Building LCA calculations for the German Sustainable Building Certificate DGNB – Methodology and Benefits
Contents:

1. DGNB Methodology Building LCA
2. Examples of results

Building LCA calculations for the German Sustainable Building Certificate DGNB – Methodology and Benefits
DGNB rating system (Germany)

- Sustainability Assessment (Environment, Economy, Social)
- **New approach**: Performance oriented and life-cycle oriented
- DGNB Germany system launched in 2009, DGNB International in 2010
- Over 200 certified buildings

### Key Components

- **Environmental Quality**: 22.5% (11 criteria)
- **Economical Quality**: 22.5% (2 criteria)
- **Social-cultural and functional quality**: 22.5% (15 criteria)
- **Technical quality**: 22.5% (5 criteria)
- **Process quality**: 10% (9 criteria)
- **Location quality**: Separate weighting, 6 criteria

Source: DGNB 2009
Sustainability at all Life Cycle Stages at DGNB

- Socio-culture
  - Health and comfort
  - Functionality and design

- Environment
  - Emissions
  - Resources

- Economy
  - Costs
  - Benefits

Sustainability at all Life Cycle Stages:
- Raw materials
- Manufacturing
- Construction
- Operation
- Cleaning
- Repair/Replacement
- Waste management
- Recycling

07.11.2011
Measurement oriented vs. performance oriented building assessment indicators

- **Measurement oriented**
  - Maximum transport distance
  - Minimum recycled content
  - Maximum energy consumption
  - Minimum reused materials

- **Performance oriented**
  - Maximum kg CO$_2$e / m$^2$a life cycle
  - Maximum MJ non renewable primary energy / m$^2$a life cycle
  - Minimum MJ renewable primary energy / m$^2$a life cycle
  - Maximum EUR / m$^2$a life cycle
DGNB's environmental assessment:

- LCA results contribute to ~13% of overall building rating
- Benchmarks are set on building level, not on element or product level
- Special training on Building LCA
- Prevents shift of burdens
- Stimulates producers to generate EPDs (Environmental Product Declarations)
Building LCA – Essential part of building assessment

Environmental Building Profile
Result of indicators for building-LCA

Environmental Life Cycle Assessment Data (e.g. Reference database or EPD)
Environmental impacts per material / product / energy carrier / waste management

Operation
(energy demand)

Products / Construction
(materials / products / systems)
According to system boundaries

Replacements
(materials * replacement cycles)
According to use scenario (e.g. 50 years)

End of life
(waste and recycling)
According to EoL scenario and demolition

Benchmark & Credits
### User and Regulatory Requirements

**Integrated Building Performance**

<table>
<thead>
<tr>
<th>Concept level</th>
<th>Framework level</th>
<th>Building level</th>
<th>Product level</th>
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<tr>
<td></td>
<td>prEN 15643-1 Sustainability Assessment of Buildings - General Framework</td>
<td>prEN 15978 Assessment of Environmental Performance</td>
<td>prEN 15804 Environmental Product Declarations</td>
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<td></td>
<td>prEN 15643-2 Framework for Environmental Performance</td>
<td>prEN 15643-3 Framework for Social Performance</td>
<td>(see Note below)</td>
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<td>Technical Characteristics</td>
<td>Functionality</td>
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<td>WI 015 Assessment of Social Performance</td>
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<td>WI 003 Use of EPDs</td>
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**Note:** At present, technical information related to some aspects of social and economic performance are included under the provisions of prEN 15804 to form part of EPD.
Building and Product Level Assessments
EN 15978 and EN 15804
Environmental parameters according to EN 15804 / EN 15978

- Global warming potential (GWP)
- Depletion potential of the stratospheric ozone layer (ODP)
- Acidification potential of land and water (AP)
- Eutrophication potential (EP)
- Formation potential of tropospheric ozone photochemical oxidants (POCP)
- Abiotic depletion potential for non fossil resources (ADP elements)
- Abiotic depletion potential for fossil resources (ADP fossil fuels)

- Input of renewable primary energy (energy resources) excluding feedstock
- Input of renewable feedstock
- **Total input of renewable primary energy** (resources and feedstock)
- Input of non renewable primary energy (energy resources), excluding feedstock
- Input of non renewable feedstock
- **Total input of non renewable primary energy** (resources and feedstock)

- Input of secondary material
- Input of renewable secondary fuels
- Input of non renewable secondary fuels
- Input of net fresh water
- Hazardous waste disposed
- Non hazardous waste disposed
- Radioactive waste disposed
- Components for re-use
- Materials for recycling
- Materials for energy recovery
- Exported energy
Data sources – LCA database (xml) and EPDs
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Global Warming Potential of selection of buildings

Source: Wittstock 2011
Global Warming Potential of selection of buildings

Mean values GWP

- Exterior walls and windows: 7%
- Bottom slab: 4%
- Foundation: 1%
- Interior walls: 3%
- Doors: 3%
- Heating appliances: 0%
- Total EoL: 3%
- Total refurbishment: 5%

Total operation: 71%

Source: Braune (not published)
Summary

- Building certificates use building-LCA methodology
- Calculation rules and data become harmonized through standardization
- Building-LCA results can be compared to benchmarks
- Tools allow non-LCA experts to apply building-LCA

... and to plan more environmental friendly buildings
Information and contact

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