



New Project Environmental Life Cycle Assessment - Determination of Ecological Sustainability Potentials by AMC

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Project aims

- **Comprehensive support** to all A and selected C projects
- **Assess and reduce** the environmental impact (I_{env}) of AMC
- **Develop ecological sustainability methodology tailored to AMC** as a function of technical performance, durability (resilience, flexibility, acceptance, material aging), circularity potential and environmental impact
- Product Environmental Footprint Category Rules (**PEFCR**) for AMC
- Publish **best practice catalogue**
- Enable **decision-making** based on environmental impact (FIM-LCA)

Preliminary work

1 Assessment of Environmental Impact and Reduction Potentials of demonstrator C "Marriage2Materials" (Extrusion of lightweight and normal concrete)

1.1 Goal and Scope

Functional unit: 1 m² exterior wall from either *Marriage2Materials* or conventional construction (same U-value)

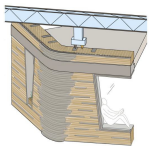


Fig. 2: a) AM-Wall

b) CM-Wall

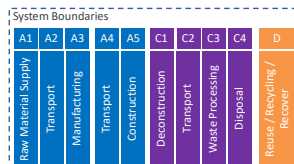


Fig. 3: System boundaries (Cradle to Cradle)

1.2 Life Cycle Inventory (LCI)



1.3 Impact Assessment and Interpretation

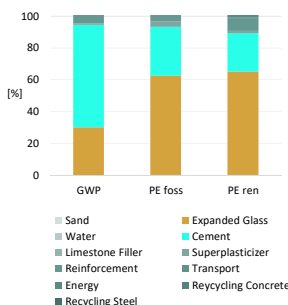
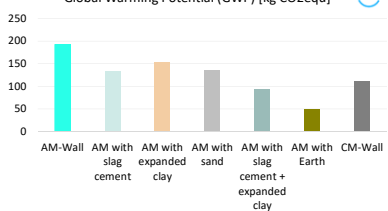


Fig. 4: Dominance Analysis

Table 1: Circularity Index of different Wall types

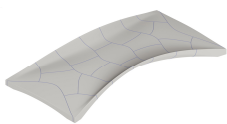
Urban Mining Index [%]	[%]
AM-Wall	54.2
CM-Wall	22.4

Fig. 5: Global Warming Potential of different variants of 1m² exterior wall



2 Assessment of Environmental Impact and Reduction Potentials of demonstrator E "Bridge the Gap" using Selective Paste Intrusion (SPI)

Functional unit: 1 bridge, identical span width, similar load bearing capacity



SPI: 1.4 m³,
59.4 kg Pre-stressed steel,
Operation: 56 kWh/m³

Conv: 4.05 m³,
Reinforcement 140 m³/kg

Environmental Impact of phase A, C and D

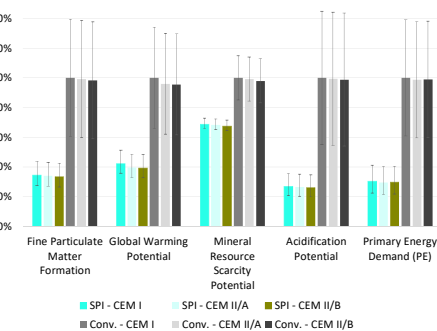


Fig. 6: Environmental Impact of "Bridge the Gap" and conventional slab

Methods

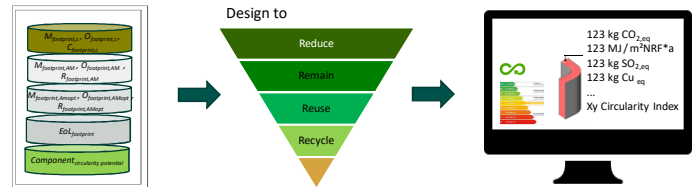
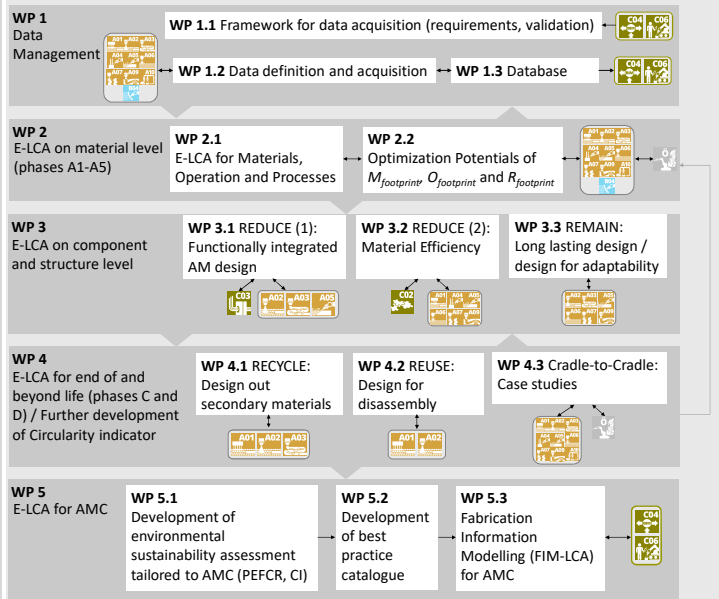


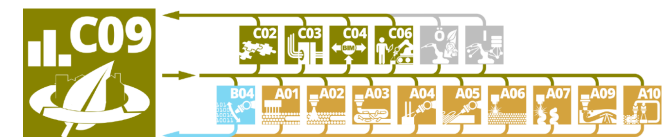
Fig. 1: Research approach of C09

- Data management system
- Environmental-Life Cycle Assessment according to ISO 14040 and 14044, EN 15804, EN 15978
- Extension of LCA to sensitivity analysis
- $I_{env} = V \cdot M_{footprint} + \Delta t \cdot R_{footprint} + O_{footprint}$
- Further develop circularity assessment

Work programme



Key collaborations



- **C06**: Data requirements, buildability, trade-offs
- **A-projects and B04**: Data on robotic unit, operation energy and materials, feasibility of optimization potentials and their effect on I_{env}

Outlook 3rd funding period

- **Integration of multiple design strategies**
- Implementation of **time-dynamic** parameters in LCA
- **Database extension** to new AM techniques and materials
- Determination of environmental impact of components and structures at an early design phase for **real structures**