Circularity: Building on the past and looking to the future

Gilli Hobbs

10th February 2022
Overview

- Circular economy intro
- Circular economy opportunities
- Building life cycles
- Value retention hierarchy
- Predevelopment audits
- Data to support circularity
- Policy developments
What is circular economy

- Use of reclaimed/recycled materials
- Designed for adaptability/flexibility
- Deconstruction potential/future reuse & remanufacture potential
- New business models – product to service
- Multi functional space/use – sharing economy

Also - health & well being, energy/water efficiency, durability/resilience, systems thinking approach
# Circular Economy opportunities

<table>
<thead>
<tr>
<th>Design</th>
<th>Manufacture and supply</th>
<th>Construction</th>
<th>In use</th>
<th>End of life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design for deconstruction</td>
<td>Ecodesign principles</td>
<td>Minimise construction waste</td>
<td>Minimise waste</td>
<td>Deconstruction</td>
</tr>
<tr>
<td>Design for adaptability and flexibility</td>
<td>Using less materials/optimising material use</td>
<td>Minimal maintenance</td>
<td>Selective demolition</td>
<td>Reuse of products and components</td>
</tr>
<tr>
<td>Design for standardisation</td>
<td>Using less hazardous materials</td>
<td>Procuring reused materials</td>
<td>Easy repair and upgrade</td>
<td>Closed loop recycling</td>
</tr>
<tr>
<td>Designing out waste</td>
<td>Increasing the life span</td>
<td>Procuring recycled materials</td>
<td>Adaptability</td>
<td>Open loop recycling</td>
</tr>
<tr>
<td>Modularity</td>
<td>Designing for disassembly</td>
<td>Off site construction</td>
<td>Flexibility</td>
<td></td>
</tr>
<tr>
<td>Specifying reclaimed materials</td>
<td>Designing for standardisation</td>
<td></td>
<td>Utilising assets</td>
<td></td>
</tr>
<tr>
<td>Specifying recycled materials</td>
<td>Using more secondary materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Take back schemes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reverse logistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of information including metrics and datasets</td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
Buildings as Material Banks (BAMB) – Circular & Dynamic Built Environment

Buildings as Material Banks

CASE STUDIES AND PILOTS

Reversible Building Design

Materials Passports

Circular Building Assessment

Circular Value Network

POLICIES AND STANDARDS

Building life cycles – past, present, future

Previous Buildings
Displacing new products & materials

Current Building
Transformation capacity

Future Buildings
Future reuse potential
Constructed Watford, 1997
BRIC EVALUATION (BUILDING REVERSIBLE IN CONCEPT)
Choosing a strategic approach – Decision Tree

Strategies for maximising residual value

- Are there any building materials or elements available on site?
  - No
  - START HERE
    - Is there an existing building on the site?
      - No
      - Is it technically feasible and viable to recover the ‘residual value’ of the building elements or materials?
        - No
        - DEMOLISH AND RECYCLE
      - Yes
      - DECONSTRUCT AND REUSE
  - Yes
    - Is it technically feasible and viable to retain the building(s) in whole or in part?
      - No
      - No
      - DEMOLISH AND RECYCLE
      - Yes
        - Yes
        - REPURPOSE
        - No
        - REFURBISH

Strategies for maximising value over the lifetime of the development by adding new buildings / infrastructure

- Is the expected life long or short?
  - Short
    - Will there be a market for elements with the required dimensions / specifications?
      - No
      - Design for... RECOVERABILITY
      - Yes
      - Design for... REUSABILITY
  - Long
    - Will the use and/or requirements change?
      - Often (<5 yrs)
      - Design for... FLEXIBILITY
      - Intermittent (5-25 yrs)
      - Design for... ADAPTABILITY
      - Rare (>25 yrs)
      - Design for... LONGEVITY

All developments should design for...
- DISASSEMBLY

London - Design Strategy Circular Economy Statement
Meridian Water regeneration project

- London Borough of Enfield – Circular Economy workstream (part of overall Environmental Sustainability Strategy)

- Value retention hierarchy

1. Remain/ Repurpose
2. Reuse in MW site
   a). Permanent use
   b). Meanwhile/ temporary use
3. Local reuse (support local enterprises)
4. High value recycling on site
   a). Permanent use
   b). Meanwhile/ temporary use
5. Reuse offsite
6. High value recycling locally > offsite
7. Other recycling on site > offsite

Quantitative (Triple bottom line) review

Commercially viable

<table>
<thead>
<tr>
<th>Value</th>
<th>Projected net revenue over 15 years/ £</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demolition costs</td>
<td>Construction costs</td>
</tr>
<tr>
<td>Marketing, management, security, maintenance</td>
<td>Revenue from land</td>
</tr>
<tr>
<td>Revenue from building</td>
<td></td>
</tr>
</tbody>
</table>

