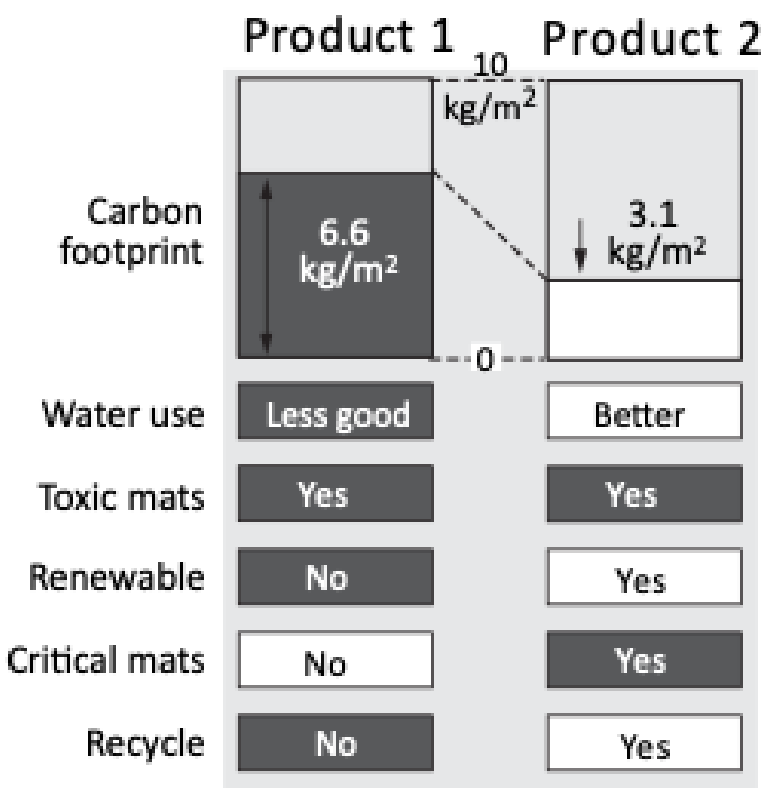
# Example: Pathway and criteria for integration





