Circularity in architecture

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Faculty of Architecture – University of Liège

- About 800 students
- 90 teachers
- 250 first-year students
- 2 sites

Botanique Site
Rue Courtois

Outremeuse Site
Boulevard de la Constitution

Laboratoire de culture numérique en Architecture
Laboratory of digital culture in Architecture

Main subjects

- **BIM** –European project BIM GAME – New e-learning methods in total collaboration to learn BIM through new technologies + **BIM coordinator certificate**

- **Modelling of spatial, temporal and semantic information** collected from 3D terrestrial **laserscan** (TLS) applied to Cultural Heritage. Modelling of spatiotemporal information collected from location-based networks. Development of **H-BIM** for an efficient management of built heritage information.

- **Parametric architecture** - Evolution of **methods** and the **use of digital design** tools to support design activities

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ULiège

Masters of architecture

September 2014- June 2019

Liège, Belgium

Technical University of Technology (TUT)

Erasmus exchange student

August 2017 – May 2018

Tampere, Finland

Master's thesis

Title: BIM "as-built" as a tool for decision-making between demolition or deconstruction

Supervisor: Sylvie Jancart

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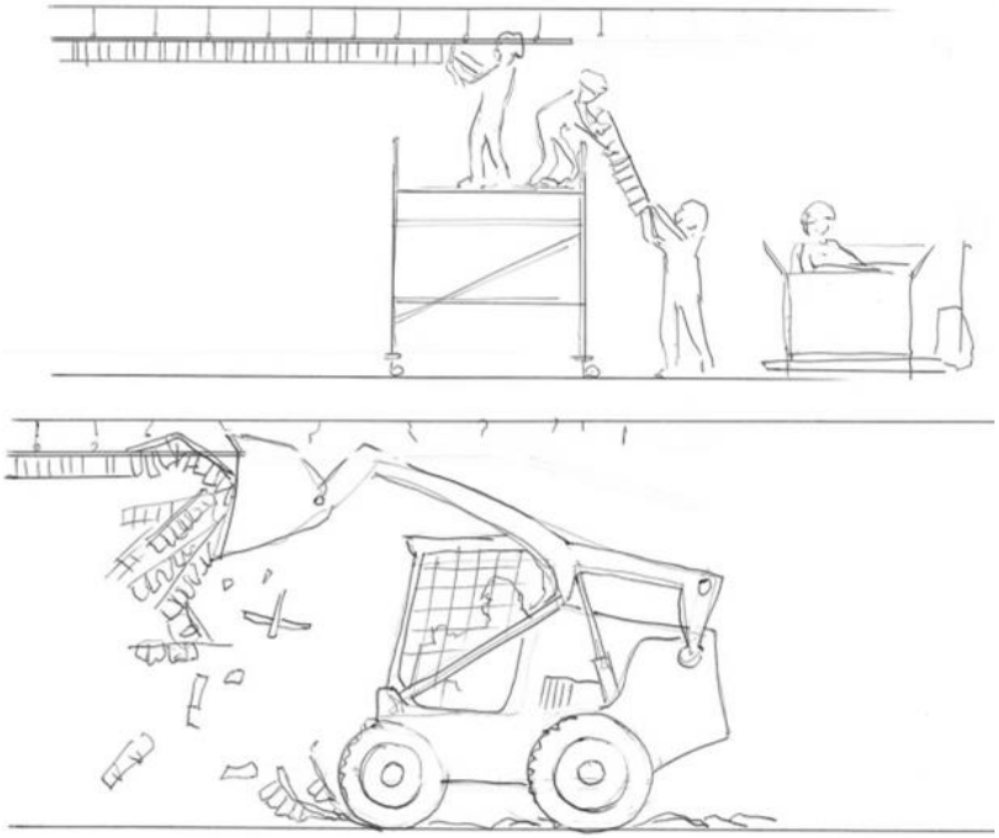
Construction vs demolition



