#BAMBimpact

HOW - The BAMB tools and findings lay the foundation for a pathway towards a circular future

BAMB
BUILDINGS AS MATERIAL BANKS

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MAKING THE RIGHT DECISION FOR CIRCULARITY

BRE & SundaHus workshop

Gilli Hobbs | BRE

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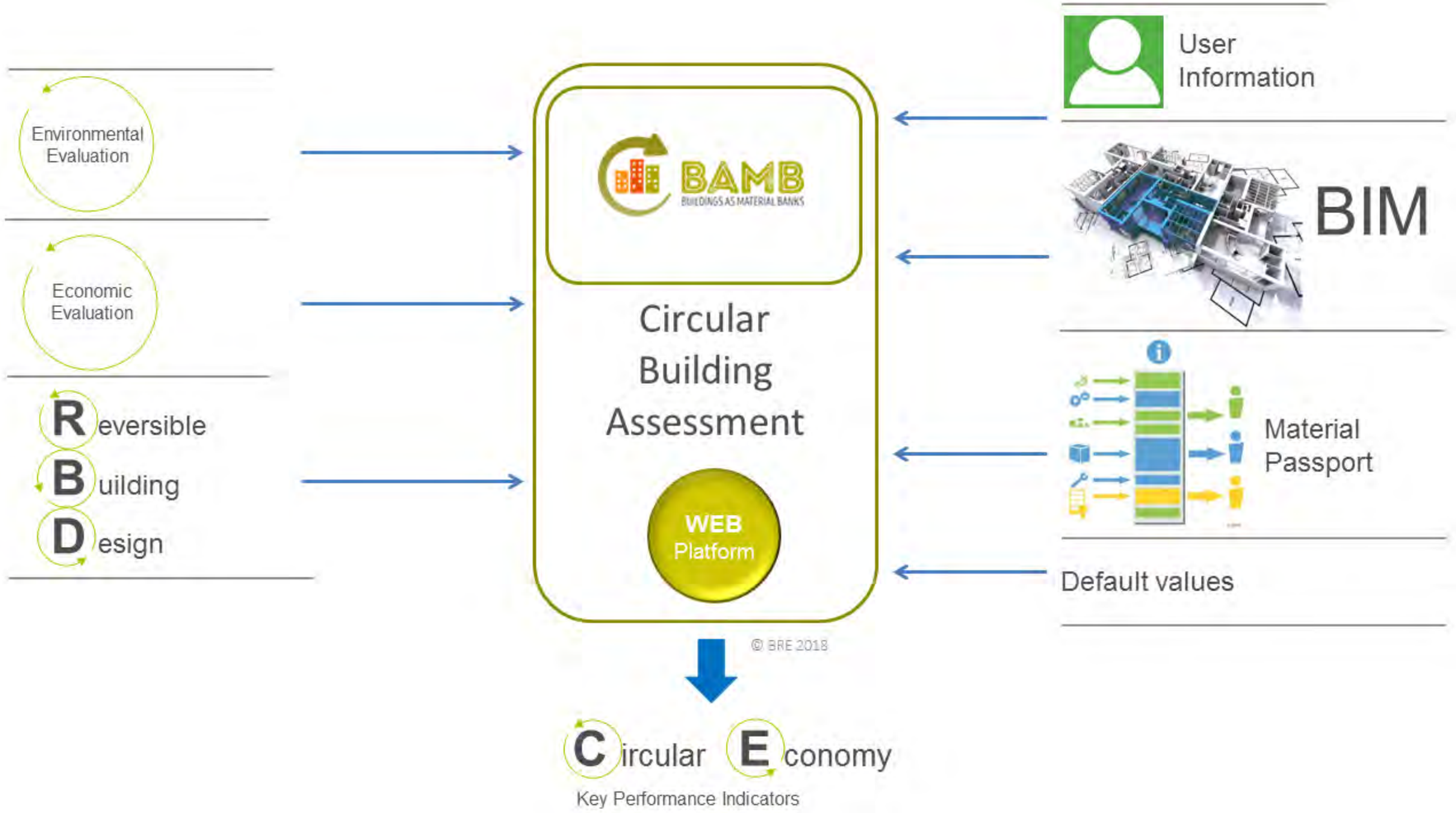
CIRCULAR BUILDING ASSESSMENT (CBA) - OVERVIEW



