Upcycling CLT cut-offs into modular building blocks: LCSA case study, adopting a multiple-cycles approach at building element level

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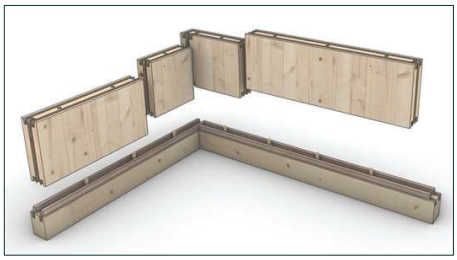
REblåkk



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Life Cycle Sustainability Assessment (LCSA)

Integrates Life Cycle Assessment (LCA), Life Cycle Costing (LCC), and Social Life Cycle Assessment (S-LCA).

LCA + LCC + SLCA = LCSA

- 🌍 Environmental Benefits
- 💰 Economic Comparison
- 🤝 Social Impact

Goal and Scope

- **Goal**: Assess the sustainability of REblåkk modular blocks compared to conventional timber stud walls.
- **Scope:** From raw material sourcing (CLT cut-offs) to one reuse cycle.
- **Functional Unit** – Load-bearing (LB) and non-load-bearing (NB) walls in a **150 m²** single-story residential house, 50 years life span.
- **Wall Estimations** – **150 m² LB walls** & **160 m² NB walls** used as the reference case.

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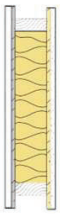
Walls composition

External / LB walls

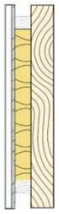
Stud wall

- Wood cladding 20mm
- Bituminous Wood fiber 12mm
- Timber frame C24 and rock wool 170mm
- OSB 12mm
- Plasterboard 12.5mm



REblåkk wall

- Wood cladding 20mm
- Bituminous Wood fiber 12mm
- Timber frame C24 and rock wool 70mm
- REblåkk 120mm



Internal / NB walls

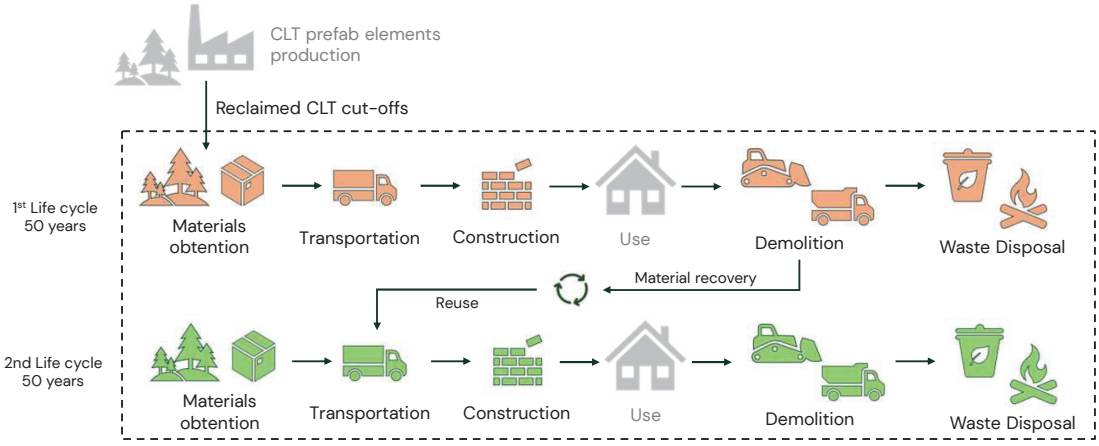
Stud wall

- Plasterboard 12.5mm
- OSB 12mm
- Timber frame C24 and rock wool 70mm
- OSB 12mm
- Plasterboard 12.5mm

