

Open session: Circularity in the construction sector



Examples of good practices



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the construction industry represents

6%

of global GDP

85%

the expectation
of growth by 2030



1st

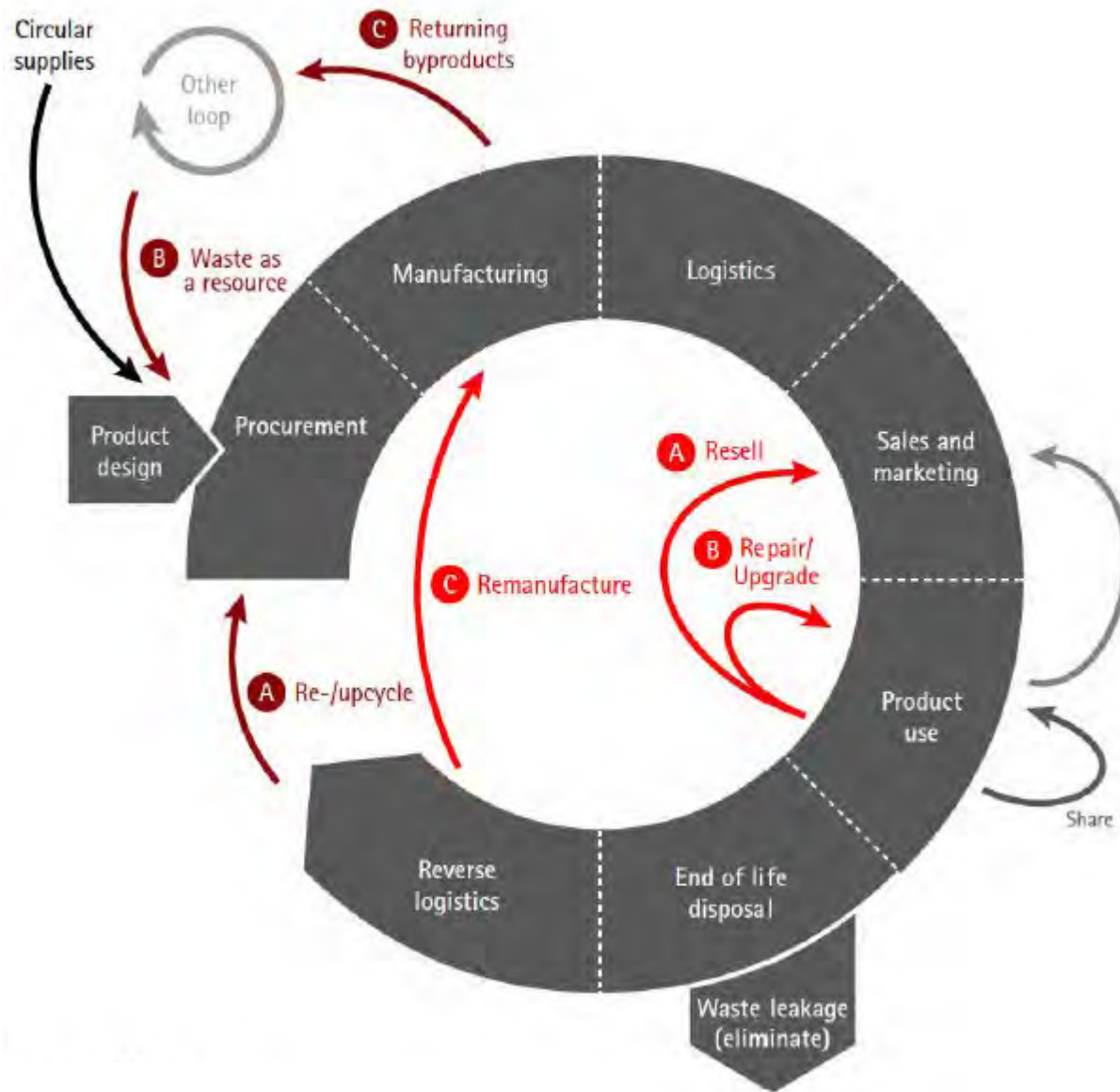
consumer of raw materials
in the world, or