# Example: Comparisons with no weighting

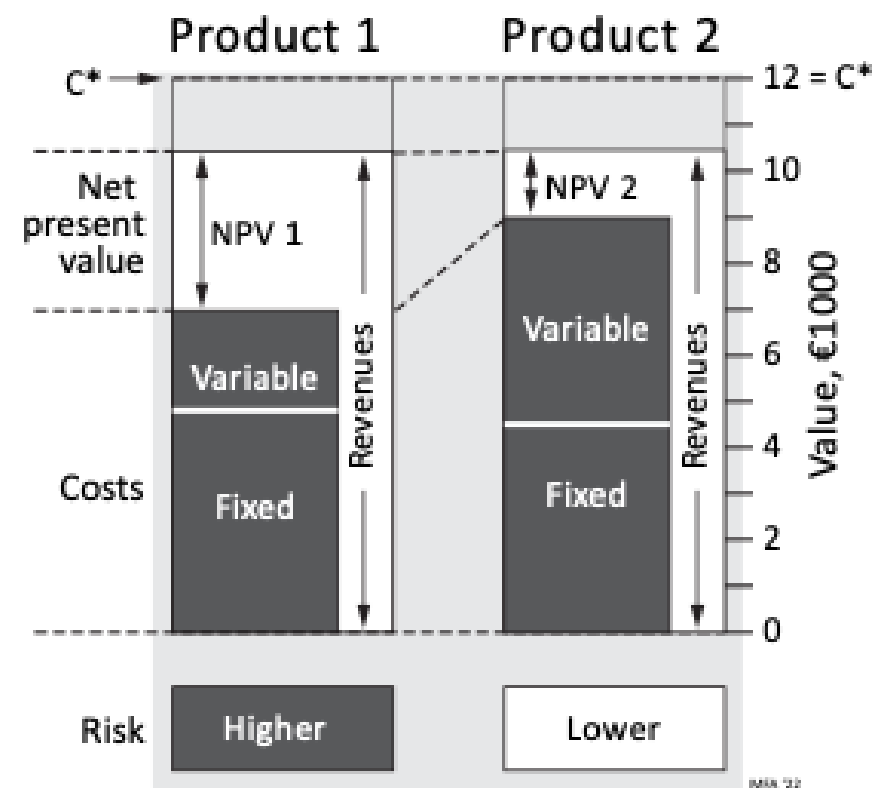
## E-LCA



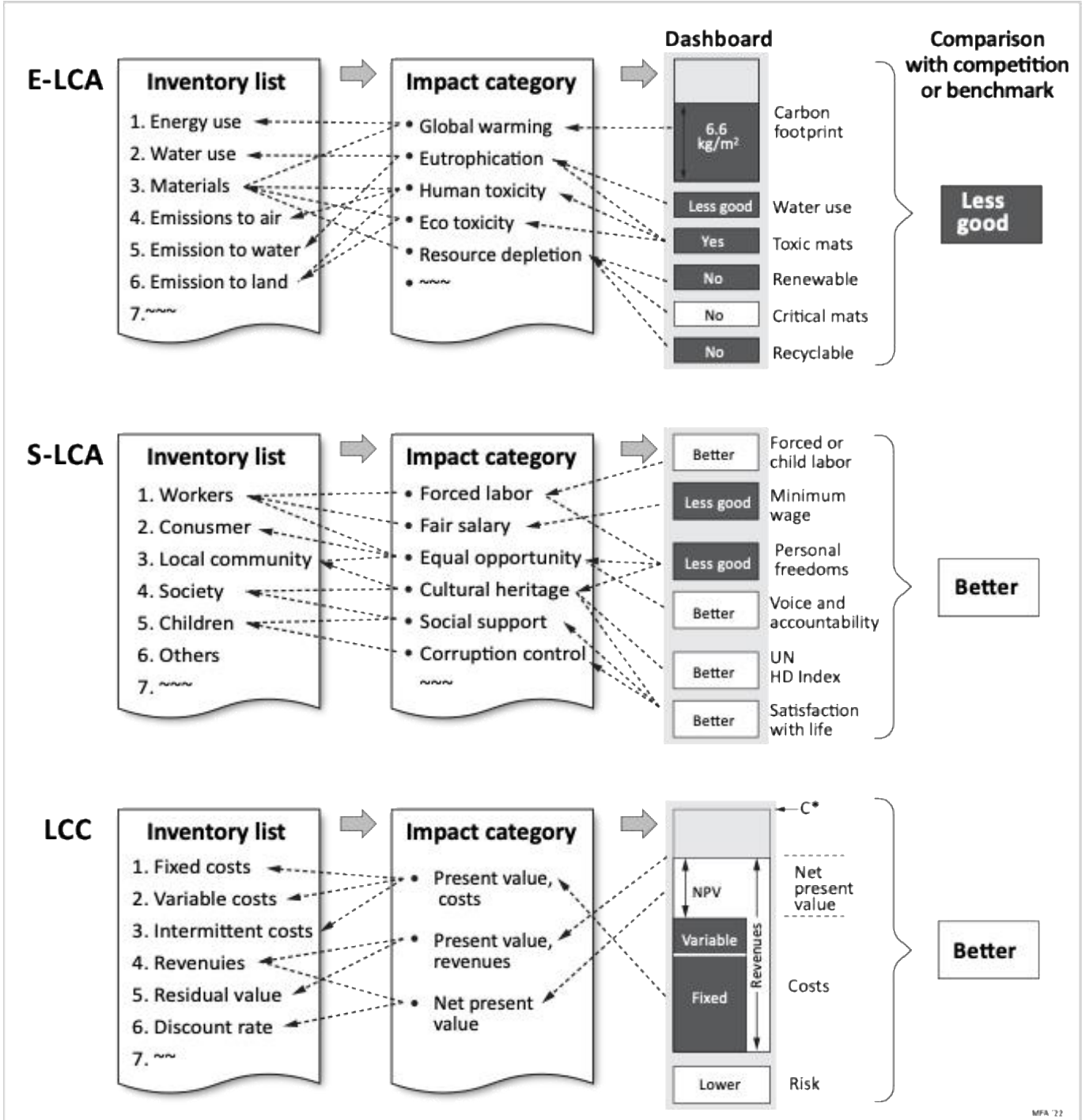
## S-LCA



## LCC



# Example: Comparison with no weighting





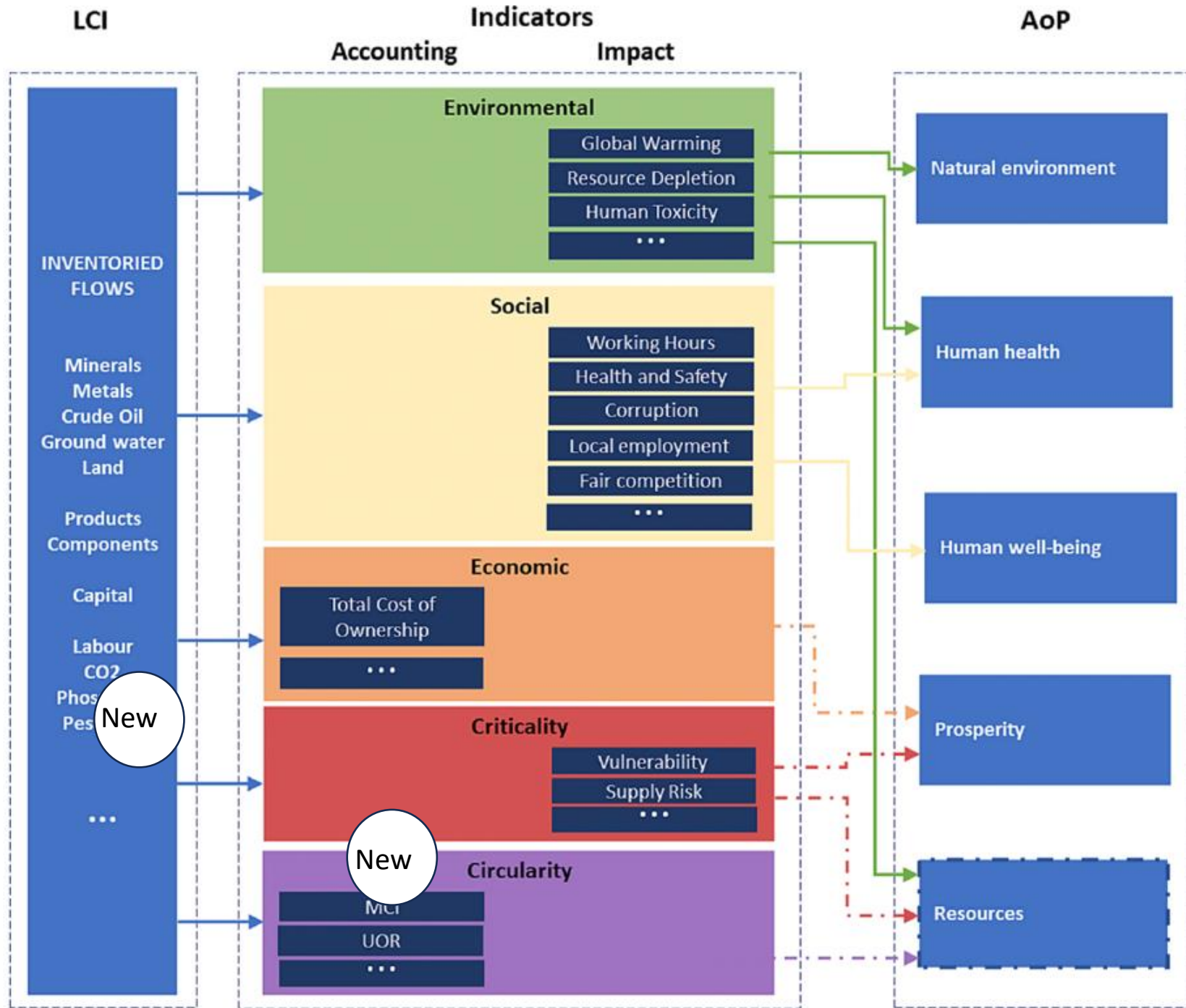
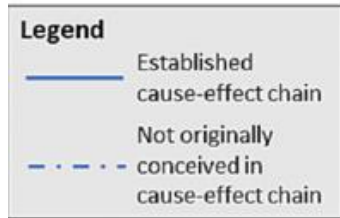
# Example: Comparisons with weighting. Recommendation to disclose all results (+ and -)

	Product 1	Product 2
Environment	Less good	Better
Society	Less good	Better
Economics	Better	Less good



# ORIENTING Framework – Integrating social, economic, environmental, criticality and circularity

Hackenhaar et al. 2024



## Handbook PART IV

### EMERGING DEVELOPMENTS

26. Life Cycle Criticality, Santillan Saldivar et al.,

27. Life cycle sustainability thinking for measuring and assessing circularity, Penia et al.





## Future LCSA. Based on Chapter 30 (Sonnemann & Valdivia) of Handbook on LCSA and Workshop on LCSA at MCV'25 Conference in Lille (Nov, 2024) (12 contributors)

- *Application of the **Life Cycle Initiative's Principles**. Possibility to exclude 'product utility'.*
- *Alignment with SLCA according to **ISO 14075***
- *Streamlining **standardized indicators sector-specific, topic-specific (nutritional LCA) and region-specific**—considering local socio-economic conditions, environmental regulations, and resource availability—to provide insights that resonate across diverse geographic & industrial contexts.*
- ***Definition of well-being as AoP that is not human-centric, e.g. well-being for all living species, or peace for all.***