REblåkk wall

- REblåkk 100mm

System boundary



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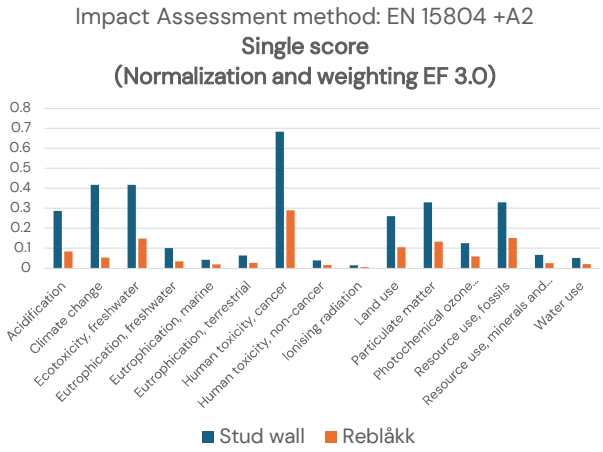
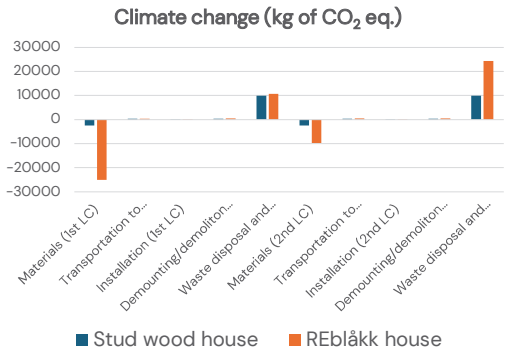
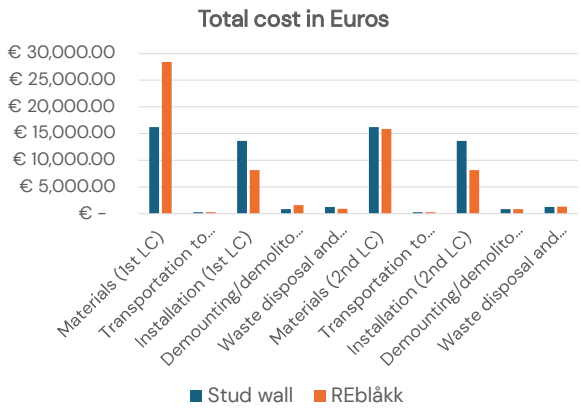
LCA results





- Potential of 87% reduction in climate change impact with REblåkk, reusing 65% of the blocks in the second life cycle.
- Decarbonization potential of 46.67 kg CO_2 eq per m^2

LCC results



💰 **Higher Initial Cost** – Using REblåkk increases total costs by **22%** in the first life cycle

♻️ **Cost Reduction in Second Life** – Due to reuse practices, costs decrease by **18%**

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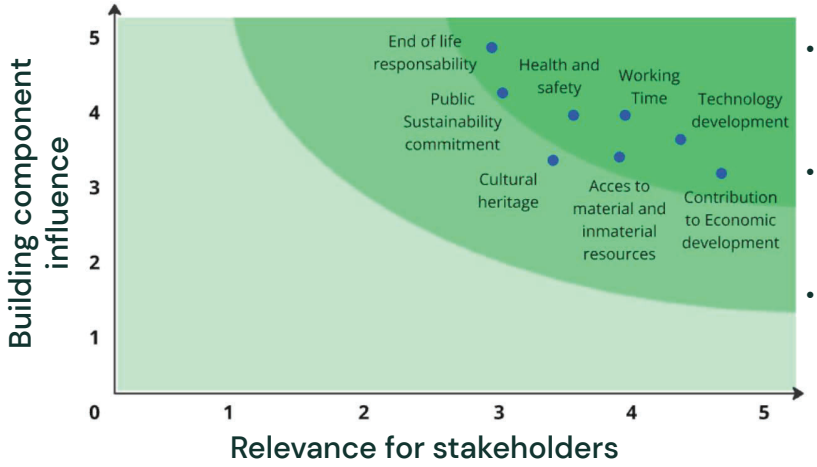
Materiality Assessment Results



- **39 social indicators** based on UNEP S-LCA guidelines analyzed.
- **Double materiality** assessment based on GRI.
- **8 indicators** identified as highly relevant for further analysis.

Key findings

🌍 **LCA (Environmental Impact)**
✅ **46.67 kg CO_2 eq/m²** decarbonization potential by reusing practices

💰 **LCC (Economic Impact)**
✅ High benefits in the long term and reusing scenarios but higher initial cost

🤝 **SLCA (Social Impact)**
✅ No full S-LCA conducted, only a double materiality assessment
✅ 8 indicators identified as highly relevance for assessment

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