3 billion

tonnes of raw materials
consumed each year

50%

of global steel
production



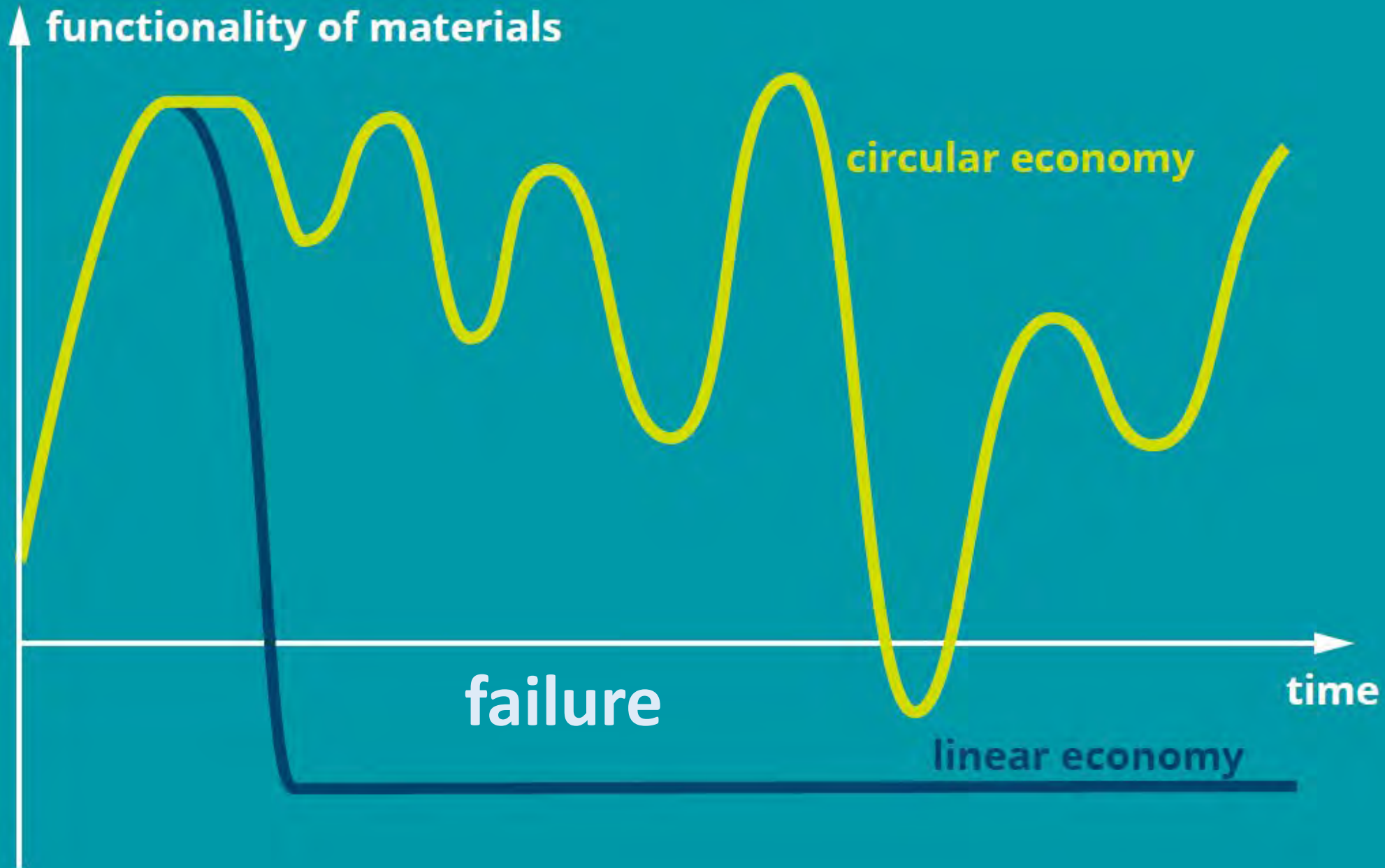
Business Models

- Circular Supply Chain**
 Provide renewable energy, bio based or fully recyclable input material to replace single-lifecycle inputs
- Recovery & Recycling**
 Recover useful resources/energy out of disposed products or by-products
- Product Life Extension**
 Extend working lifecycle of products and components by repairing, upgrading and reselling
- Sharing Platform**
 Enable increased utilization rate of products by making possible shared use/access/ownership
- Product as a Service**
 Offer product access and retain ownership to internalize benefits of circular resource productivity