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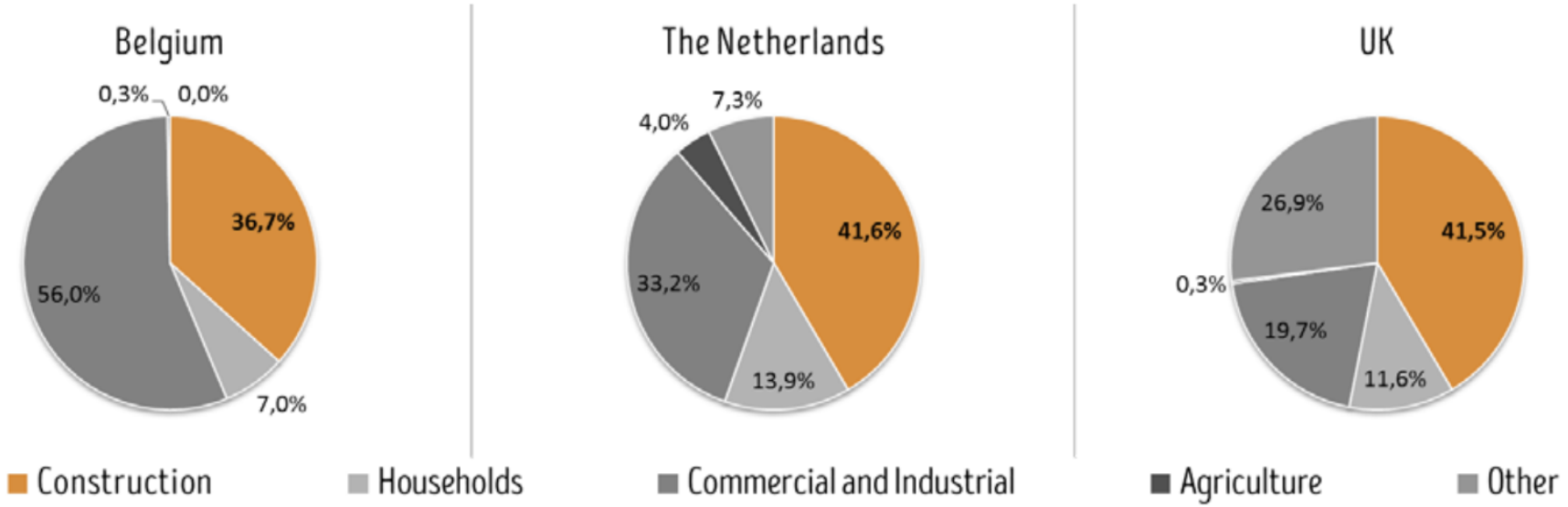
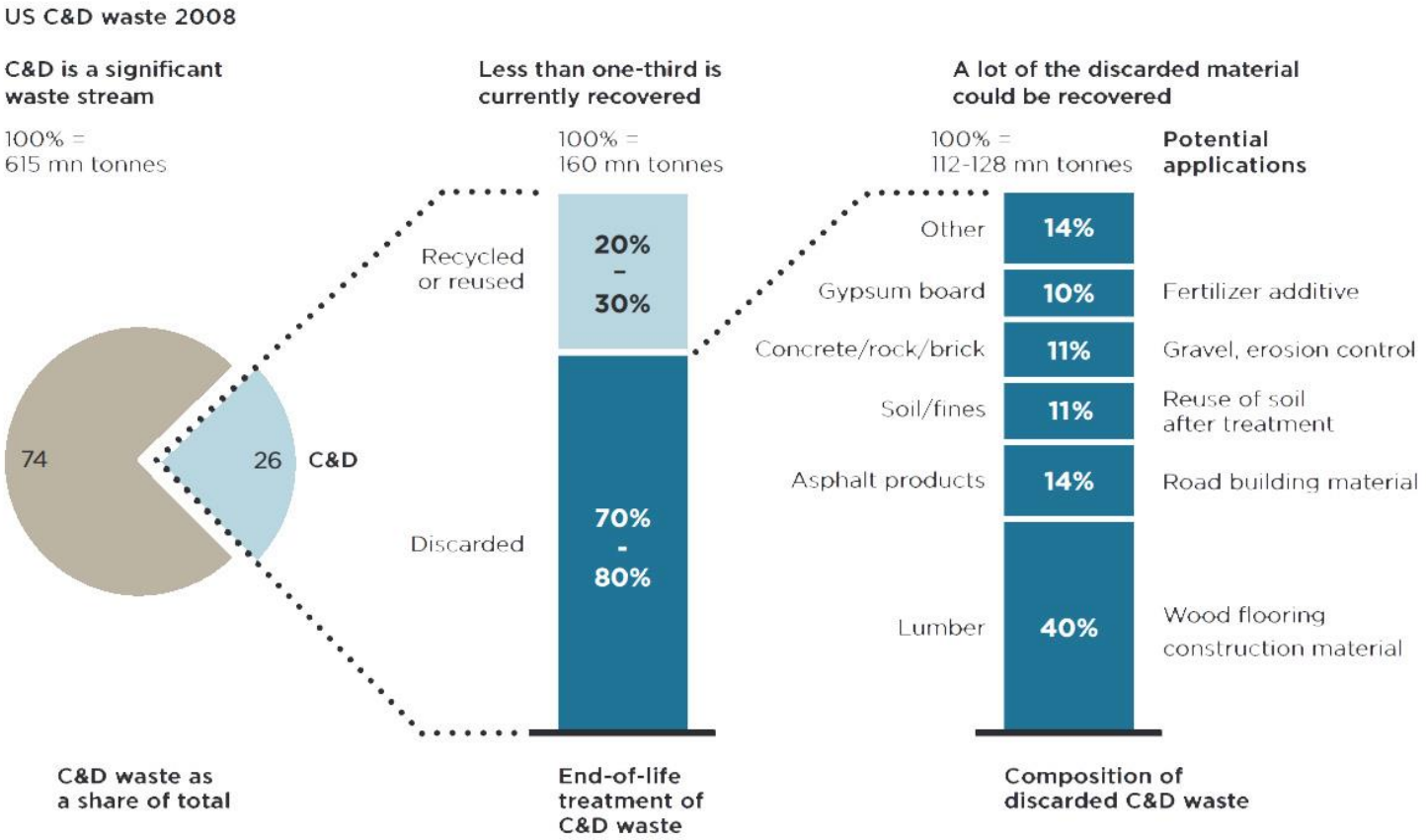
Waste production per sector



