

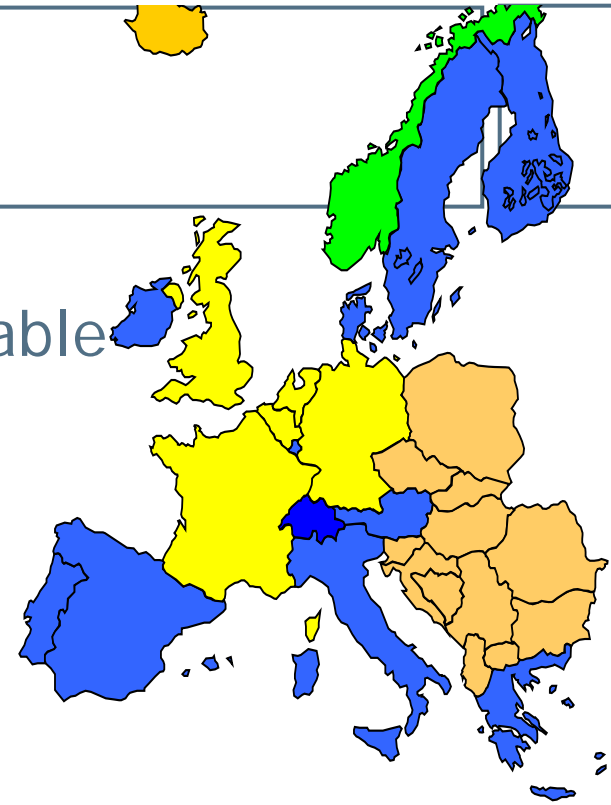


# COMPARISON OF EUROPEAN LCA-BASED BUILDING ASSESSMENT AND DESIGN TOOLS

Daniel Kellenberger

1. Starting point (PRESCO WP 1 and 2)
2. Goal of PRESCO WP2
3. Overview of studied tools
4. Studied impact assessment indicators
5. Case studies and results
6. Recommendations for tool developers
7. Conclusion
8. Outlook

- Practical Recommendation on Sustainable Construction ([www.etn-presco.net](http://www.etn-presco.net))
- Thematic EU network
- Established in 2000, ended in 2004
- WP 1: Definition of a European guideline in sustainable construction  
-> Database with recommendations
- **WP 2: Characterization and comparison of computer-based LCA software for integrated building planning**
- Application of some recommendations from WP 1 in the building assessment tools of WP 2



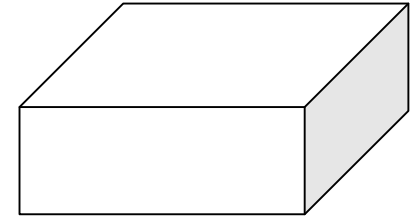
- Encouragement of the information and knowledge transfer between European tool developers
- Benchmarking and analysis of results based on case studies
- Development of recommendations for rationalising LCA-based assessment tools for buildings



- **OGIP (Switzerland)**; based on the CRB cost element method and LCI-data mainly from „Ökoinventare für Energiesysteme '96“, <http://www.the-software.de/BauenUmwelt.html>
- **Eco-Quantum (Netherlands)**; LCI-data from SimaPro-Database, [www.ecoquantum.nl](http://www.ecoquantum.nl)
- **EQUER (France)**; LCI-data mainly from „ Ökoinventare für Energiesysteme '96“, <http://www.izuba.fr/equer.html>
- **ENVEST (England)**; LCI-data from different sources (e.g. APME, SimaPro, etc.), only for office buildings, <http://www.envestv2.bre.co.uk/>
- **BECOST (Finland)**; LCI-data from a Finnish database, <http://www.vtt.fi/rte/projects/environ/becost.html>
- **ECOSOFT (Austria)**; LCI-data from „ Ökoinventare für Energiesysteme '96“, from construction materials eco-inventory and IBO-database, impact assessment with SimaPro, <http://www.ibo.at/forschung.htm>
- FURTHER: **ESCALE (France)**, **SIMA-PRO (Netherlands)** und **LEGEP (Germany)**

- ~~CML 92 (all or only a choice of indicators)~~
- Global warming potential (kg CO<sub>2</sub>-Equivalents)
- ~~Water consumption~~
- ~~Waste~~
- ~~Direct costs~~
- ~~Indirect costs~~
- ~~Primary energy~~
- ~~And so on ...~~