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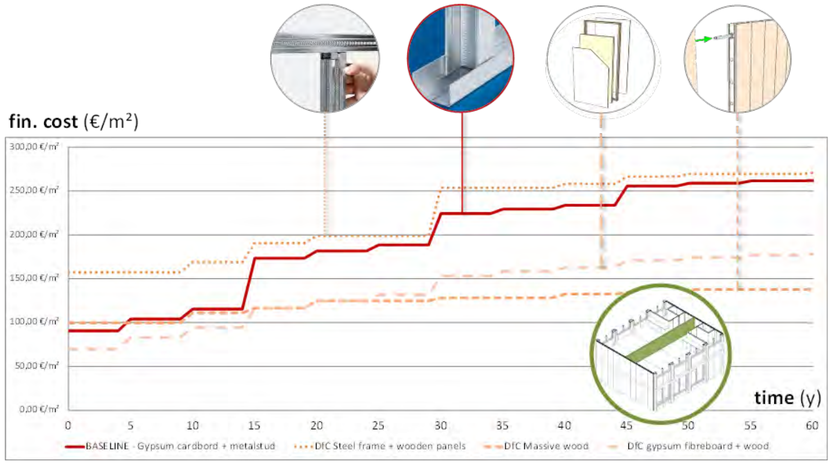
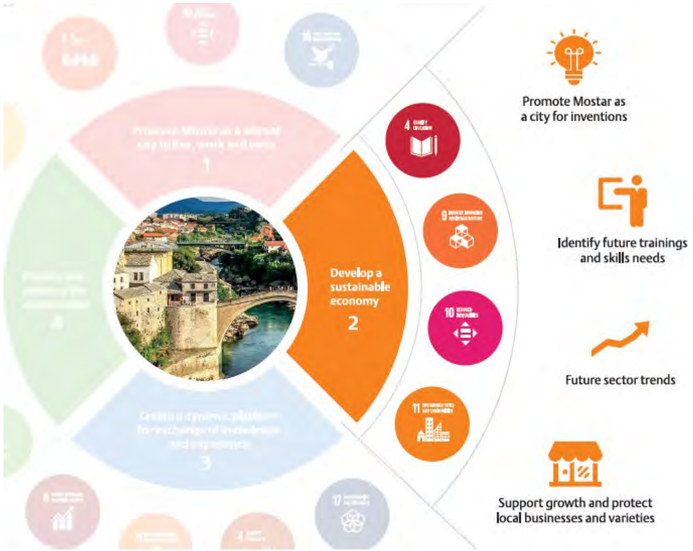
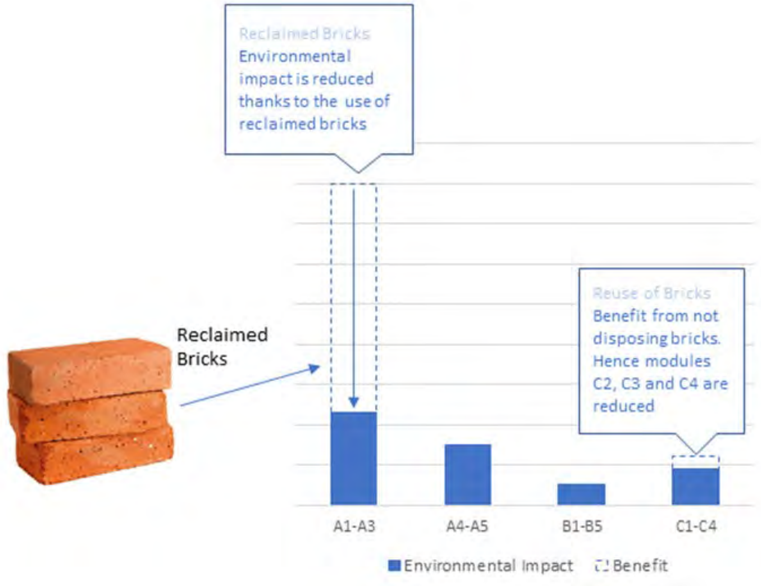
SUPPORT FOR DECISION MAKING



Economic



Social



Environmental

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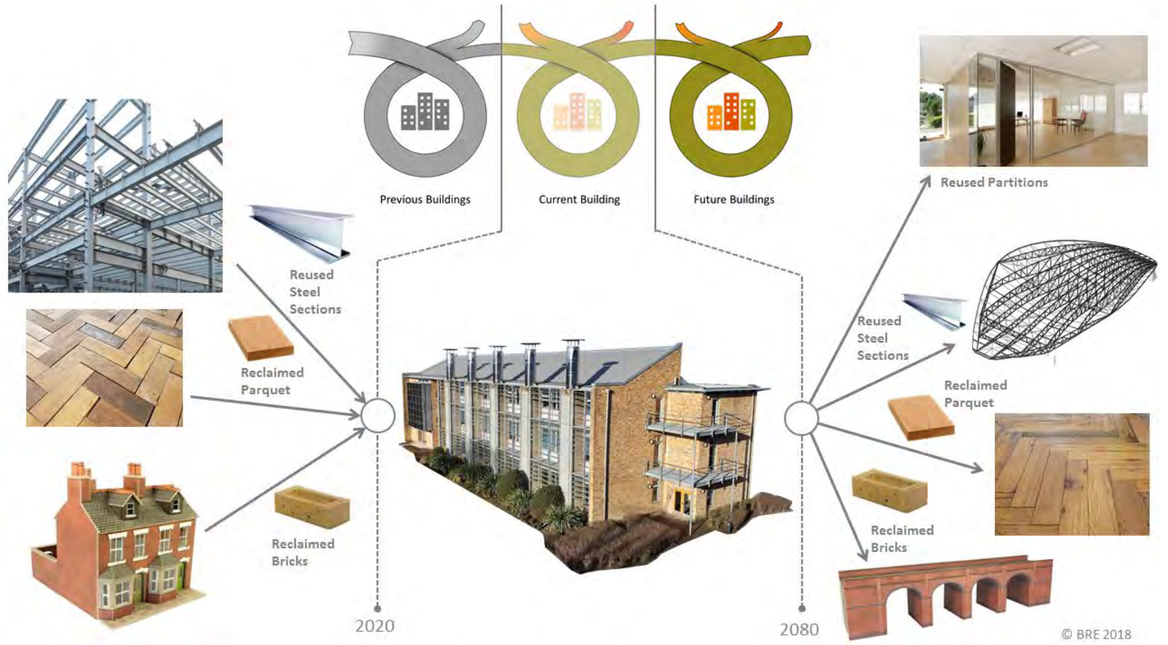
FIND OUT MORE & JOIN THE CONVERSATION...