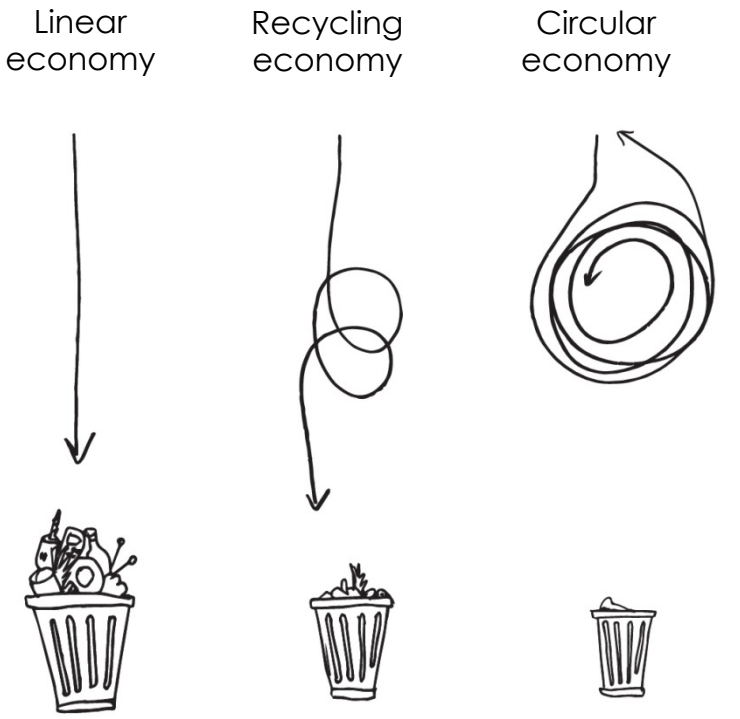
Construction and demolition waste: a noteworthy opportunity



How to avoid demolition waste?

©Pixabay

From linear to circular



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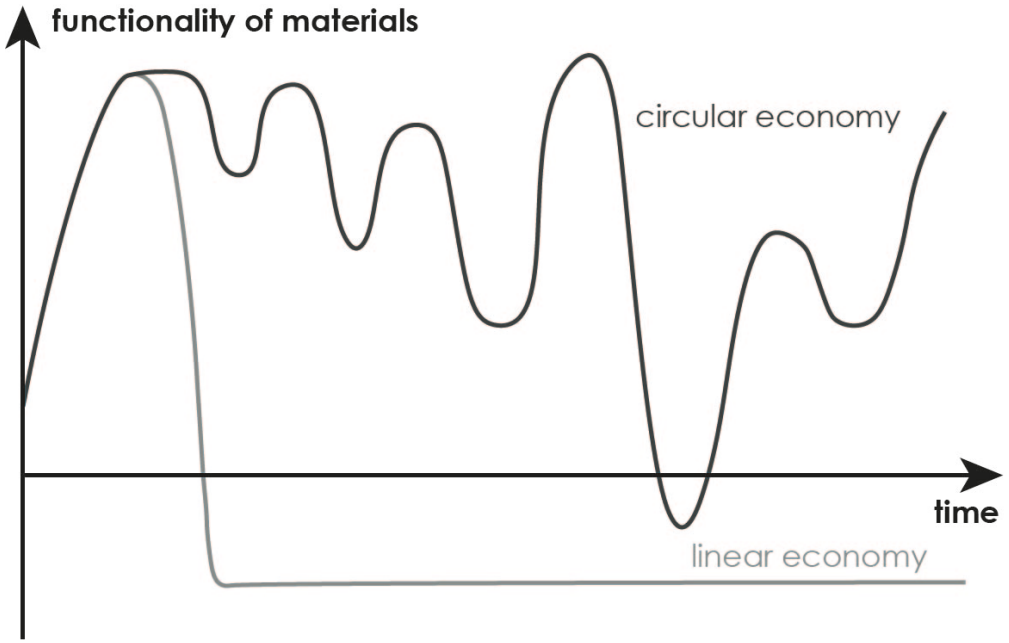
Influence of circular economy over time



