

# Development of a methodology for architects for the assessment and integration of sustainable material use from the early design phase

Elke Meex – Griet Verbeeck

Hasselt University, Faculty of Architecture and Art, Diepenbeek, Belgium – contact: elke.meex@uhasselt.be

## Problem statement



- **Focus shift** in building sector: from energy efficiency towards global environmental impact



- **Environmental impact** = use of resources, emissions, waste generation, contribution to global warming, ...  
→ focus of this research = (sustainable) **material use** in building design



- LCA = most objective and quantitative way for analysis  
→ application on **whole building level**  
= most appropriate assessment level for architects  
= **complex** (unique building design, wide variety of materials used, amount of input needed, ... )
- Use of LCA on whole building level = not widely spread  
→ no **legislation** on sustainable material use on a European (or a Belgian) level (in contrast to energy)



- **Architect** plays a **central role** in the design process  
→ environmental impact assessment of material use
  - Should be embedded in his **work method**
  - Should support the decision making process from **early design phase** to final construction

## Research aim



= to develop a **methodology** for a tool to assist architects in the decision making process on **sustainable material use** by providing information on environmental performance along the **design process**

- from **viewpoint of the architect** = in charge of the decisions concerning the environmental impact
- focus on **early design phase** = when most crucial decisions on building structure & layout are made

## Research methodology<sup>(1)</sup> & timing

Phase 1: Knowledge development		Phase 2: Implementation	Phase 3: Output
Framework	Architects & design	Calculation methodology	Design support model
<b>Literature review:</b>			
-LCA: legislation, standards, general information -Available models, tools, databases -Current / future developments LCA	-Design process -Design methodology -Design support -Design tools	-Detailed analysis calculation methods of existing tools -Interaction material use and other aspects design process -Search for default values on material use and LCA in design process	-Different output possibilities for feedback -Implementation calculation model in easy user-interface
<b>Field research:</b>			
-Comparative assessment of tools on whole building level -Architect-oriented focus	-Survey architects 1) attitude towards the building environmental performance 2) needs with regard to tool -In-depth analysis of design projects	-Testing usability of different calculation tools in practice -Choice final calculation model(s) -Distillation default values from material use in design projects	-Test panels & focus groups -Fine-tuning calculation tool
<b>Result:</b>			
-LCA knowledge -Comparison tools → SWOT - analysis → improvements? -Starting point further research	-Insight in design process and decision making strategies -Focus points for methodology / tool development	-Calculation methodology -Default values -Draft model ready for testing and fine-tuning	-Design support model for integration of sustainable material use from the early design phase



(1) based on doctoral research Lieve Weytjens at Hasselt University (Weytjens, 2013)

## Finished and ongoing research



- Review on **LCA framework**:
  - Literature review: ISO and CEN standards, ...
  - Examination of most important **existing** LCA databases and tools for Western-European context:
    - Theoretical examination of underlying framework and principles = *finished*
    - Practical application of these tools on a reference building → comparison of tool options = *ongoing*

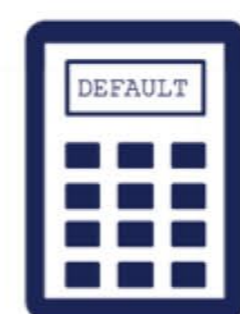


- Research on **architects'** current needs, expectations & work method with regard to **sustainable material use**:
  - Literature review on design process and design support methods
  - **Survey** on the knowledge, needs and work method of architects with regard to sustainable material use
    - Conducted in February 2014
    - Approx. 715 Flemish architects participated
    - About 350 filled in the survey  
= **response rate** of almost 49%
    - Processing results = *ongoing*

## Research still to be done within PhD



- Thorough analysis of the architect's work method and the design decision making process → in **collaboration** with architects:
  - **Analysis** of real life design projects: focus on material decisions
  - In-depth **interviews** on these decisions made along these projects  
→ Determination of the most influential design phases and parameters on material use along the design process



- Detailed analysis of existing **calculation methodologies** → look for:
  - Best calculation methodology: **simplicity vs. accuracy**
  - Possible **default values**
  - **Interaction** with material use & other aspects of design process  
→ Implementation of knowledge in calculation methodology



- **Focus groups** with architects:
  - Discuss input and output **options** of the tool, ease of use of interface, ... based on examples found in literature or existing tools  
→ Adaptation and fine-tuning of the support tool



- Aim = a **design decision support tool** for the environmental performance of building design, specifically oriented to **architects**

### Methodology scheme based on:

Weytjens, L. Design support for energy efficiency and summer comfort of dwellings in early design phases: A framework for a design tool adapted to the architects' practice in Flanders. Doctoral dissertation, Hasselt University (2013)

### Icons based on images found on:

<http://mdblackfly.com/>  
<http://barryclark.co/coaching/>  
<http://www.canstockphoto.com/>  
<http://www.thinkstockphotos.com/>

<http://www.clker.com/clipart-hammer-1-1.html>  
[http://commons.wikimedia.org/wiki/File:Simple\\_Globe.svg](http://commons.wikimedia.org/wiki/File:Simple_Globe.svg)  
[http://vector.me/browse/123068/person\\_reading\\_book\\_clip\\_art](http://vector.me/browse/123068/person_reading_book_clip_art)  
<http://www.nibe.org/nl/diensten-en-producten/onderzoek/LCA>  
<http://www.sswm.info/category/planning-process-tools/decision-making>