- ***Storing LCSA data in machine-readable format in databases**, to build the groundwork for automated data collection and the application of Artificial Intelligence.*
- ***Improving visualisation** features for results easier to understand and interpret by policy-makers / stakeholders.*
- *Address the limitations on **aggregation and integration** of the sustainability dimensions. **Multicriteria decision-making** methods is recommended for LCSA.*
- ***Tailored impact assessment methods** that reflect the unique carrying capacities of diverse ecosystems and cultural norms.*
- *Developing capability for conducting LCSA at '**city-scale**'. Too much focus on product-scale / project-scale limits its capability.*
- *From Life Cycle Management (LCM) towards **Life Cycle Sustainability Management (LCSM) integrating ESG**.*
- *EPDs are expanding, so, **Sustainability Product Declarations** can be seen as next step for communication.*

# Thanks!



Save the date!

## WRF'25 Conference

2-3 September 2025, Geneva (Switzerland)

Call for Abstracts

Deadline: 14 Jan.2025

New Resource Strategies for a Fair and Sustainable Future

2-5 September 2025, Geneva & Online

### Extractive Sector

Enhance public and private  
governance of the extractive sector

### Built Environment

Design a resilient, sustainable and  
fair built environment

### Consumer & Industrial Goods

Shift to sustainable production and  
consumption patterns