1. Heated reinforced concrete  
**Cube** without windows and  
doors

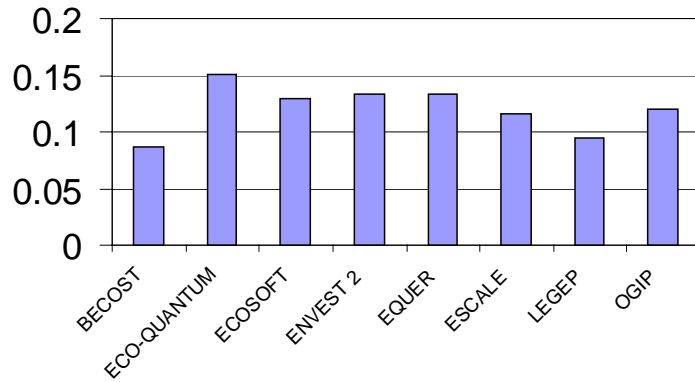


2. A building (**FUTURA**) in three  
construction variations  
(Brick-, concrete- und  
wooden walls)

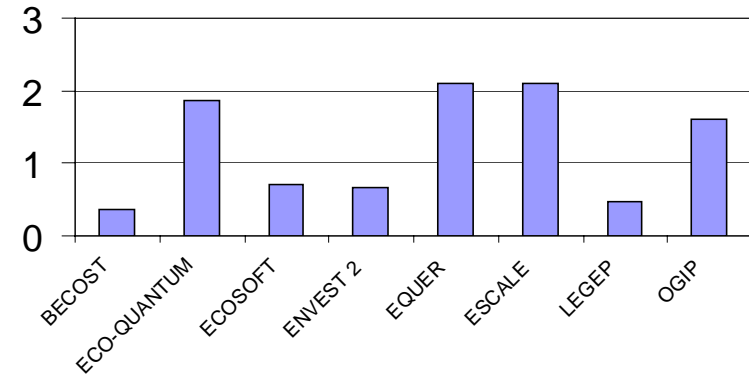


3. Implementation and assessment of some  
recommendations on sustainable construction from  
WP1 of PRESCO on the FUTURA building