- Client view - Heathrow Expansion
- Designer view - BRIC & BRE Env bdg
- New assessment methods
- BIM data integration
- CBA platform proof of concept
- User experience
- Further developments



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MATERIALS PASSPORTS

Making data on materials value for recovery and reuse available

Lars Luscuere - EPEA

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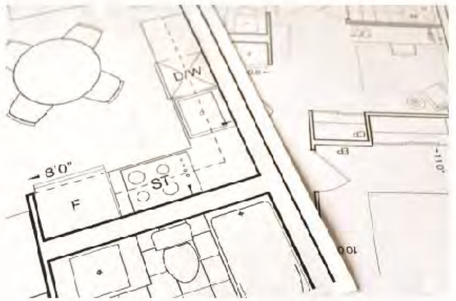
BUILDINGS AS MATERIAL BANKS

COMPANY
EPEA Nederland

PRODUCT
REMs
Reversible Experience Modules

Product features

+ Lorem Ipsum
+ Dolor sit amet
+ Consectetur adipiscing elit



MATERIAL HEALTH ASSESSED

REVERSE LOGISTICS IN PLACE

(PARTS) DESIGNED FOR BIOSPHERE

(PARTS) DESIGNED FOR TECHNOSPHERE

CONTAINS RENEWABLE CONTENT

CONTAINS RECYCLED CONTENT

Reuse Potentials

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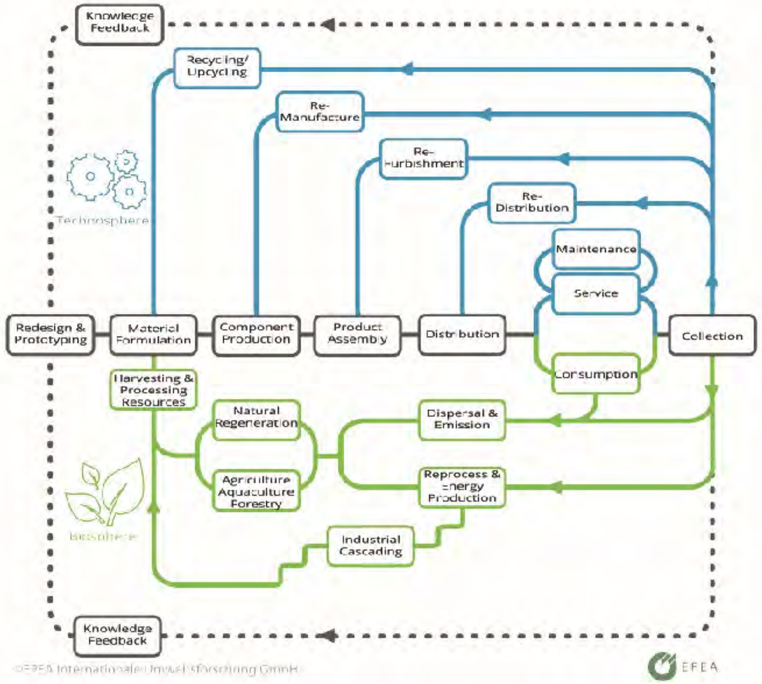

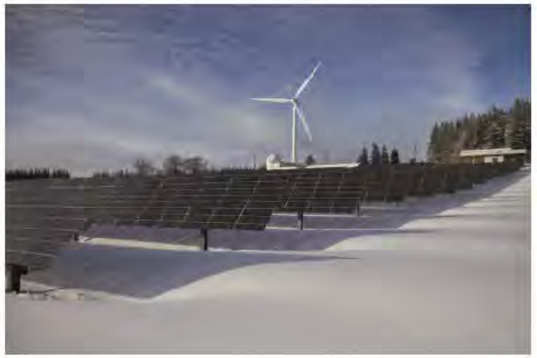

Product story

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Lars.Luscuere@epea.com

Lars Luscuere - EPEA

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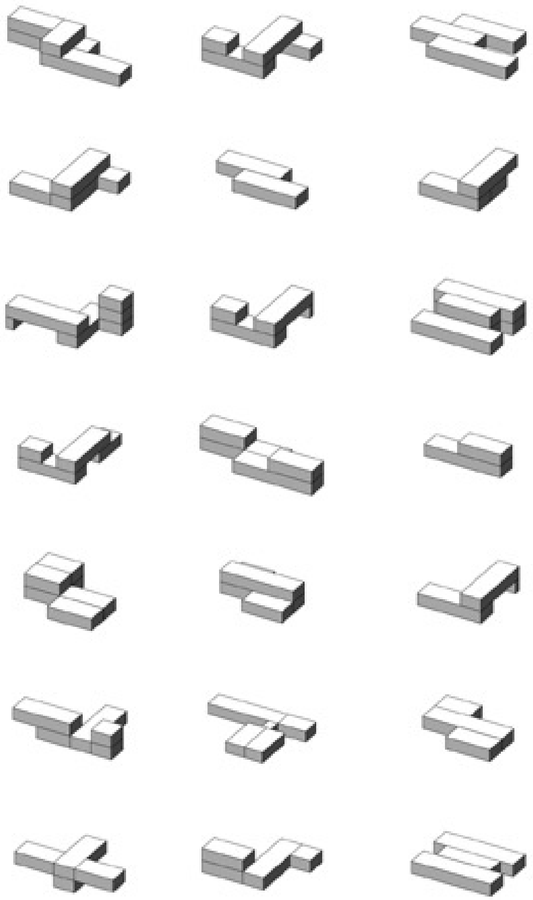
REVERSIBLE BUILDING DESIGN TOOLS AND PROTOCOLS