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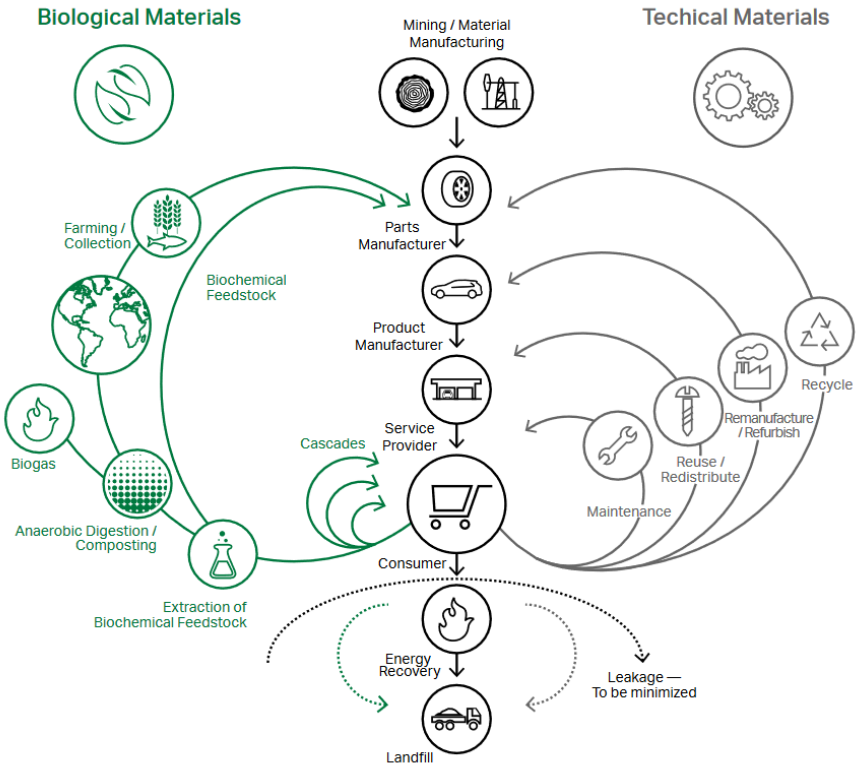
Circular economy: an industrial system that is restorative by design



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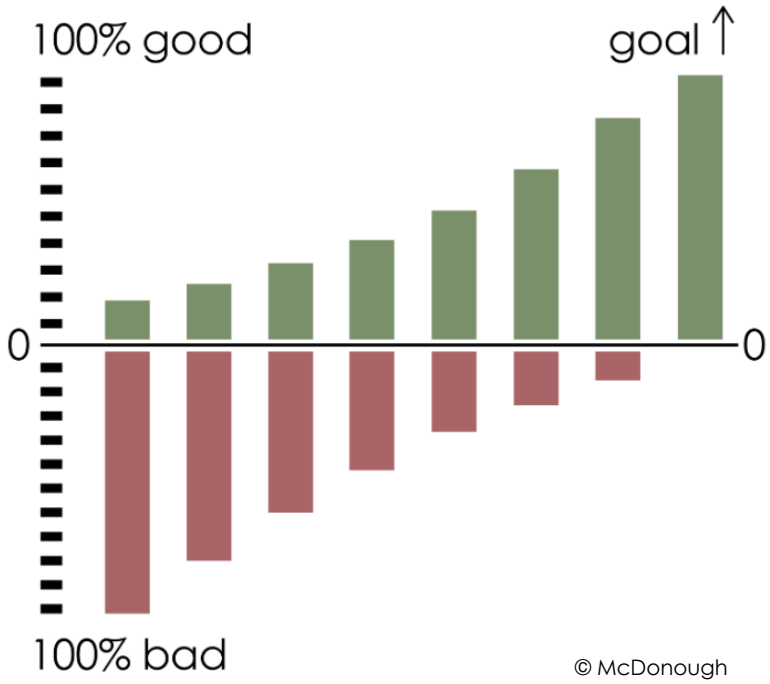
The upcycle chart



Circular economy in the building sector

Conception

Flexibility
Modularity
Normalisation

Materials

Local
Bio

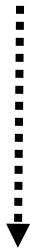
Construction processes

Waste management
Reuse

What is waste?

