

# **Towards AI-augmented sustainability assessments:** integrating large language models in the case of product social life cycle assessment

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26/02/2026 VTT – beyond the obvious

# Background

- **Growing Importance of Social Responsibility**, increasingly recognized as a key aspect of sustainability
- Rising demand for robust methods to **assess the social impacts of products and services across their life cycles (S-LCA)**
- Clear need to **ease company's barriers to reporting**
  - Clear implementation protocol
  - Robust implementation assistance



**Operational Life Cycle  
Sustainability Assessment  
Methodology Supporting Decisions  
Towards a Circular Economy**

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# Problem & Solution

S-LCA is not widely adopted due to challenges in data collection, processing, and methodological variability

Manual S-LCA is time-consuming and can run into issues of subjectivity and inconsistency

There is a need for scalable, efficient, and objective approaches to social impact assessment

There is a lack of research around automating S-LCA processes



Transform the concrete, cohesive S-LCA protocol developed in the EU Orienting project into a scalable, LLM-enabled application

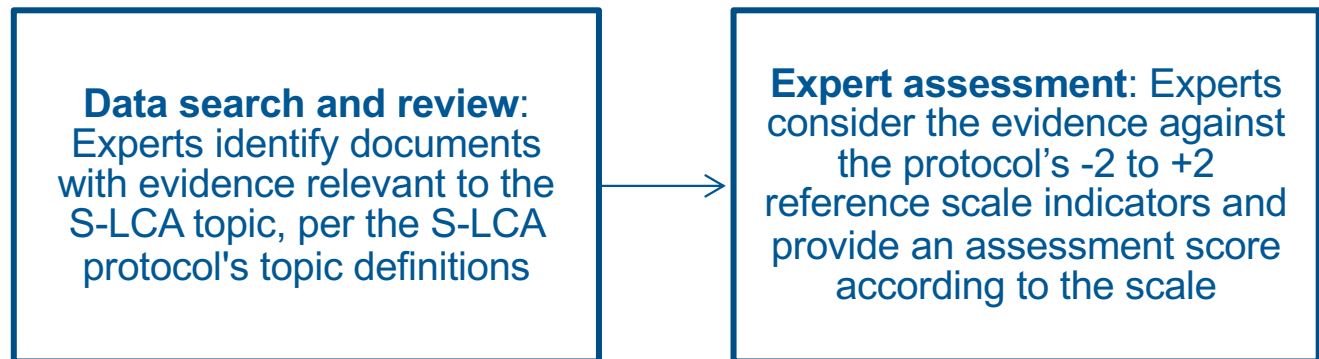
Develop a practical HITL framework that utilizes LLMs to augment expert-led S-LCA processes, improving efficiency, scalability, and consistency