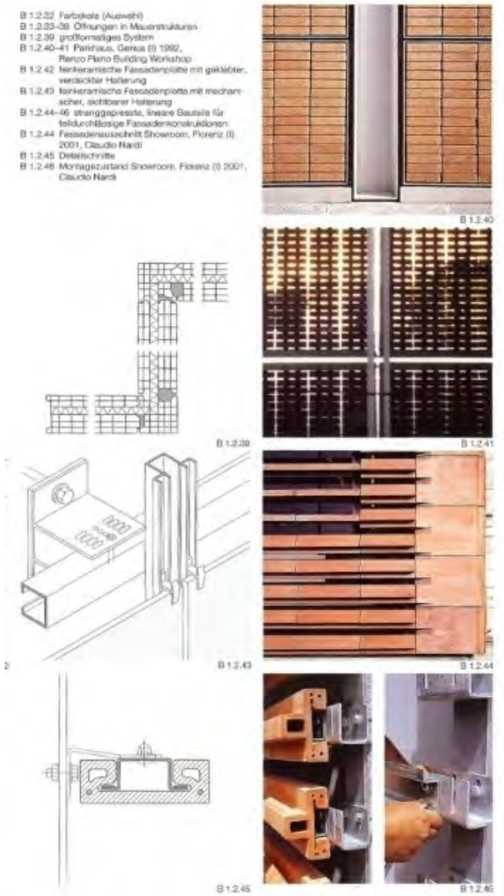
Opening the door to circular construction

Dr. Elma Durmisevic, University of Twente, 4D architects

Co-funded by the Horizon 2020 Framework Programme of the European Union

REVERSIBLE BUILDINGS





Paradigm Shift towards Circular Buildings and Economy

Elma Durmisevic, Head of the research EU Horizon 2020/BAMB Revisable Buildings
University of Twente / 4D architects

Co-funded by the Horizon 2020 Framework Programme of the European Union

Reversible Building Design Toolkit

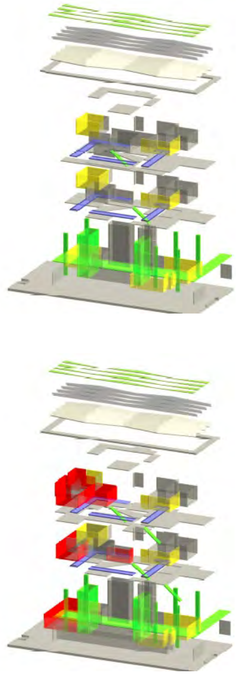
- Reuse potential product level
- Transformation capacity building level
- Virtual simulator
- REVERSIBLE BUILDING DESIGN protocol

Technical Reversibility

Separate materials

Reconfigure structure

Spatial Reversibility



Adapt

Elma Durmisevic, Head of the research EU Horizon 2020/BAMB Revisable Buildings
University of Twente / 4D architects

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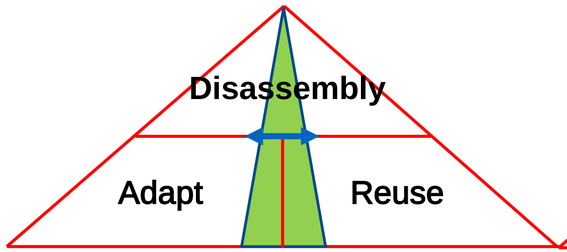
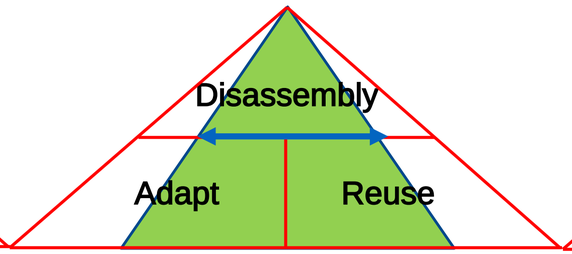
REVERSIBLE BUILDING DESIGN/FRAMEWORK

