Financial Assessment of Material Reuse in Building Products:

Comparing cost drivers in wood, concrete, and glass reuse

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Sustainability evaluation of a business model for material reuse
Background

Use of secondary materials for producing building materials is one way to reduce embodied emissions of buildings (Nußholz, Nygaard Rasmussen, Milios, 2019)

Background

- Economic potential and business models around material reuse are emerging
Background

• However, many financial barriers to economic application remain (Adams et al. 2018)
  • low value of post-use materials
  • labor-intensive recovery processes

→ reuse if often more expensive than new!
Background

• To help diffusion of business models for material reuse in the building sector better understanding of their financial viability is needed
• Fierce competition with linear producers
Research objective

• advance understanding of the financial structure of reusing different end-of-life materials for building materials by presenting a cost structure analysis of three reuse solutions

• Reuse solutions developed by a Scandinavian case company for wood, glass, and concrete.
Research question

• What are the main cost drivers of the three different materials streams and applications?
Method

Case study research

• A comparative case study design of a Scandinavian company that developed a business model for three commercialized reuse solutions
  • Wood for panels (By-product use)
  • Glass for windows (Material reuse)
  • Concrete for flooring and walls (Material recycling)
Method
Method

Cost structure analysis

• A cost structure analysis was conducted to identify the cost associated with various value chain steps, their inputs and activities

WHY?:

• Understanding the cost structure can indicate
  • Competitive (dis)advantages
  • Feasability of reuse
  • Suitable policy interventions
Method

• Organizing invoices according to production step
  • Material sourcing,
  • R&D,
  • Preparation for reuse,
  • Production, and
  • Installation.

• Labour costs for project management not included
Data collection

• Data was collected from company’s accounting data and semi-structured interviews.

• Company employees were consulted to verify accurate understanding of financial data and value chains.
Findings: Glass

Cost Factors - Circular Window

- Material sourcing (secondary)
- Material sourcing (primary)
- R&D
- Preparation for reuse
- Production
- Installation

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Findings: Wood

Cost factors - Circular Wood Panels

- Material Sourcing (secondary): 50%
- Production: 40%
- Installation: 10%
Findings: Concrete
Comparing cost drivers

Similarities:
• Manufacturing was a significant share of total costs

Differences:
• Very different costs for material sourcing
• Virgin materials can be a considerable part of costs
• Different number of production steps needed
• Legal requirements can drive costs (e.g. high R&D costs for concrete)
Discussion and limitations

• First production line only
• In future:
  • higher efficiency
  • no start-up costs
  • no installation costs
• Limited generalizability
• No costs for project management
Future research

• Comparison with linear value chain
• Sustainability value (environment, economy, society) disregarded
  • other value flows for other stakeholders beyond the firms’ financial value
Conclusions – So what?

• More diversified picture than common CE narrative on higher labour costs, but lower material costs
• Primary material input can be a significant cost driver
• More integrated value chains needed to be competitive (otherwise high transaction costs)
• Better understanding of competitive (dis)advantages with linear producers needed
Thank you for your attention!

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