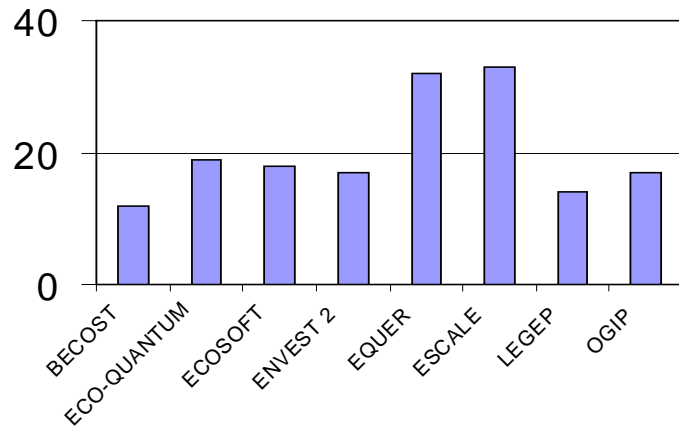
■ kg CO2 eq per kg concrete



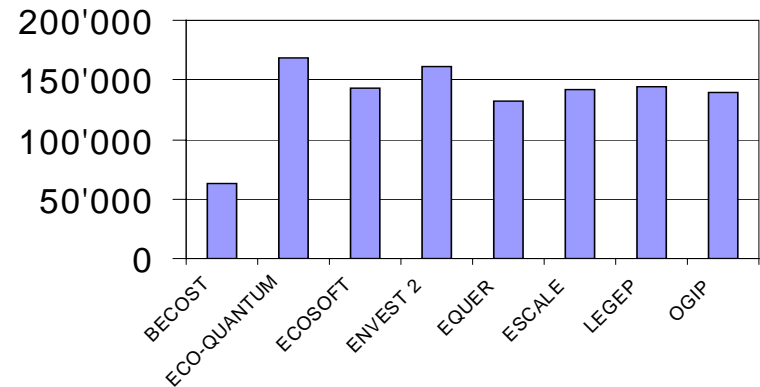
■ kg CO2 eq per kg steel

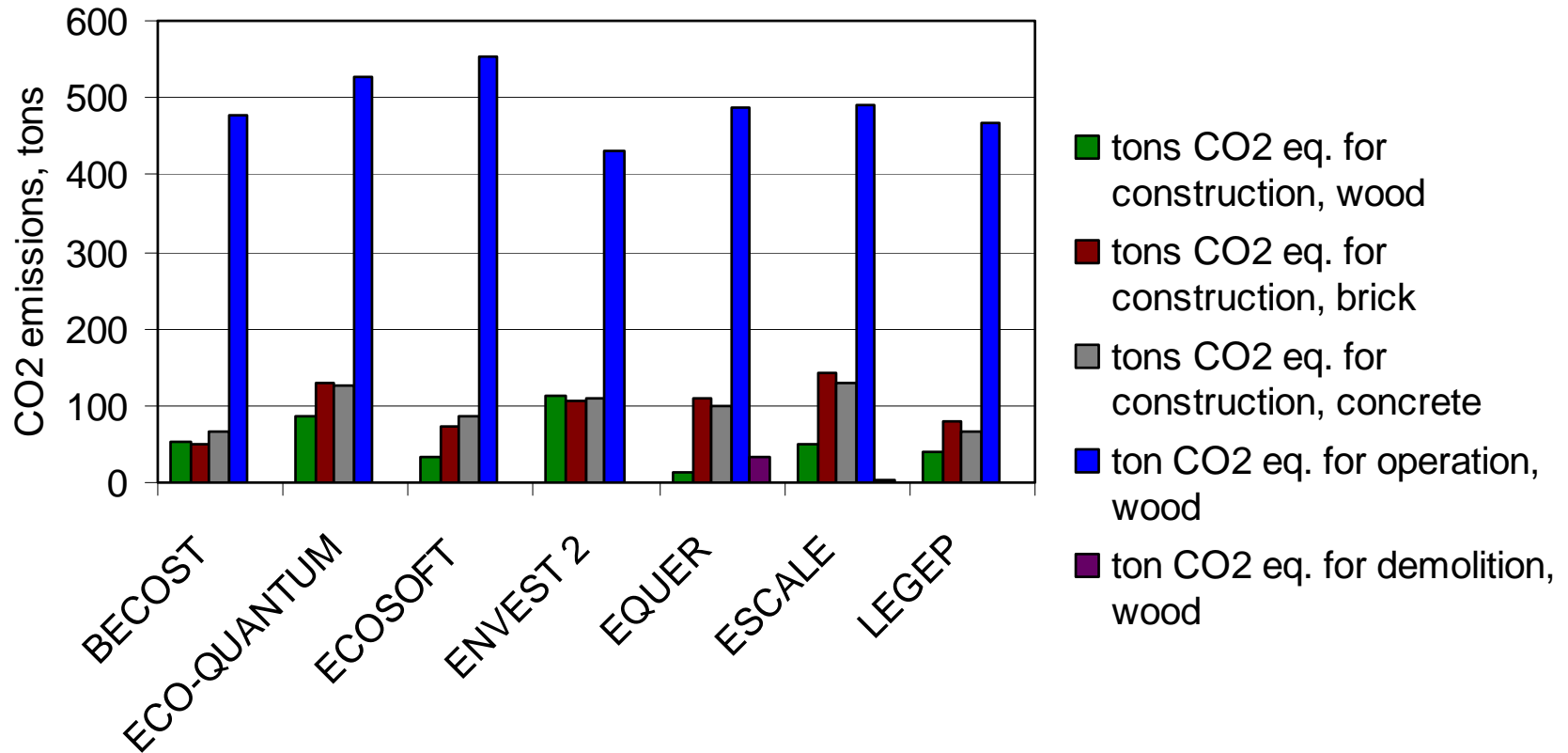


■ tons CO2 eq for reinforced concrete



■ kg CO2 eq per TJ end energy (UCPTE electricity mix)





## Differences in various Tools

- User Interface (CAD-based, materialization in volume or weight, etc.)
- Amount of steel in reinforced concrete (adaptable)
- Type of electricity mix (European / local)
- Transportation (factory to building site and/or building site to disposal) type (lorry 18t or 40t) and distance (average / specific)
- Calculation of heating demand (included / not included)
- Disposal (included / not included)

## Application of recommendation (WP1)

Only very few recommendations could be used for the calculation

- Only ecological recommendations suitable
- Most ecological recommendations can not be modelled in the tools (e.g. “use locally sourced materials”)
- No clear definition in the way of implementing a recommendation (e.g. “saving water measures”)

## Application of certain recommendations

- Replacing double glazing by triple glazing
- Reducing the amount of drinking water by applying water saving fittings
- Reducing the material transports from production to construction site
- Reducing water consumption by using rain water
- Using renewable energy for heating (wood instead of gas)
- Replacement of rock wool insulation by renewable materials (e.g. cellulose based insulation)

## Application of certain recommendations

The recommendations applied in the study show in most cases a small impact reduction;

Measures with a big negative effect on the heating demand show large impact reductions.

Some recommendations do not clearly imply an ecological improvement

- LCI-Data: Go for a consistent data collection- and representation method (see my presentation in the afternoon)
- Try to take into account all possible transports
- Consistent “Cut-off” rules
- Demolition/dismantling and disposal/recycling: must be taken into account
- Consistent definition of the building's and the construction elements' life-span
- As energy is no environmental impact indicator it should be at least subdivided into energy from biomass, water, nuclear, wind/solar/geothermal and fossil fuels

The goal of PRESCO WP2 was very ambitious and could only be reached to a certain extent:

- The incomplete list of recommendations for tool developers gives a lead in what must be taken into account and helps to improve existing or to evolve new tools
- The tools vary very strongly → detailed analysis were almost not possible
- Best practice in Methodology and no harmonization on LCI-data over Europe
- Information and knowledge transfer → very helpful
- The application of the recommendations for more sustainable constructions → very difficult

1. For a simplification of the assessment tools further work is necessary
2. For the interpretation of the results the user (architect, civil engineer, etc.) must be trained
3. The transparency must be enhanced to be able to make a proper analysis of the results

**The End**

**Thank you for your attention**