BUILDINGS



Product life extension

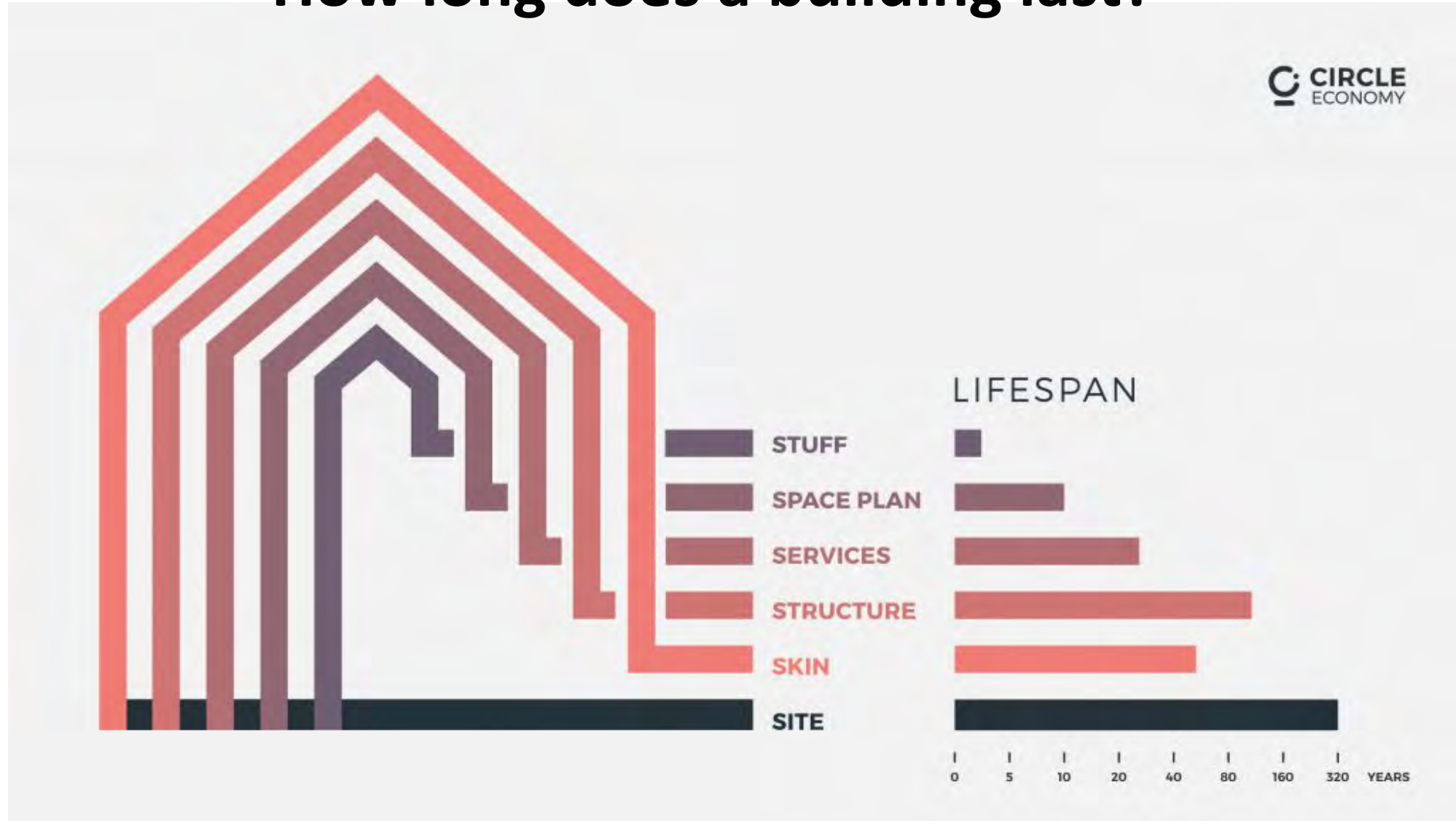


Building failure

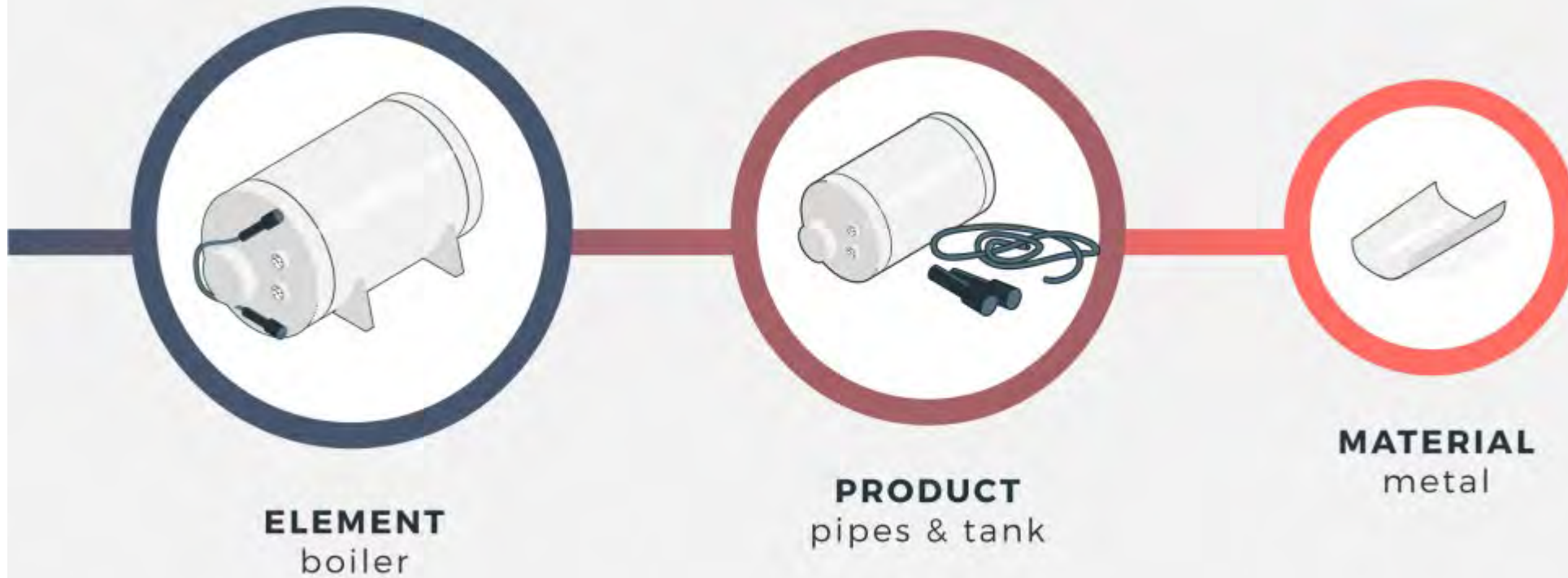
Santander 



How long does a building last?