What is waste?

« Waste is material without identity »
Thomas Rau



If we give an identity to a material, it is no longer waste

Reuse of building materials

Existing materials

Future materials

OPALIS

BAMB
BUILDINGS AS MATERIAL BANKS

PLANETREUSE

HARVEST MAP
Marketplace for professional upcyclers

Second Use
BUILDING MATERIALS + SALVAGE

MADASTER

A LITTLE GAME

Is it circular?

Is it circular?

Using plastic bottles as bricks

Is it circular?

Waste House by BBM

© BBM

Is it circular? *Light as service in terminal buildings at Amsterdam Airport Schiphol*

©Philips

Is it circular? *The Green House in Utrecht*

© The green house, Utrecht

Is it circular?

Quality writing paper → photocoping paper → cardboard for packaging → tissue paper/toilet paper

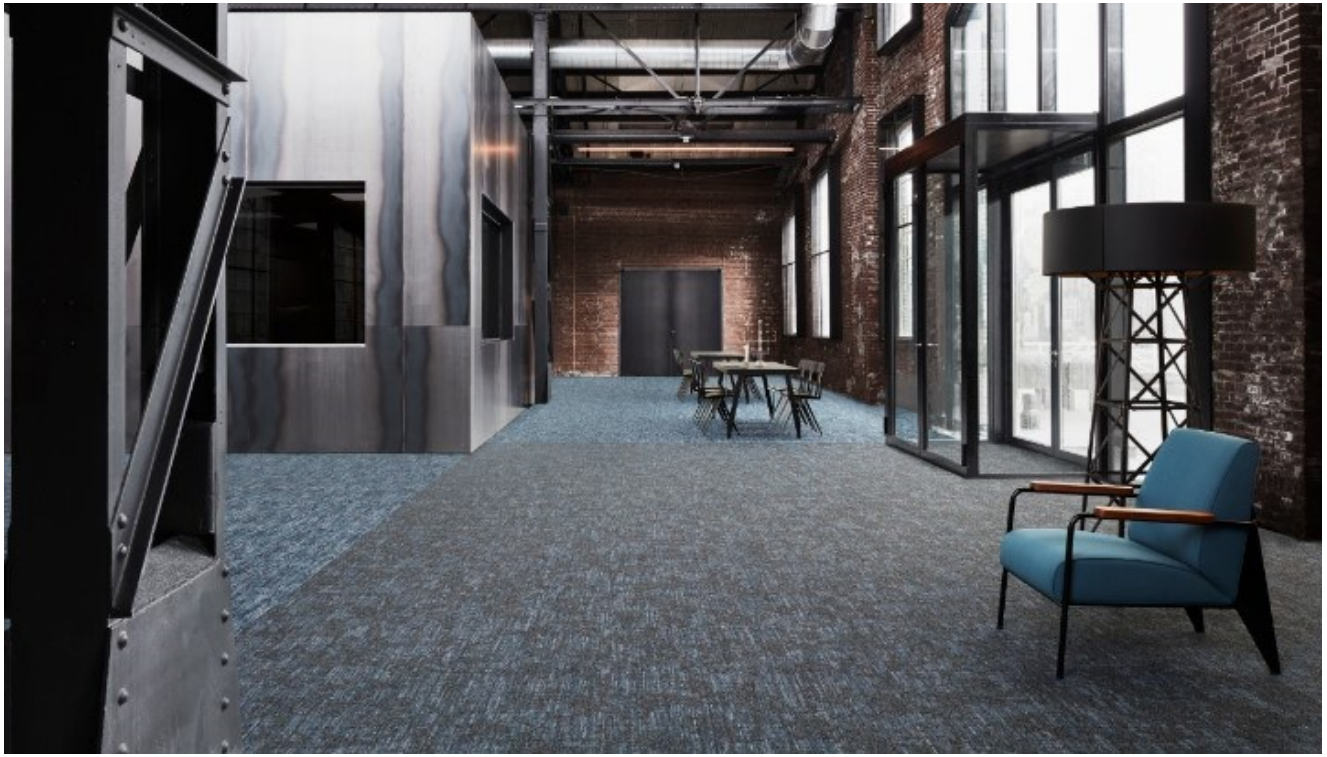



Is it circular?

Kamikatz Public House by Hiroshi Nakamura & NAP

© Hiroshi Nakamura & NAP

Is it circular? *Flow by Desso*



© Desso

Is it circular? *Think by Steelcase*

© Herman Miller

Is it circular?

