

Life cycle assessment methodologies in the construction sector: From research to current application

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LCA in the construction sector

- From research...
 - Development of a methodology
 - Data collection
 - Validation and improvement of models
- To current application
 - Which applications ?
 - Barriers
 - Way to proceed in France
 - Future

Development of a methodology

- Pioneer work and first exchanges (Niklaus Kohler 1986, workshop in Cambridge 1992, European REGENER project 1996)
- In France : PhD in 1995, Bernd Poster, main innovation : linking LCA with thermal simulation, importance of energy issues
- Functional unit and system boundaries
- Choice of indicators system (damage...)
- Dealing with recycling, allocation, scenarios

Data collection

- Large influence of early design on environmental performance (choice of a building site, architectural sketch...)
- Need for generic data, materials but also processes (energy, water, transport, waste...)
- Balance between simplification and accuracy (e.g. not aggregating dioxins in COVs)
- Use of Ecoinvent until now, still limits
- Possible development of more local data

Validation and improvement of models

- No global experimental validation -> intercode comparison : REGENER, IEA, PRESCO
- Differences due to data (electricity mix, recycling % in steel, cement % in concrete...)
- Methodological differences (e.g. biogenic)
- Global agreement on CO₂ indicator
- Differences when ranking materials (timber)
- Improvement : dynamic/consequential LCA, uncertainty propagation, calibration, allocation, expansion towards urban design

What could be current application of LCA ?

- Design
- Answers to call tenders
- Regulation constraints
- Certification

Some barriers to these uses

- Small number of complete LCA studies on buildings
 - No references, no benchmarks
- Complex methodology to be simplified or adapted to construction stakeholder practice
 - LCA is an holistic and systemic approach difficult to simplify without limits
 - Results are difficult to interpret
- Long term decision making
- Low reproductibility of studies due to youngness of LCA

How are these barriers now addressed in France ?

- A more research oriented project : BENEFIS (partly founded by ANR) – (2012-2014)
 - CSTB, Mines Paris Tech, Bouygues construction, Izuba Energies, Maison de qualité
- A more stakeholders oriented project : HQE performance
 - Large scale building LCA experiment by construction stakeholders (not LCA specialists) based on a common methodological framework
 - Collect data and improve knowledge on new building performances

I have a dream

- In 2020, LCA is a true systemic approach
 - One core methodology with minor sectorial deviations
 - Common indicators to simplify the modularity of data (as a minimum requirement)
- In 2020, LCA is a user friendly tool in the construction sector
 - LCA is no more only a tool for expert
 - LCA is used by buildings designers