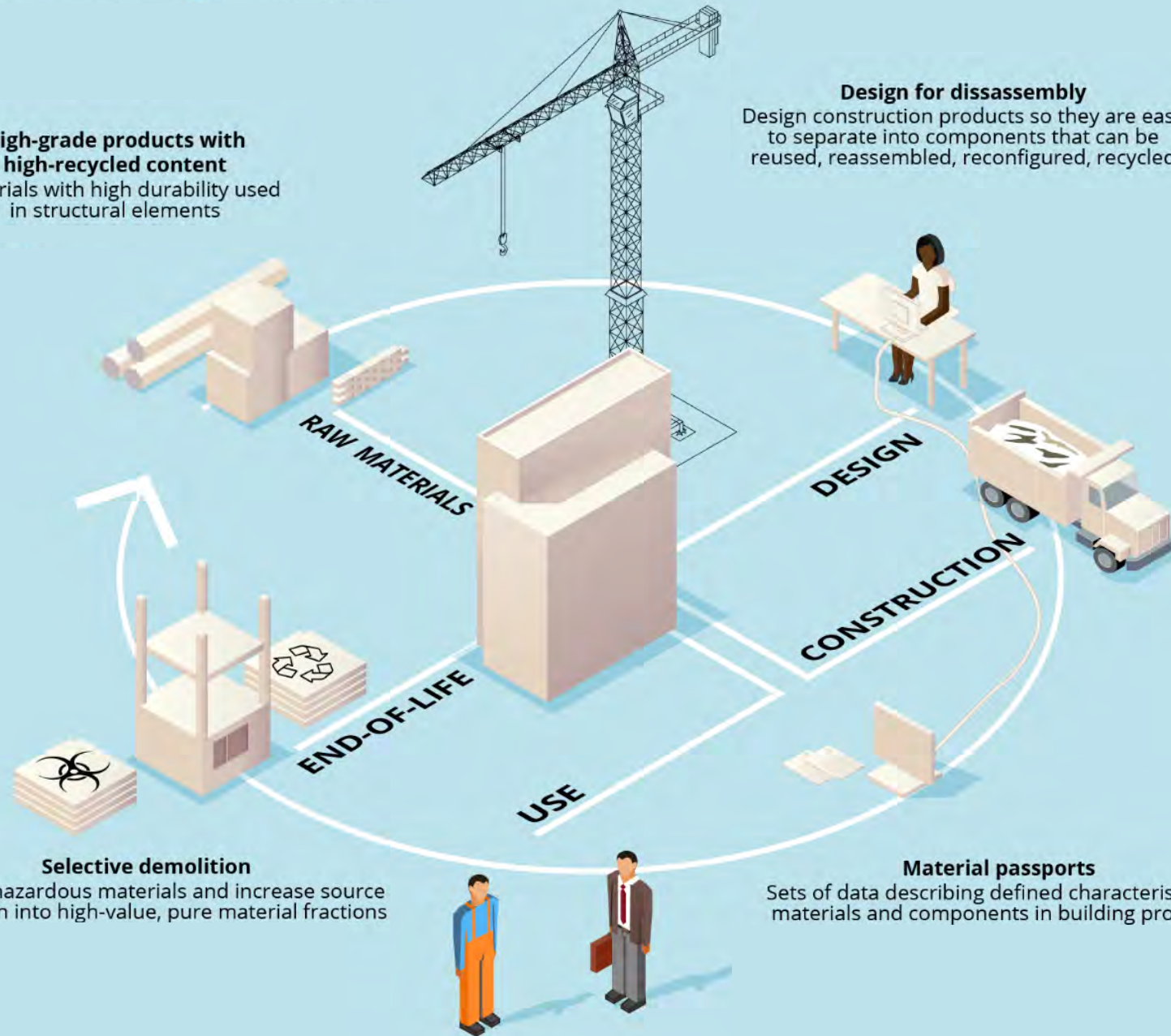
Building layers and their expected lifetime according to Duffy 1998, and Brand 1995 respectively (Durmisevic, 2010)