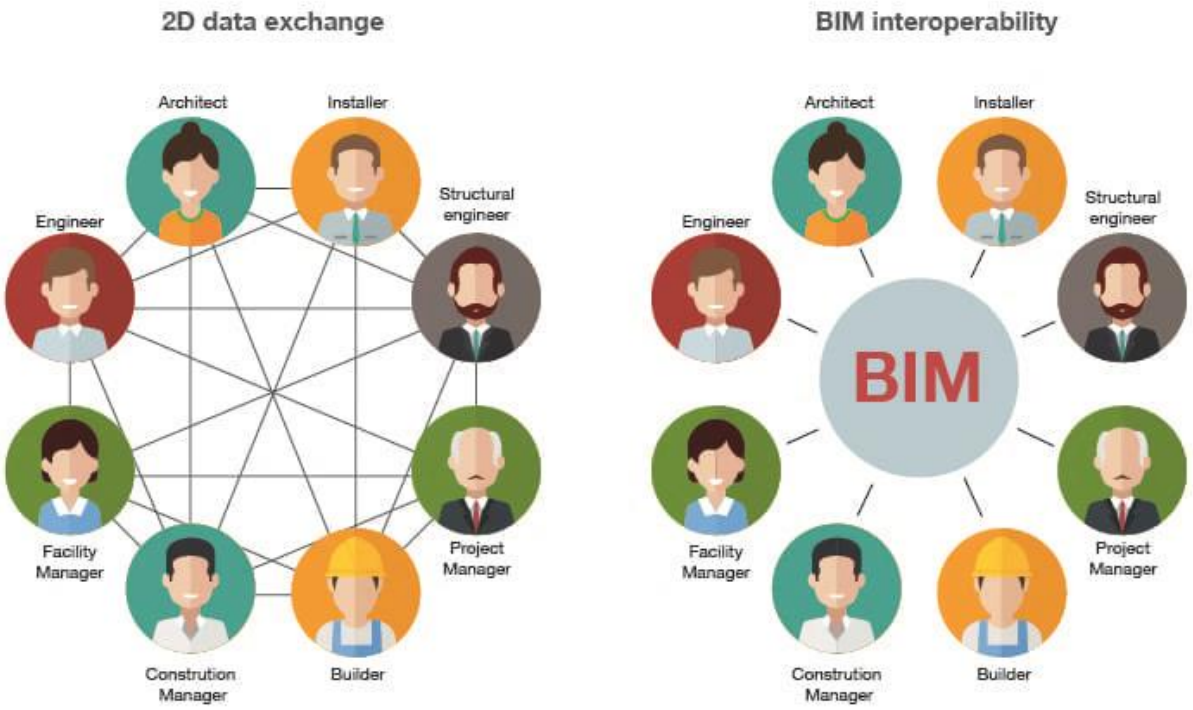
PIT lab Amsterdam by DOOR Architecten

© PIT lab

Is it circular?

...