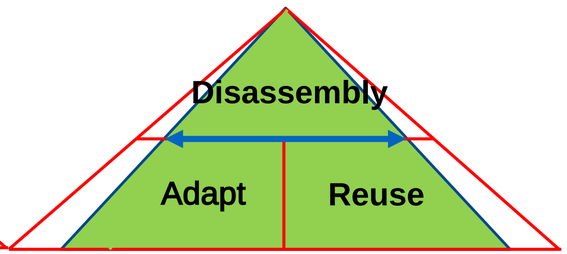
Reversible Building **Reuse Potential**

Low reversibility

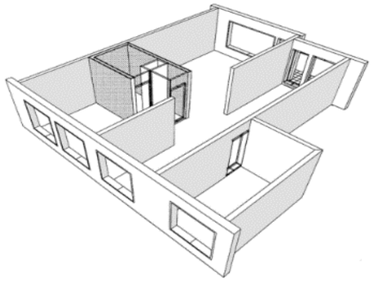




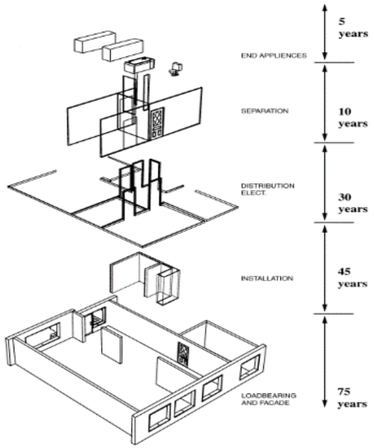
High reversibility



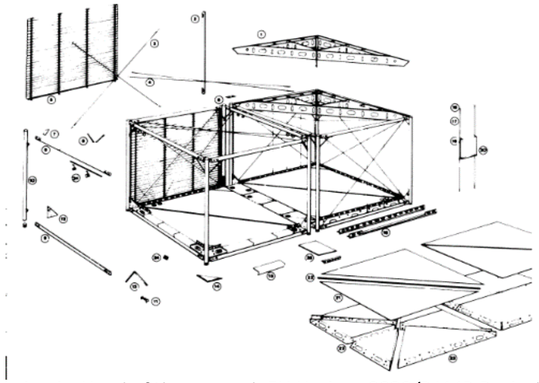
1 Irreversible structure



2 Partly reversible



3 Reversible structure



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University of Twente / 4D architects

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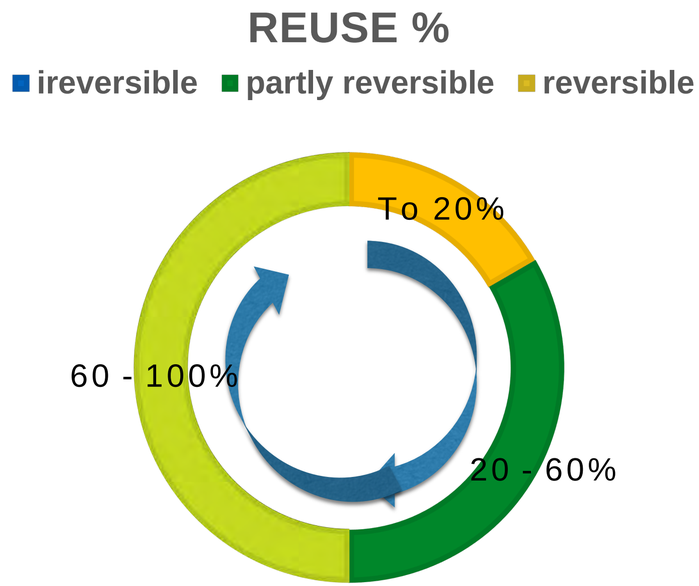
CATEGORIES OF REVERSIBLE STRUCTURES

in relation to the type of material composition:

IREVERSIBLE
if RP indicates that a system has **RP < than 0,3** these systems will be characterised as irreversible and **the end of life options** = **RECYCLING/DOWN CYCLING**.

PARTLY REVERSIBLE
If system has **RP> 0,3 and RP < 0,6 end of life options** =**REPAIR, DIRECT REUSE, REMANUFACTURING**.

REVERSIBLE
If system has **RP > 0,6** this would mean that besides **DIRECT REUSE AND REPAIR** of its parts the system can be **RECONFIGURED AND UPGRADED** and its **dimensions adjusted to fit new requirement**.



Elma Durmisevic, Head of the research EU Horizon 2020/BAMB Revisable Buildings
University of Twente / 4D architects

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REVERSIBLE BUILDING INTEGRATED VIEW

Building level transformation + material composition:

Elma Durmisevic, Head of the research EU Horizon 2020/BAMB Revisable Buildings
University of Twente / 4D architects

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Dr. Elma Durmisevic, University of Twente, 4D architects

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TURNING BAMB SOLUTIONS INTO VALUE FOR YOUR BUSINESS

IBM & VITO workshop

Martijn Peters | IBM

Co-funded by the Horizon 2020 Framework Programme of the European Union

APPLYING REVERSIBLE BUILDING DESIGN PRINCIPLES FOR COMMERCIAL BUILDINGS

"WHY INVEST IN A REVERSIBLE BUILDING DESIGN?"

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MATERIAL PASSPORTS APPLIED FOR REUSING STEEL STRUCTURES (UK)

"CAN MATERIAL PASSPORTS LOWER FINANCIAL BARRIERS FOR STRUCTURAL STEEL RE-USE?"

..... next use?