The EPM hierarchy – The Circle Economy

High-grade products with high-recycled content
Materials with high durability used in structural elements

Design for disassembly
Design construction products so they are easy to separate into components that can be reused, reassembled, reconfigured, recycled





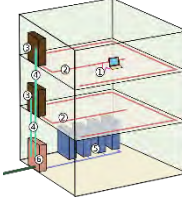

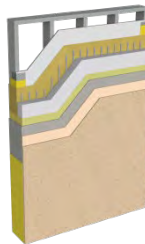



Selective demolition
Remove hazardous materials and increase source separation into high-value, pure material fractions

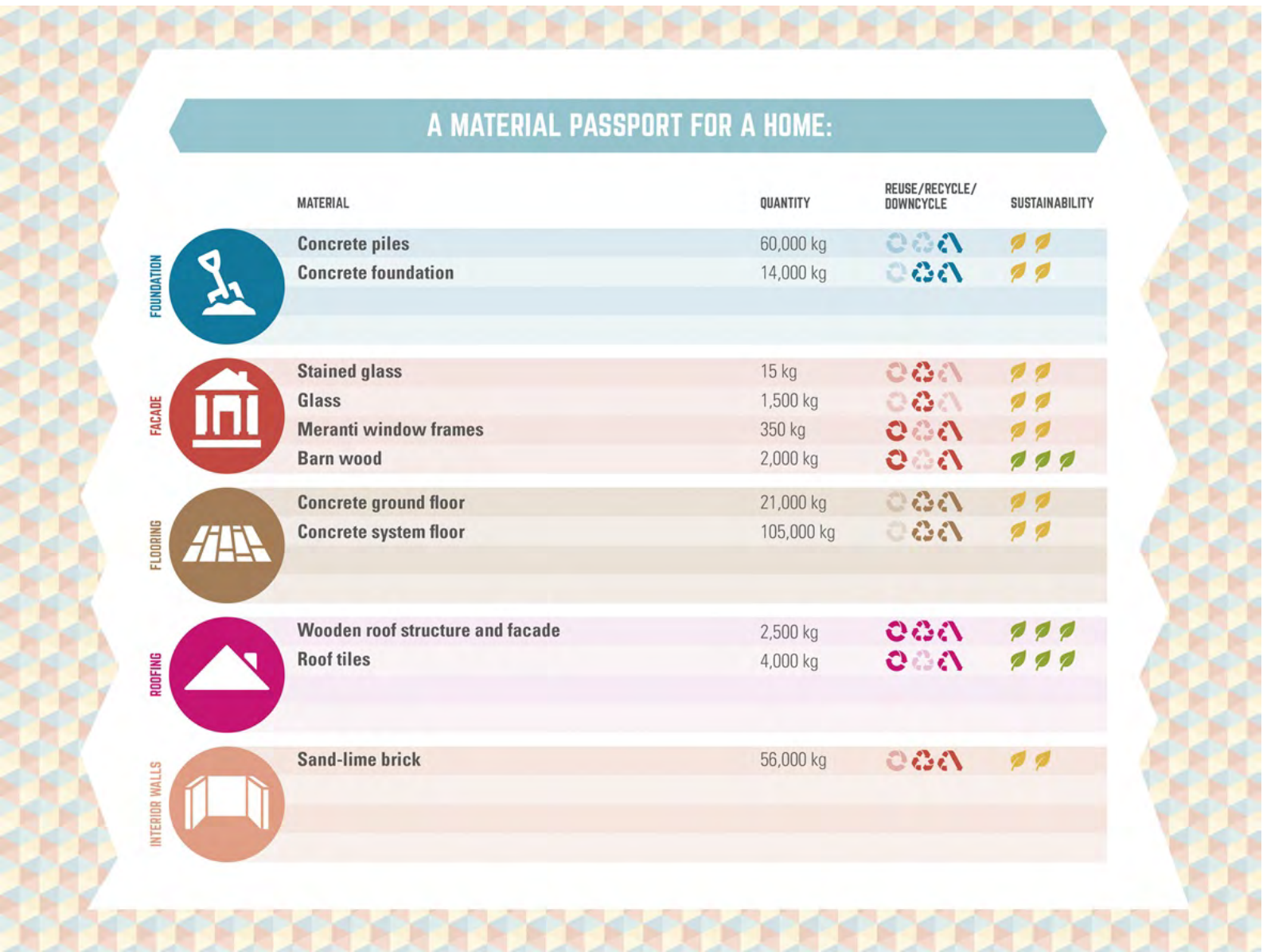
Material passports
Sets of data describing defined characteristics of materials and components in building products