# Case & Method

Case study: Beverage carton product in Finland

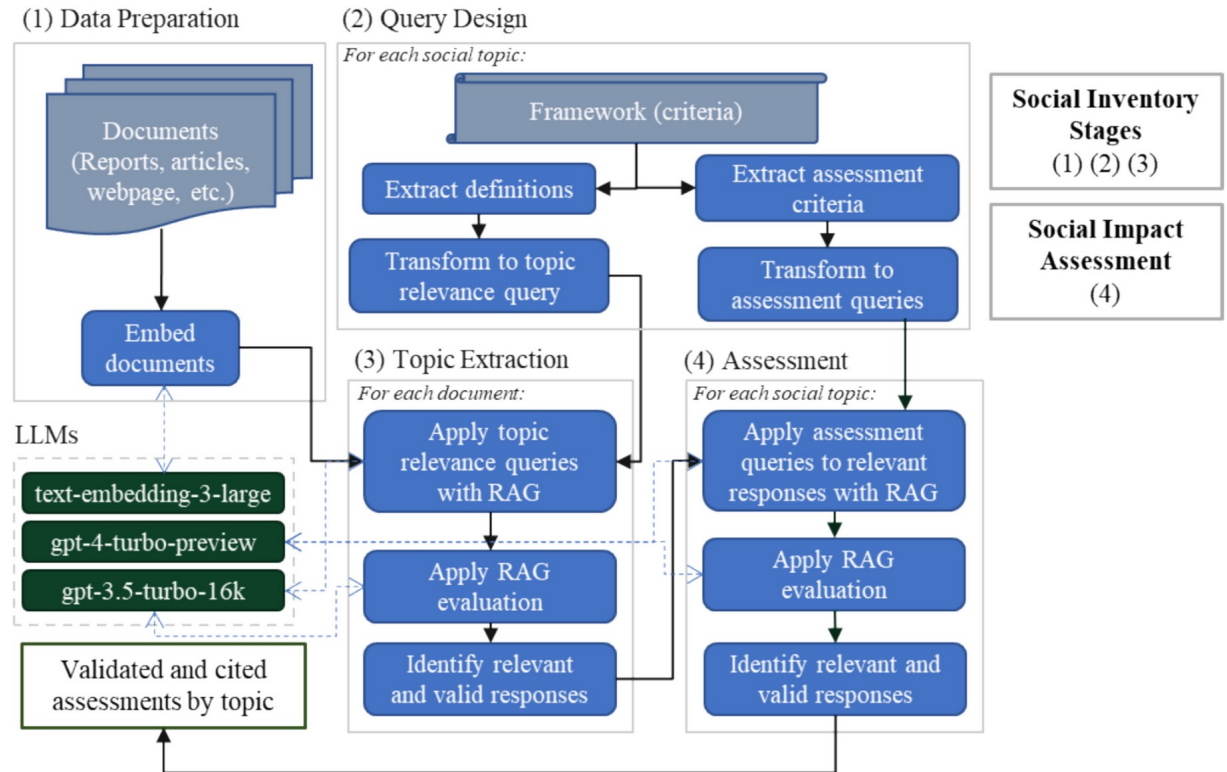
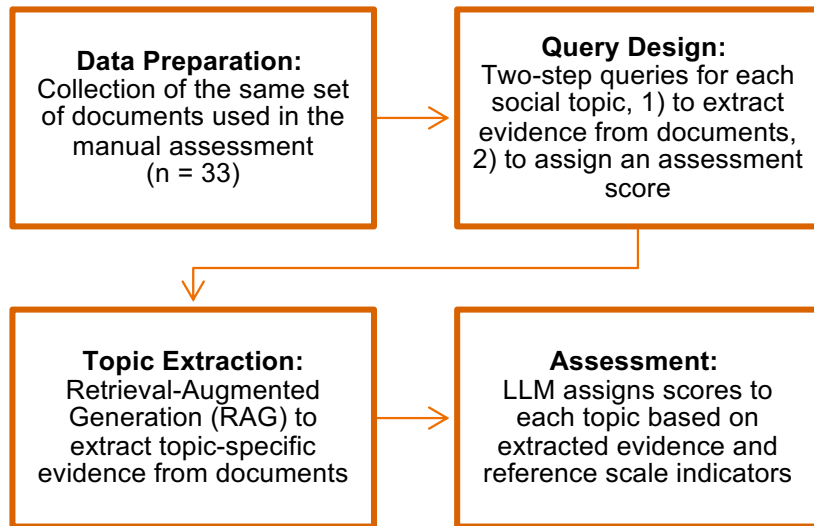
- Pilot an AI-augmented pipeline for S-LCA on 10(/29) social topics from the EU Orienting S-LCA protocol
- Compare AI-augmented assessments with traditional manual S-LCA