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MARKET SIZE OPPORTUNITY FOR REUSE

"WHAT IS OR WILL BE THE SIZE OF THE PIE"

disclaimer - unfortunately we will only talk about it

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Martijn Peters | IBM

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POLICY RECOMMENDATIONS

Supporting the sector through policy in order to make circularity b
usiness as usual

Molly Steinlage - Brussels Environment


N
S
W
220
200
240
260
280
300
320
340
0
20
40

- Josefina Lindblom, DG Environment - *Level(s)*
- Philippe Van de Velde, Public Waste Agency of Flanders (OVAM) - *Tracimat*
- Mervyn Jones, Rijkswaterstaat, Netherlands - *Purchasing and Procurement Rules*
- Matti Kuittinen, Ministry of the Environment of Finland - *Finish Roadmap to a Circular Economy*

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Molly Steinlage - Brussels Environment

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BAMB PILOT PROJECTS

Learning by doing - circular architecture tested at real scale" at BAMB´s final event
SBE19 Brussels - BAMB-CIRCPATH

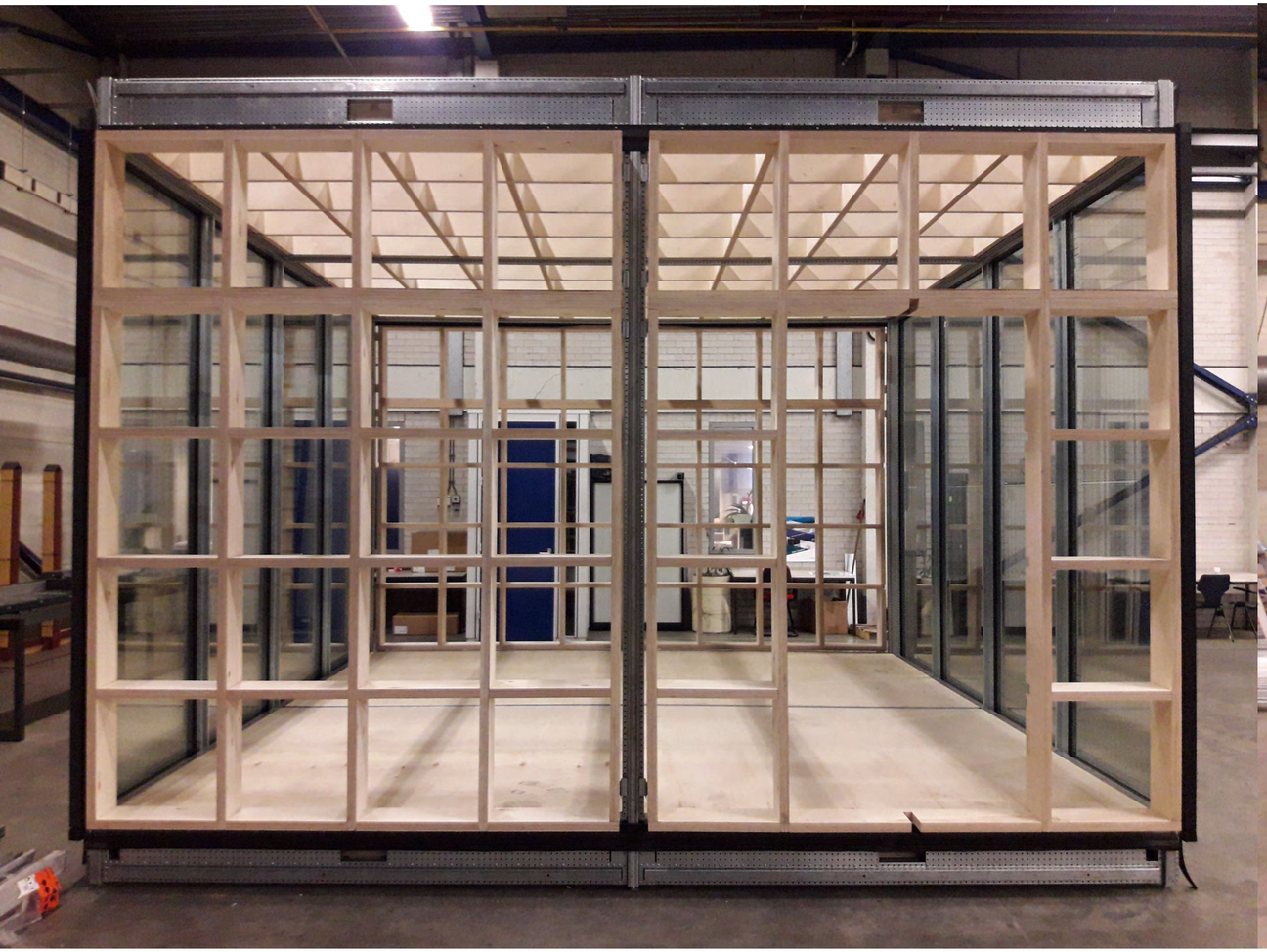
Teodora Capelle| Bruxelles Environnement