Extension of construction service life
Renovate, improve maintenance, upgrade, repair and adapt constructions

Product life extension strategies

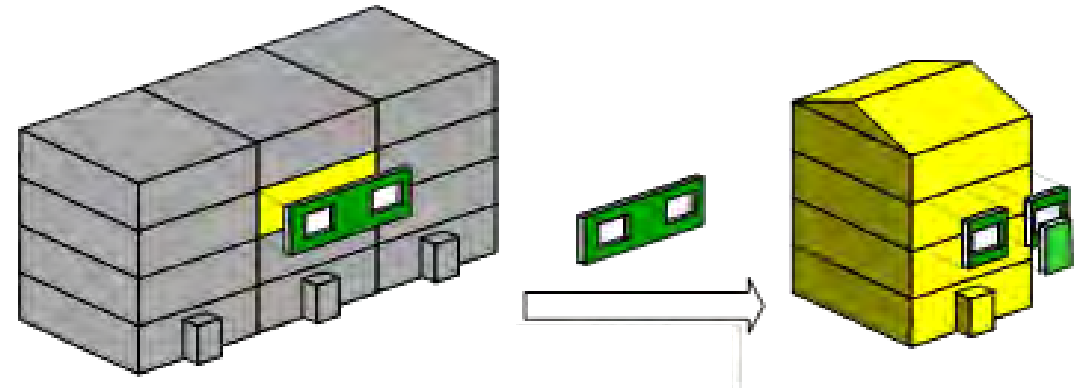
	MATERIAL	PRODUCT	ELEMENT	SPACE	SERVICES	STRUCTURE	SKIN	BUILDING
								
DESIGN / DEEP RENOVATION	Renewable Upcycable Durable	Compatible Handable Accesible		Flexible Versatile	Accesible Replaceable	Durable Accesible Prefabricated	Modular Prefabricated Independent Reversible Handable	Expandible Modular
USE	Inform (BMP), Reuse, Recycle			Adapt	Inspect, Improve maintenance, repair, renovate			

Information: Building material passport



A simplified example of a material passport, drawn up by Metabolic, for a standard Dutch house: an important tool for re-imagining buildings as material banks

