Circular economy of buildings: Leroy Merlin case study

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Context:

- Building and construction sector: 1/3 of global resource consumption

  - 50% of raw material consumption
  - 40% of energy consumption

- Construction & demolition waste (CDW)
  - EU: CDW = largest waste stream (1/3 of all EU waste)
  - ~20% of total waste in Belgium
Context:

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  - EU: CDW = largest waste stream (1/3 of all EU waste)
  - ~ 20% of total waste in Belgium (40% in the world)
Context:

- CDW (Construction & Demolition Waste): mostly not recycled

Causes:
- heterogeneity
- dispersion
- economic viability
- (policy / inconsistencies, discrepancies)
VALDEM project:

VALDEM aims to improve demolition waste treatment to reach a circular economy in North of France and Wallonia (BE) (and Vlanderen, BE) (01.07.2016 – 4 years)

General information: http://www.valdem-interreg.eu/

Co-founders:
Leroy Merlin
The story of a recycled concrete

- Demolition of Leroy Merlin store of Douai (59, FR)
- Recycling of the "waste" (recycled aggregates, RA)
- Construction of the new store in Tourcoing/Neuville-en-Ferrain (59, FR)
  ⇒ substitution of a part of natural aggregates (NA) in the concrete slab
- Valorization of all the fractions
  o 4-20 mm in concrete (Eqiom)
  o 0-4 mm in pavement (EtNISI)
- [https://www.youtube.com/watch?v=2lRb7PDcl_4](https://www.youtube.com/watch?v=2lRb7PDcl_4)
Goal and Scope

Goal

• To assess the environmental impact of the substitution of a part of natural aggregates by recycled aggregates in the case of the demolition-construction of Leroy Merlin store in the Hauts de France

Scope

• FU: 1 m³ of concrete
• Cradle-to-gate (comparative) LCA
• 2 scenarii : 100% NA ↔ 20 RA + 80% NA (= RA20)
• Boundaries: raw materials, transport, production
Inventory

1. RA
   - Production

   - Adaptation of generic entries to the French case

   excavation           on-site transport                    crushing
Inventory

1. RA
   • Leroy Merlin Douai demolition: 3100 tonnes of RA
     o 4-20 mm: 1700 tonnes: 200 tonnes to Wambrechies
       1500 tonnes to Roost-Warendin
     o 0-4 mm: 1400 tonnes to Recynov - Santes
   • Transport
     o 4-20 mm: transport to Eqiom concrete plants
       • Wambrechies, 50 km (→ Leroy Merlin Tourcoing)
       • Roost-Warendin, 4 km (→ other projects)
     o 0-4 mm: transport to Recynov site, Santes, 39 km
       • EtNISI in pavement
Inventory

2. **NA (4-20 mm); sand (0-4 mm)**
   - Production: adaptation of generic entries to the Belgian case (Gaurain quarry, BE)
   - Transport distances: 55 km (Eqiom), 47 km (Recynov, Santes)

3. **Concrete**
   - Eqiom formulation: adaptation of generic entry (concrete, sole plate and foundation, + FR)
LCA Results – FU = 1 m³ Concrete, Wambrechies

Simapro 9.0; Ecoinvent 3.5; CML-IA 3.05
LCA Results – FU = 1 m³ Concrete, Wambrechies

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Abiotic depletion
Global warming (GWP100a)
Ozone layer depletion (ODP)
Photochemical oxidation
Acidification
Eutrophication

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LCA Results – NA / RA production and transport

Simapro 9.0; Ecoinvent 3.5; CML-IA 3.05
Conclusions

• **Substitution of 20% of NA with RA in concrete**
  No significant impact difference on 1 m³ of concrete because cement in the most impacting element

• **NA / RA production and transport**
  GWP100a: gain depending on distance between the demolition and the valorization sites
  - Recynov - Santes: 1 kg CO₂ eq / tonne
  - Eqiom - Wambrechies: 1.6 kg CO₂ eq / tonne
  - Eqiom - Roost: 5.7 kg CO₂ eq / tonne
Conclusions

- Gain for the construction of the new store in Tourcoing/Neuville-en-Ferrain: 322 kg CO\textsubscript{2} eq

- Global gain if total reuse of the 3100 t of RA (0-4 and 4-20 mm): 10400 kg CO\textsubscript{2} eq

- 4-20 mm RA: 8500 m\textsuperscript{3} of concrete

- EtNISI pavement: to be continued...
Take home message

The valorization of the demolition waste from Leroy Merlin Douai store provides a significant environmental gain compared to the use of natural aggregates only.

Let's get circular!
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http://www.valdem-interreg.eu/