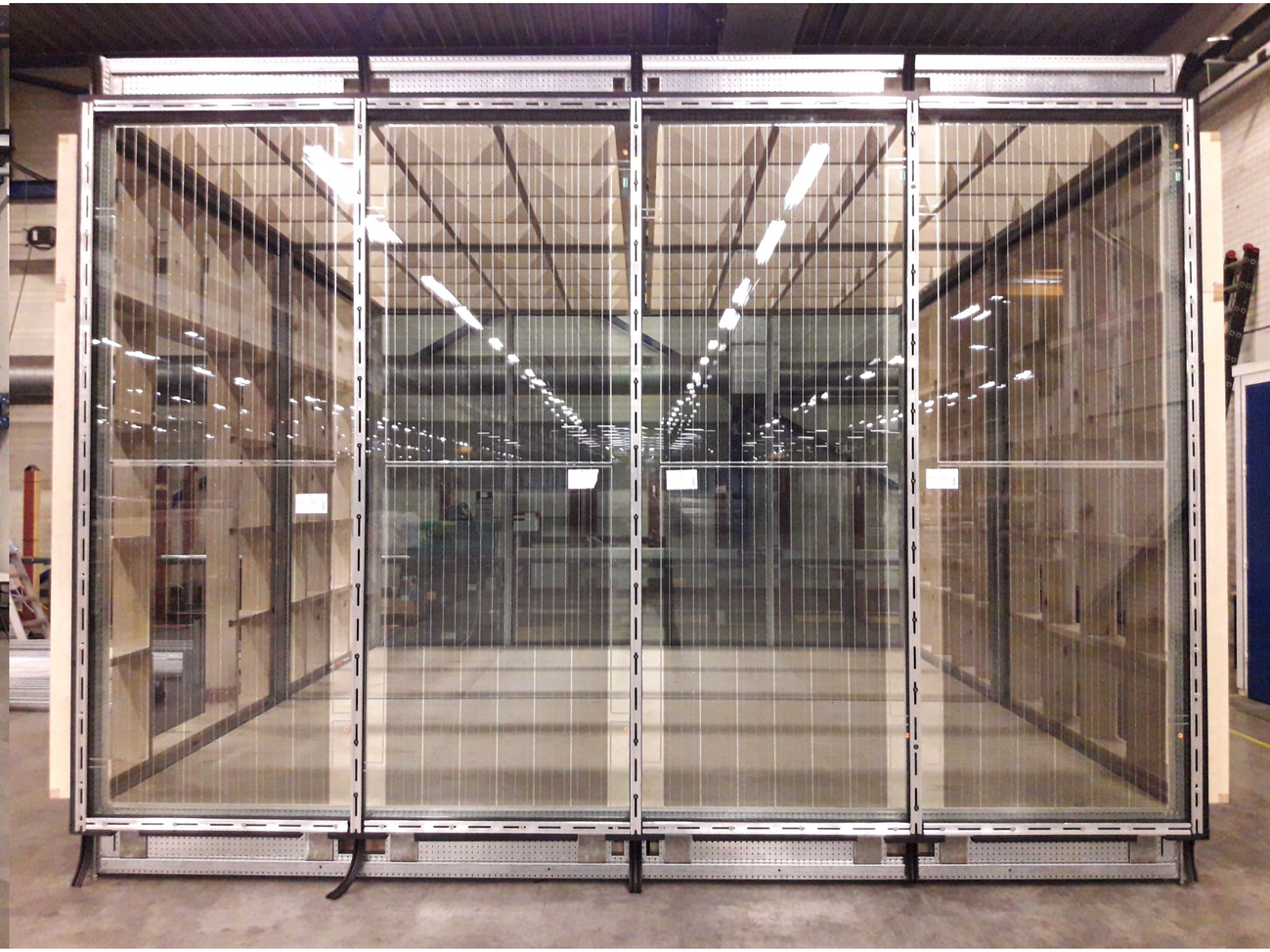
BUILD REVERSSIBLE IN CONCEPTION (BRIC)
BRUSSELS

CIRCULAR RETROFIT LAB (CRL)
BRUSSELS

REVERSIBLE EXPERIENCE MODULES (REM)
TRAVELLING

GREEN TRANSFORMABLE BUILDING LAB (GTB LAB)
NETHERLAND





INCREASE AND EXTEND VALUE OF MATERIALS

RESHAPE THE DESIGN APPROACH

REDISTRIBUTION OF ROLES

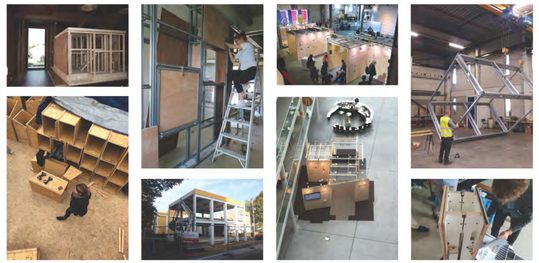
SHARE INFORMATION ACROSS PROCESSES, TIME

GATHER INFORMATION FOR FUTURE ASSESSEMENT TOOL

BUILDINGS AS MATERIAL BANKS

D14 – 4 pilots built + Feedback report 28.02.2019

TESTING BAMB RESULTS THROUGH PROTOTYPING AND PILOT PROJECTS



1. BUILDINGS AS MATERIAL BANKS

1.1. A SYSTEMIC APPROACH

Designing buildings as repositories of valuable materials is a concrete contribution towards the development of a circular construction industry. The *"Buildings as Material Banks" H2020 innovation project* has provided **practical** answers for **the preservation of raw materials and the implementation of waste reduction strategies and solutions**. The project has identified actions along the construction industry processes and given in-depth insights into the necessary **changes within the value chains** to support the **circular economy transition**.

The Buildings as Material Banks project has contributed to the creation of a new culture of "**recovery, re-use, and upcycling**". The team developed protocols for **reversible building design**, addressing different layers ranging from materials through components to buildings.

The project seizes the opportunities offered by digitalization through the development of more than **300 material passports** and by creating a **Circular Building Assessment** tool.