Evolution of the way of working



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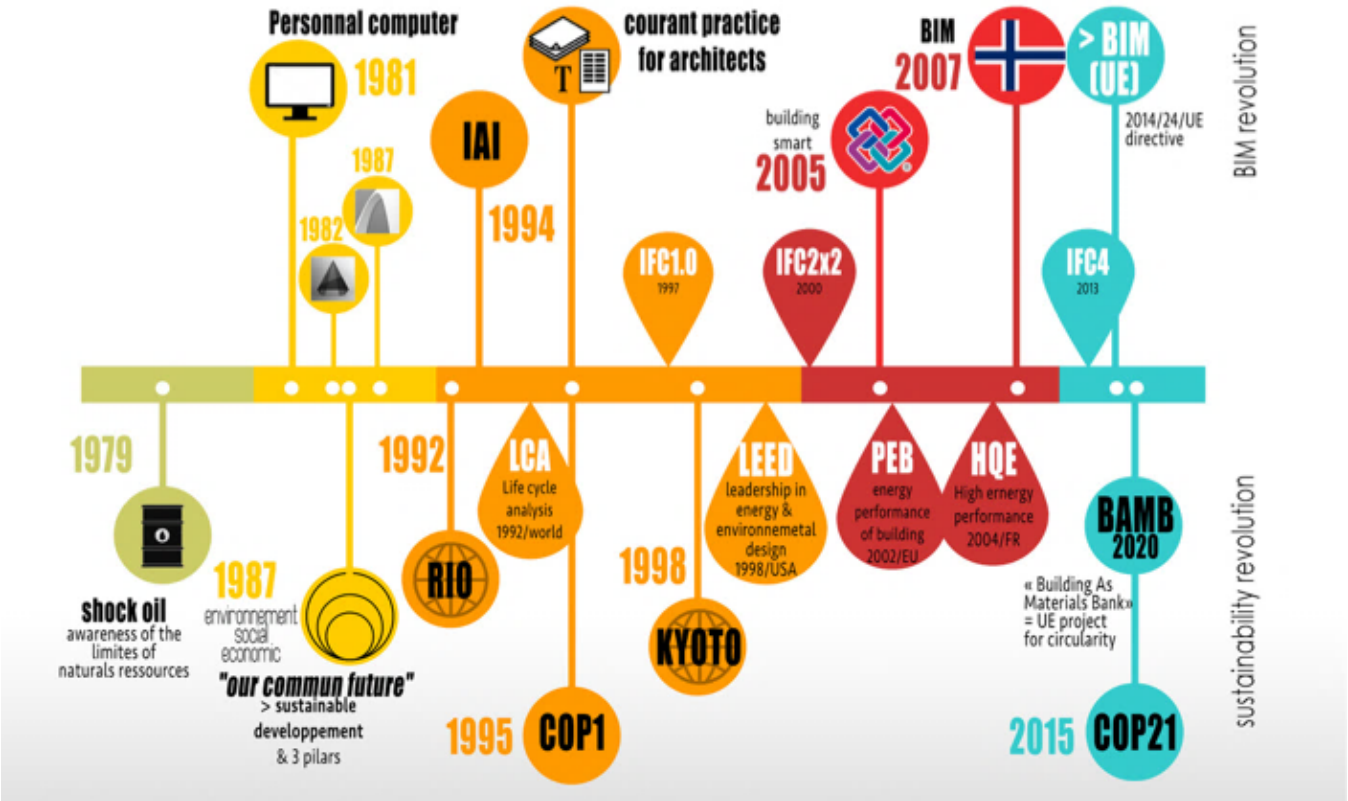
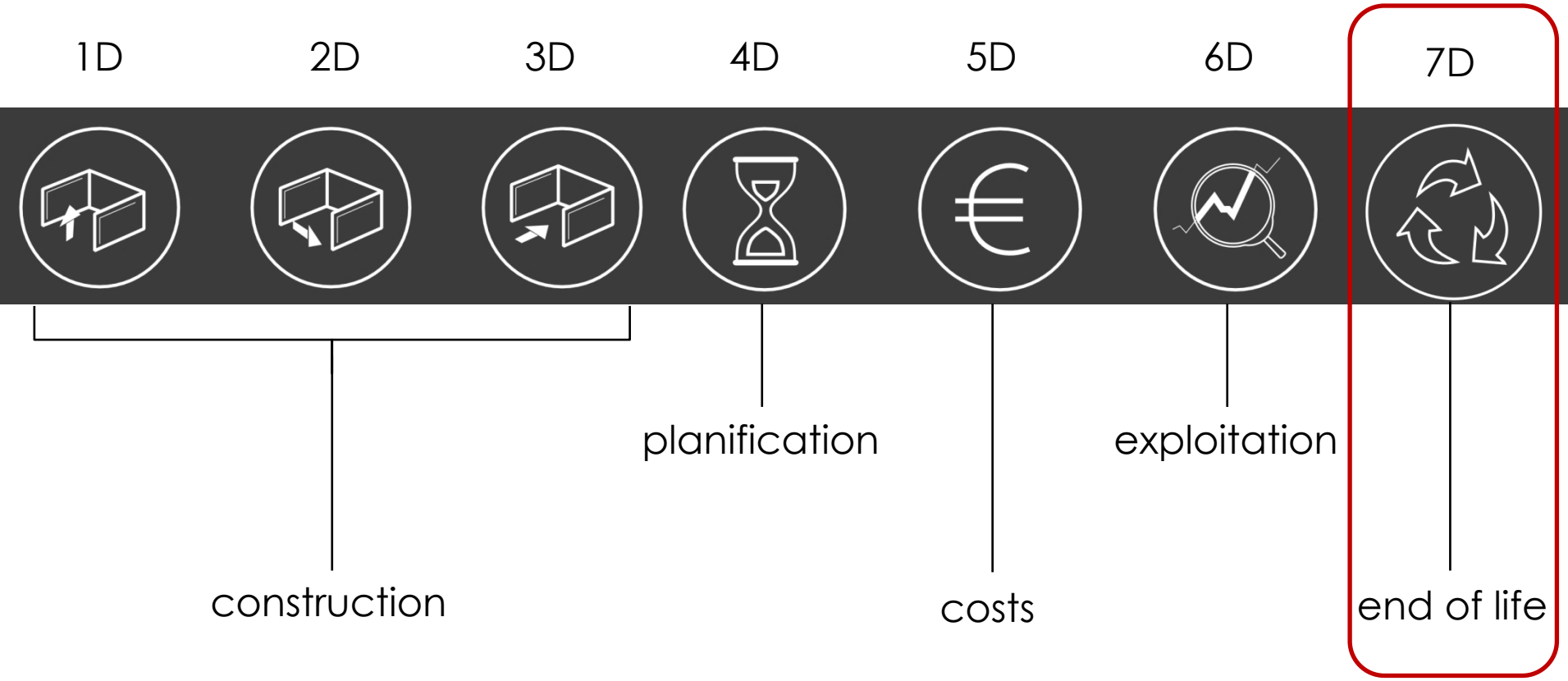
Timeline : evolution of BIM versus sustainable design