Opportunities

<table>
<thead>
<tr>
<th>Value</th>
<th>Projected return over 15 years/ £</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total no of jobs created</td>
<td></td>
</tr>
<tr>
<td>Net total additional Gross Value Added (GVA)</td>
<td></td>
</tr>
</tbody>
</table>

Sustainability

<table>
<thead>
<tr>
<th>Value</th>
<th>Total payback / £</th>
</tr>
</thead>
<tbody>
<tr>
<td>Embodied carbon saved</td>
<td></td>
</tr>
<tr>
<td>Sale of residual assets/ materials</td>
<td></td>
</tr>
</tbody>
</table>

(Triple bottom line) Total ROI

| Value | Commerically viable + (Social) Opportunities + Sustainability |
Support circular business models
1) Provide markets/ support to reuse & recycle existing assets
2) Learning from these audits (& what happens) to support future reuse (Design for Disassembly, supplier take back, capacity building, new business models)
3) Data, and access, at End of (first) Life to enable future disassembly, reuse, high value recycling
# Pre-demolition audit – recent example

<table>
<thead>
<tr>
<th>Description</th>
<th>Estimated quantity</th>
<th>Tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete from buildings on site</td>
<td>22,000 m³</td>
<td>52,800</td>
</tr>
<tr>
<td>Stone cladding</td>
<td>2860 m²</td>
<td>715</td>
</tr>
<tr>
<td>Metal (mainly steel)</td>
<td>350 tonnes</td>
<td>350</td>
</tr>
<tr>
<td>Brick &amp; block work</td>
<td>250 m³</td>
<td>400</td>
</tr>
<tr>
<td>Timber</td>
<td>250 m³</td>
<td>125</td>
</tr>
<tr>
<td>Glass</td>
<td>70 m³</td>
<td>172</td>
</tr>
<tr>
<td>Plasterboard</td>
<td>100 m³</td>
<td>75</td>
</tr>
<tr>
<td>Plastics</td>
<td>35 tonnes</td>
<td>35</td>
</tr>
</tbody>
</table>
## Reuse and recycling recommendations

<table>
<thead>
<tr>
<th>Product/ material</th>
<th>Current</th>
<th>Proposed uplift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>Recycle to fill material</td>
<td>Recycle to RCA and use in new concrete on site</td>
</tr>
<tr>
<td>Bricks</td>
<td>Recycle to fill material</td>
<td>No change</td>
</tr>
<tr>
<td>Stone cladding</td>
<td>Recycle to fill material</td>
<td>Reuse cladding</td>
</tr>
<tr>
<td>Glass</td>
<td>Recycle to fill material</td>
<td>Recycle back into glass</td>
</tr>
<tr>
<td>Metals</td>
<td>Recycle everything</td>
<td>Reuse &amp; recycle</td>
</tr>
<tr>
<td>Plastics (carpet tiles)</td>
<td>50% reuse, 50% recycle</td>
<td>Reuse 100%</td>
</tr>
<tr>
<td>Timber</td>
<td>Recycle &amp; temporary reuse</td>
<td>No change</td>
</tr>
<tr>
<td>Plasterboard</td>
<td>Recycle to form soil conditioner</td>
<td>No change</td>
</tr>
</tbody>
</table>
Data – still TBC

**What Data?**
- Products & materials used
- Supplier details
  - (Product data templates/passports)
- Design for Disassembly & Adaptability details
- Digital twin/Asset registers/pre-demolition/refurbishment audits (esp. existing assets)

**How to store/transfer it?**
- Digital (Building Information Model)
- Virtual > Physical (Deconstruction Plan)
- Physical > Digital (QR code)
- Physical (RFID tag/label)

**How to update it?**
- Digital (via Asset Information Model)
- Digital (via Supplier e.g. Material/Product passport)
- Virtual > Physical (FM Maintenance records, replacements, refurbishments)
Policy drivers ahead

**EU**
- Revision of Construction Product Regulation (CPR)
- Revision of Energy Performance in Buildings Directive (EPBD)
- Green Public Procurement (including mandating of Level(s))
- EU Taxonomy – technical criteria for circular economy
- CEN TC 350 & B558 – Sustainability of Construction Works - Sub-committee: Circular Economy in the Construction Sector

**UK**
- Extended Producer Responsibility
- England Waste Prevention Programme (consultation ended June 2021)
- Scotland & Wales Circular economy strategies > action
- Circular Economy Statement ‘ratcheting’ requirements - London Plan
- Green Public Procurement (CiH Value Toolkit)
Thanks for listening

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