


**Sustainable building:  
search for an integrated method to evaluate  
the sustainability of dwelling types**


**ERSCP 2008 - Berlin**

**C. Spirinckx**  
**A. Vercalsteren**



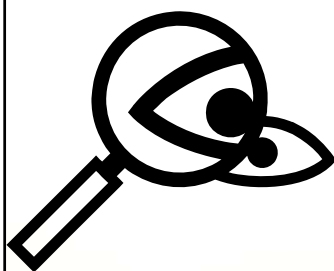
September 23, 2008

confidential – © 2008, VITO NV – all rights reserved




1

## Structure




- **Introduction**
- **Belgian project**
  - Integrated approach
  - Expected outcomes
- **Revitalise of PREPARE thematic group on Sustainable Building?**



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved



2

## Introduction

- **Construction sector** => high environmental impact
- **Energy Performance regulations (EPN) since 1 january 2006**
  - Limited to **energy use** during **use phase**
  - What about other environmental effects?
  - What about other life phases?
- **BATNEEC studies**
  - Limited to **material level**
- Only **limited changes** are noticeable



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

3

## Belgian project

### SuFiQuaD - Sustainability, Financial and Quality evaluation of Dwelling types

- Improving sustainability of the **housing sector** in Belgium
- Looking at building level
  - Including whole lifetime
  - Including different sustainability aspects
    - \* **environmental aspects (LCA)**
    - \* **financial aspects (LCC)**
    - \* **quality aspects (MCA)**



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

4

## Belgian project

- **Belgian Science Policy programme: SSD**  
**Science for a Sustainable Development**
- **Project: 2007 – 2011**
- **Project partners =**  
**ASRO (Catholic University of Leuven)**  
**BBRI (Belgian Building Research Institute)**  
**VITO (Flemish Institute for Technological Research)**



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

5

## Belgian project

**Improve the sustainability of the building sector  
in 2 ways:**

- **general analysis of the sector**  
**=> determine responsibilities of the most important stakeholders**
- **detailed analysis of representative housing types**  
**=> recommendations, ordered by efficiency**



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

6

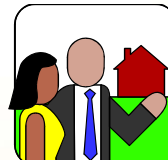
## Belgian project

Analyse the complex interaction **between**

- housing type - lifestyle - spatial characteristics - technical solutions

**and**

- financial + environmental consequences



=> strategies for a **sustainable development** of  
**different housing types in Belgium**



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

7

## Belgian project

### Integrated approach

- Integrated environmental aspects
- Whole life cycle
- Building level:  
Typology, lay-out, dimensions,  
orientation, location,...
- Including Financial Cost
- Including Quality

➔ **LCA**

➔ **element  
method**

➔ **LCC**

➔ **MCA**

**+ optimisation**



September 23, 2008

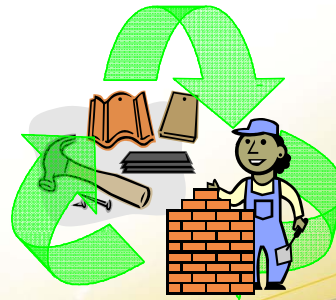
confidential – © 2008, VITO NV – all rights reserved

8

## Environmental aspects

### ISO 14040 and 14044

- Goal and scope
- Inventory analysis
- Impact assessment
- Evaluation



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

9

## Environmental aspects

**Monetisation** of environmental effects =  
translation into **eco-costs**

- What are people prepared to pay to prevent/restore a certain environmental impact?
- Add environmental costs to financial costs



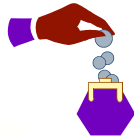
September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

10

## Financial aspects

- **LCC**: total cost of building, from planning to disposal



- **Initial costs** => budget restriction
- **Periodic costs** => energy costs, replacement costs, ...
- **Total cost** => sum of present values
- **Uncertainty: sensitivity analyses**



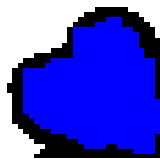
September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

11

## Integration of financial and environmental costs

Initial  
Financial  
Costs



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

12

# Integration of financial and environmental costs

Initial  
Financial  
Costs

Periodic  
Financial  
Costs



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved



13

# Integration of financial and environmental costs

Initial  
Financial  
Costs

Periodic  
Financial  
Costs



Initial  
Environmental  
Costs



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved



14

## Integration of financial and environmental costs

Initial  
Financial  
Costs

Periodic  
Financial  
Costs



Initial  
Environmental  
Costs

Periodic  
Environmental  
Costs



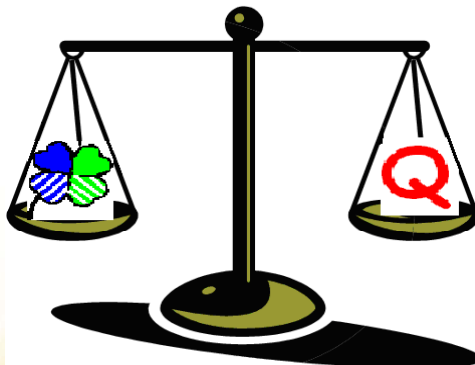
September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

15

## Quality evaluation

**Buildings = whole set of functions,  
no identical “functional units”**



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

16

## Quality evaluation

- Based on an existing method
- **Multi-criteria analysis**
  - Determination of qualities
  - Determination of scores (score functions)
  - Determination of importance of qualities (weighting factors)



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

17

## Optimisation

- Clarify possible conflicts between **decisions** based on:
  - Financial investment costs
  - Total financial costs (investment costs + costs-in-use)
  - Total financial costs and environmental investment costs
  - Total financial costs and total environmental costs
  - Total financial costs and total environmental costs + performance evaluation



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

18

## Expected outcomes

- Conceptual model to optimize the **total costs** (financial and environmental during the whole life cycle) and **benefits** (qualities)
- Operational **work instrument** translation of elaborated methodology
- Analyses of the **sustainability of representative dwelling types** for the Belgian context
- Document with **policy recommendations** based on the findings of the analyses



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

19

## PREPARE Thematic Group

- Re-launch of the Sustainable Construction Thematic Group within **PREPARE**
  - to discuss the application of the methodology with a broad range of different stakeholders over Europe
  - to learn from each other and to enhance **European cooperation in the field of sustainable construction and buildings**



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved

20

# Questions?



September 23, 2008

confidential – © 2008, VITO NV – all rights reserved



21