Materials Passports are electronic and inter-operable data sets that collect characteristics of materials and assemblies. They enable building stakeholders to better capture the value of products they use by extending their life span.

The Circular Building Assessment tool assesses the transformation capacity, and reuse potential of buildings. It allows efficient data management at project level to generate optimal decision-making models for the stakeholders.

The research process developed during the project has provided insights into **how policies and standards** can shape the systemic shift. It helped identify new **needs and opportunities for emerging businesses** in the industry.

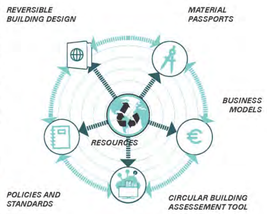


Figure 1: Towards a circular construction ecosystem Building as Material Banks Horizon2020 Innovation project

1.2. PILOT PROJECTS

In order to maximize BAMB's innovation potential, dissemination impact and stakeholder involvement, six pilot projects tested and demonstrated the project outputs in various settings.

The pilot projects investigate and demonstrate new design approaches to making buildings more flexible throughout their life. From the first phase, they focus on manufacturing to increase the quality of materials and products, on construction and maintenance, as well as on the re-design potential of the building.

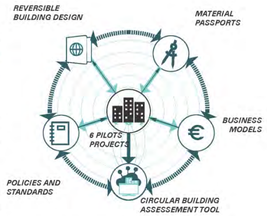


Figure 2: Articulation of the pilots projects around the Building as Material Banks Horizon2020 Innovation project major topics

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 642384.

BRIC 4.4. BUILD REVERSIBLE IN CONCEPTION BRIC)

CONSTRUCTION DRAWINGS: AS BUILT PLANS (OF EACH TRANSFORMATION/RELOCATION).

4.4.1. DESIGN APPROACH

REVERSIBILITY

Constructed during the 2017-2018 academic year, the first version of BRIC building has been deconstructed in winter 2018. Designed for two successive re-assemblies and dis-assemblies, the project included transformation scenarios for BRIC2 and some incipient idea about BRIC3. Several key strategic criteria were identified:

- each construction has different volume and function
- all the successive buildings use the same materials and maximize their reuse potential
- screwed together or interlocked connections create the opportunity to recuperate, sell, re-use materials after the end of the project
- circularity has been adressed at various levels: building, spatial, system, element and material level

SUSTAINABLE BUILDING

The project combines building circular solutions for reducing waste and minimising environmental impacts, with the aim to close energy and material loops. It challenges the entire value chain. The project tackles topics such as local supply, energy efficiency, and closing urban hydrologic cycles.

WOOD AS AN INTRINSICLY CIRCULAR RESOURCE

The BRIC project used bio-based and renewable materials with a focus on wood and wooden derivatives. Characterized by its specific "texture, structure, flexibility, and tension"[4] , the wood take multiple shapes, provide re-usable and upgradable products, etc. Timber and wood-based products were used to replace petrochemical and mineral-based construction materials. This reduces natural resource depletion. Within the production phase, the wood demands little energy consumption compared with other products. Moreover, wooden materials sequester carbon, contributing to the long-term storage of atmospheric carbon dioxide. Hence, they offer an additional measure to mitigate Greenhouse Gases Emissions. Light and resistant, with insulating properties and the ability to regulate humidity, timber is an important resource for circularity.

Figure 15:BRIC 1, facades

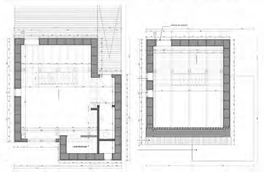


Figure 16:BRIC 1 plans

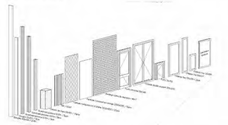


Figure 17:Inventoriesand reuse strategy for BRIC 2

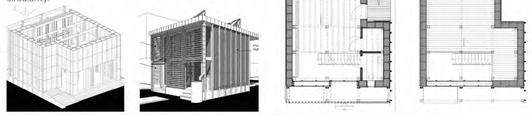
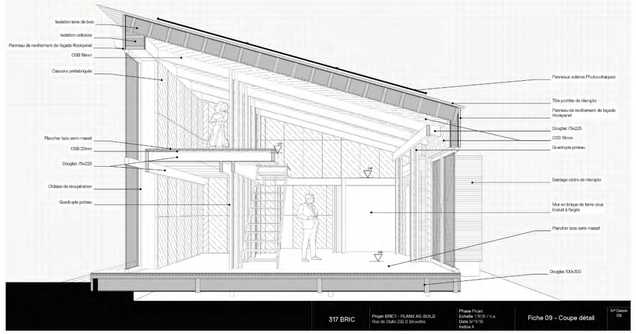


Figure 14:projet BRIC 2, axonometric views (insulation boxes and finishing), groundfloor plan and second floor plan

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 642384.

BRIC 1



BRIC 2

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 642384.

TESTING BAMB RESULTS THROUGH PROTOTYPING AND PILOT PROJECTS REPORT

28.02.2019

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Teodora Capelle| Bruxelles Environnement

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Coffee Break

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Parallel sessions – PART I : Explore the BAMB tools and results for your business and industry

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Lunch

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Parallel sessions – PART II : Explore the BAMB tools and results for your business and industry

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Coffee Break

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What did you say?