Circular building strategies

JAN PEŠTA
Czech Technical University in Prague –
University Centre for Energy Efficient Buildings
Principles of circular building design
Circular economy

- an economic model, which through closing economic loops aims at:
  - optimizing resource usage within planetary boundaries;
  - maximizing and retaining the value of assets in the economy;
  - and minimizing waste.

- Application of circular strategies opens an opportunity to offer the same economic service with lower impact on the environment, in which we live.
Building as material banks

Costs

Demolition
Operation (50 years)
Construction

$ $ $ $ $ $ $ $
Building in layers approach

- SITE (∞)
- STRUCTURE (50-100 years)
- SKIN (25-50 years)
- SERVICES (15-25 years)
- SPACE PLAN (5-15 years)
- STUFF (0-5 years)
Key circular building strategies
### Design principles and actions

<table>
<thead>
<tr>
<th>Design Principles</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durability</td>
<td>Refuse</td>
</tr>
<tr>
<td>Upgradability</td>
<td>Rethink</td>
</tr>
<tr>
<td>Adaptability</td>
<td>Reduce</td>
</tr>
<tr>
<td>Reversibility</td>
<td>Reuse</td>
</tr>
<tr>
<td>Disassembly and reassembly</td>
<td>Repair</td>
</tr>
<tr>
<td>Ease of maintenance and repair</td>
<td>Refurbish</td>
</tr>
<tr>
<td>Attachment and trust</td>
<td>Remanufacture</td>
</tr>
<tr>
<td>Limiting inputs and their externalities</td>
<td>Repurpose</td>
</tr>
<tr>
<td>Limiting the net costs of operation</td>
<td>Recycle</td>
</tr>
<tr>
<td>Selective deconstruction</td>
<td>Recover</td>
</tr>
</tbody>
</table>
Design for disassembly

- focus on the assemblies and the systems
- to allow dismantling at the end of life or during renovation
- to reusing their components
Modular design

- Connected with prefabrication
- Solace House, Poland
- Envilop, Czech Republic
- Moreconnect project, Czech Republic
Selective deconstruction

- Predemolition audit
- Deconstruction plan
- Example – Mercury Building
- On site collection (e.g. CUBICASA https://www.cubi.casa/)
- Digital market (ROTOR DC, Cyrkl.com)
CirCon4Climate

Tool for circularity feedback

Certification systems  Circularity assessment  BIM
Certification systems

- LEED
- BREEAM
- SBToolPT
- SBTool
- Verde
- BR
- E
- EAM
- DGNB
- HQE
- SBToolCZ
- Protocolo ITACA
- CASBEE

Environmental Product Declaration (EPD)

Cradle to Cradle

Level(s)
CTI Tool

- [https://ctitool.com/cti-framework-2/](https://ctitool.com/cti-framework-2/)
### UMI tool

- [https://urban-mining-index.de/en/](https://urban-mining-index.de/en/)
Life Cycle Assessment

- Potential environmental impacts including Climate change, Resource depletion etc.
- 4 steps: goal and scope definition, inventory analysis, Impact assessment, Interpretation
- ISO 14040:2006
- Environmental product declaration (EPD)
- Database of EPD (e.g. Environdec.com)
This publication has been developed as one of the activities of CirCon4Climate project. This project is part of the European Climate Initiative (EUKI) of the German Federal Ministry for Economic Affairs and Climate Action (BMWK).

The opinions put forward in this publication are the sole responsibility of the author(s) and do not necessarily reflect the views of the Federal Ministry for Economic Affairs and Climate Action (BMWK).