Reusing: urban mining



Heliopolis waste collection



self-building system

Simplicity.....
accessibility.....
....and reversibility



**Reversible
connections**



Bolts

+ strong, can be reused
- size, cost



Screws

+ easily removable
- limited reuse



Magnets

+ keeps component whole
- structurally weaker



**Semi-reversible
connections**



Nails

+ speed of assembly
- difficult to remove



Rivet

+ speed of assembly
- difficult to remove



Staple

+ speed of assembly
- difficult to remove



**Irreversible
connections**



Glue

+ strong and efficient
- difficult to separate



Welding

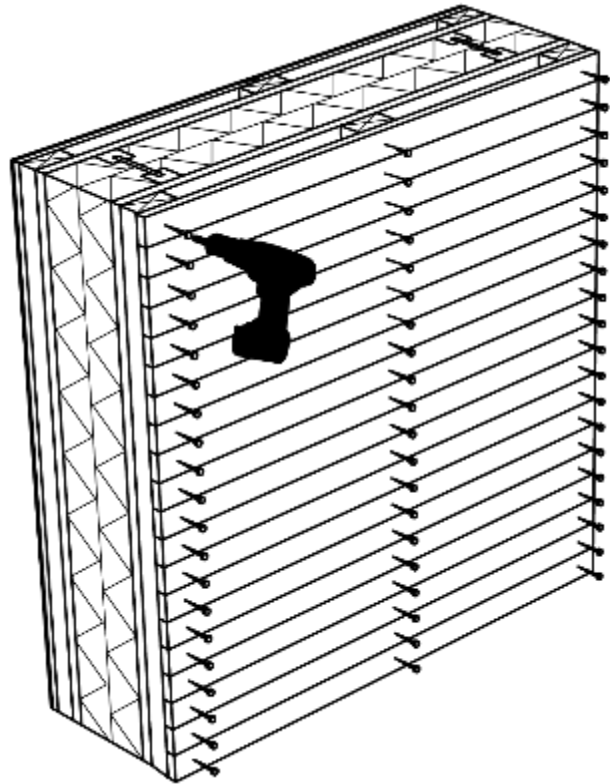
+ strong
- impossible to separate