© Charlotte Dautremont

BIM 7D?


1D
2D
3D
4D
5D
6D
7D
construction
planification
costs
exploitation
end of life

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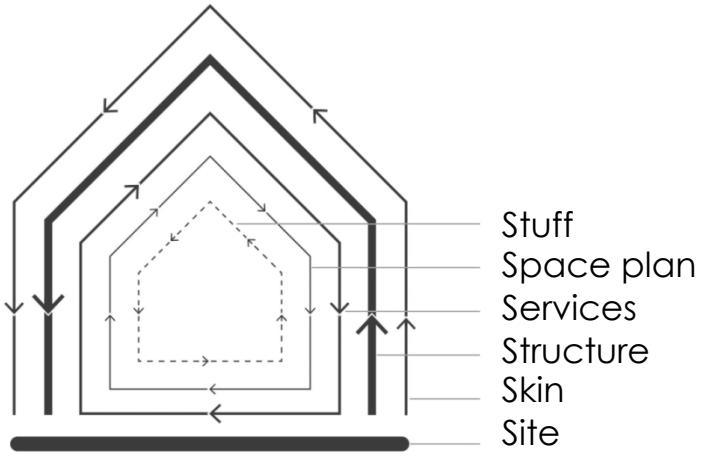
BIM “as-built" as a tool for decision-making between demolition or deconstruction

© Shu Wang, Amtateur Studio

Research questions

What? How much? Where?

- Documentation
- Identification
- Maintenance
- Security
- …



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Objectives of the survey

- Identify the challenges for architects
- Identify the offered solutions
- Identify the wished of the architects

The survey consists of four parts

1. General informations
2. Approach to circular economy
3. Use or non-use of BIM-technologies
4. Combination of BIM and circular economy

The survey consists of four parts

1. **General informations**

    - Size of the architecture office
    - In which region they practice
    - The principal contractors of their projects
    - The average size of your design projects in 2018
    - The number of projects they have in progress in the different development phases

2. Approach to circular economy
3. Use or non-use of BIM-technologies
4. Combination of BIM and circular economy

The survey consists of four parts

1. General informations
2. **Approach to circular economy**

    - Knowledge according to circular economy
    - Knowledge of the concept "Design for Deconstruction“
    - Recovered or reused building materials in new design, construction or renovation projects
        → If yes, how they have done it
        → If not, why they haven’t done it
    - What they think could help promoting the use of recycled materials

3. Use or non-use of BIM-technologies
4. Combination of BIM and circular economy

The survey consists of four parts

1. General informations
2. Approach to circular economy
3. **Use or non-use of BIM-technologies**

    - Knowledge of BIM
    - The use BIM-technologies
    - Advantages and disadvantages of BIM
    - How they save and share the information

4. Combination of BIM and circular economy

The survey consists of four parts

1. General informations
2. Approach to circular economy
3. Use or non-use of BIM-technologies
4. **Combination of BIM and circular economy**

    - Integration of information about recovered materials into a BIM model

        →If yes, how they have done it

        → If not, why they haven't done it
    - New skills and knowledge / new professions

Selection of the offices

- Applying the principles of circular economy:

  3XN Architects, Thomas Rau, William McDonough, SuperUse Studios, Epicuria Architects, Cepezed, DOOR Architecten, LIAG, Plekvoor, Samyn & Partners, Atelier 4|5, Alain Richard, V+, DDS+, ….

- Using BIM:

  Mecanoo Architecten, Cigler Marani Architecten, PLH Architecten, A-tract architecture, 8office, Jasper Eyers, B2Ai, VK Architects & Engineers, …

- Combining the principles of circular economy and the use of BIM:

  ???

Thank you!