Manual Assessment



# Case & Method

## AI-Augmented Assessment

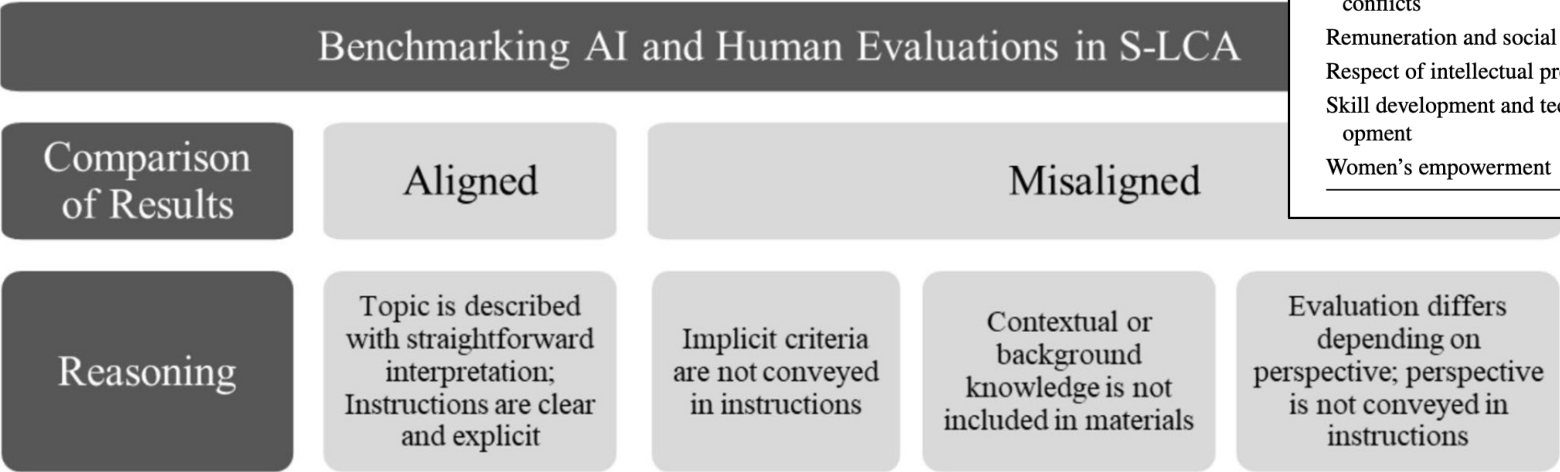


# Results

50% alignment between human and LLM assessments

**Table 5** LLM and manual level assessments by social topic

Social topic	LLM Level	Manual level
Child labor	1	1
Community engagement	2	2
Contribution to economic development (including local employment)	1	1
Fair competition	0	- 1
Health and safety (workers)	1	1
Prevention and mitigation of armed conflicts	NA	0
Remuneration and social benefits	0	2
Respect of intellectual property rights	2	0
Skill development and technology development	1	1
Women's empowerment	NA	0



**Fig. 3** Summary of findings from benchmarking AI with human evaluations

# Takeaways

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## Strengths

Significant potential to improve efficiency, scalability, and objectivity in S-LCA

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AI can provide consistent, evidence-based assessments when criteria and input materials are clear

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## Limitations

AI lacks contextual and tacit knowledge that humans bring

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Results are sensitive to the quality of instructions and the availability of relevant data

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Stakeholder perspective and evidence weighting must be explicitly defined for AI

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## HITL Comparison

Comparing AI and human assessments is critical to identify gaps and improve both methods

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# Implications & Future Research

## For Practice

- AI-augmented S-LCA can significantly speed up screening and extraction tasks, saving experts' time for more sensitive or complex judgment tasks
- Hybrid approaches (AI + human oversight) are recommended for critical or nuanced assessments

## For Research

- Further development is needed to integrate contextual materials, define stakeholder perspectives, and refine instructions for AI
- Testing in diverse industry contexts and with different S-LCA methods will reveal additional areas for improvement

## For Policy

- Policymakers should consider the realities of how AI can or cannot be used for easing the reporting process when considering regulations around assessment disclosure