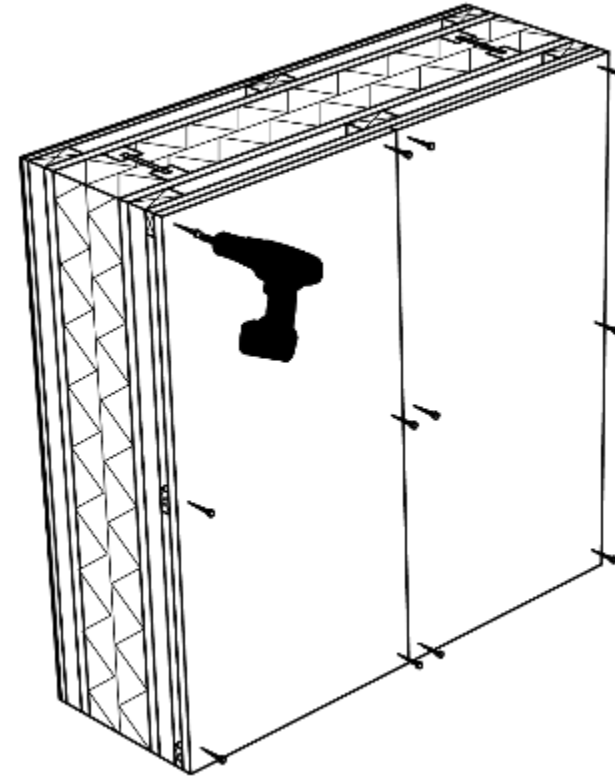
Cement mortar

+ strong
- difficult to separate

Fast



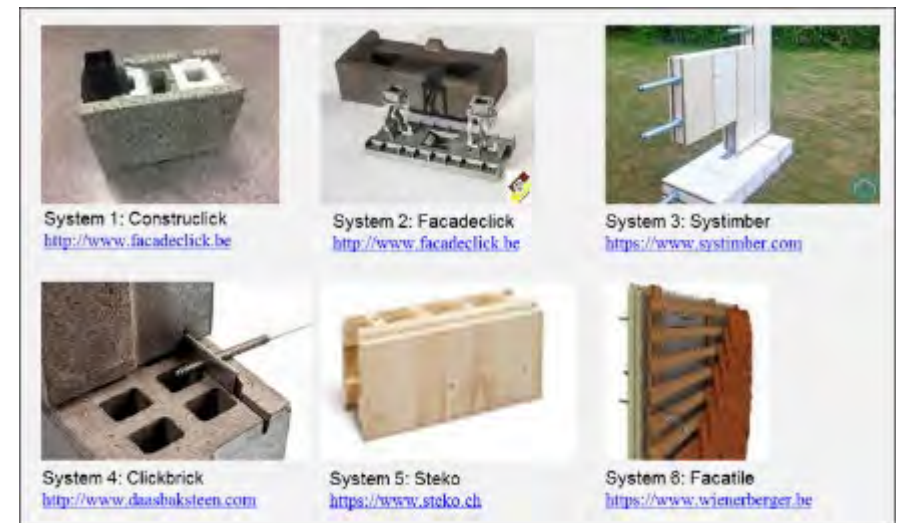
= 60 x



= 12 x



Reversible



Handable and managable

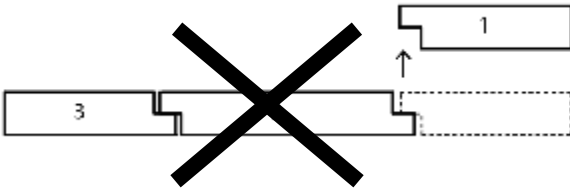
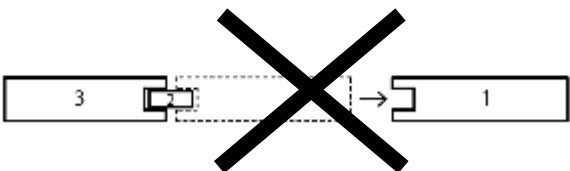
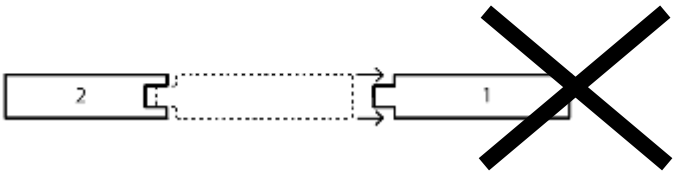
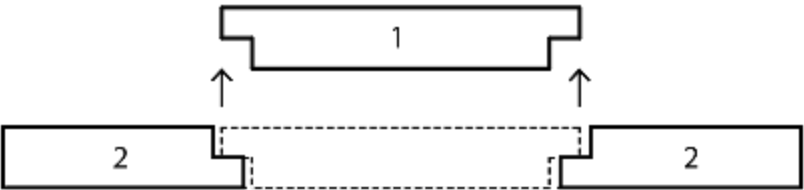
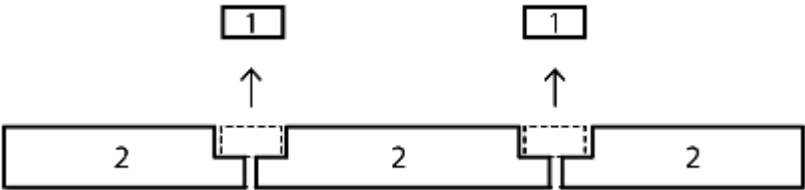
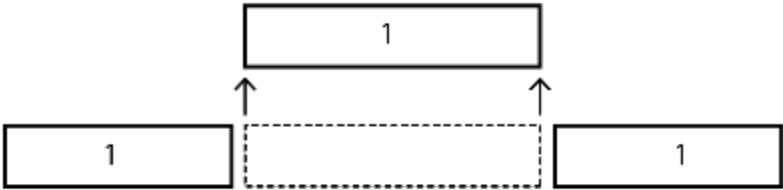


H2020 MORE-CONNECT pilot Tallinn, Estonia: Large and heavy boards are very demanding to install

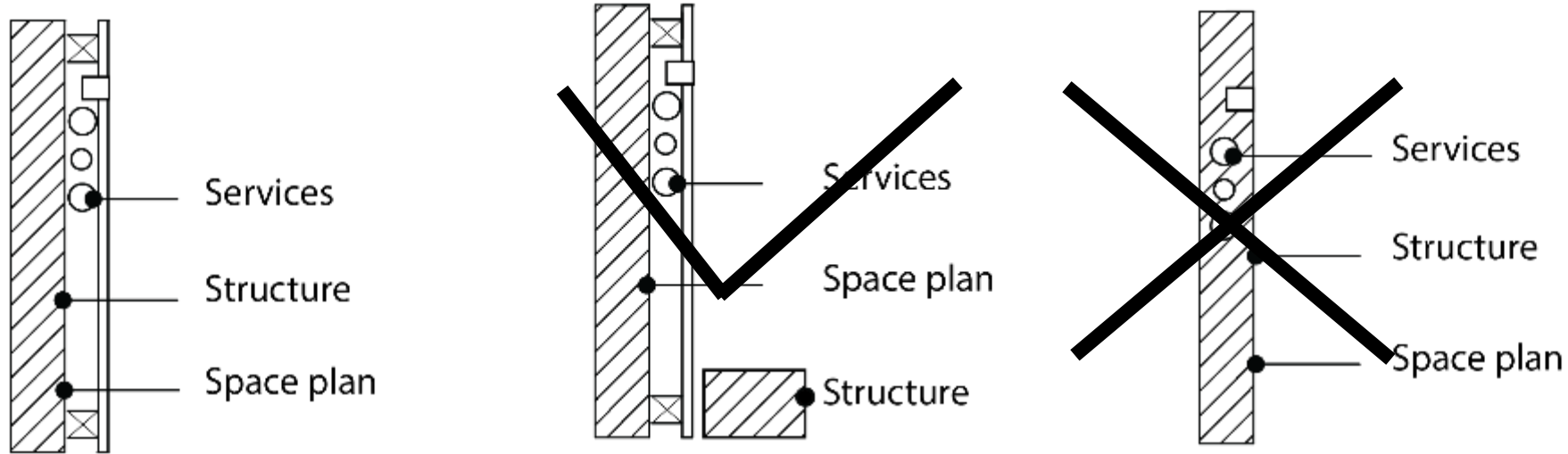


H2020 MORE-CONNECT pilot Arnhem, The Netherlands: Smaller and lighter boards, easier to handle

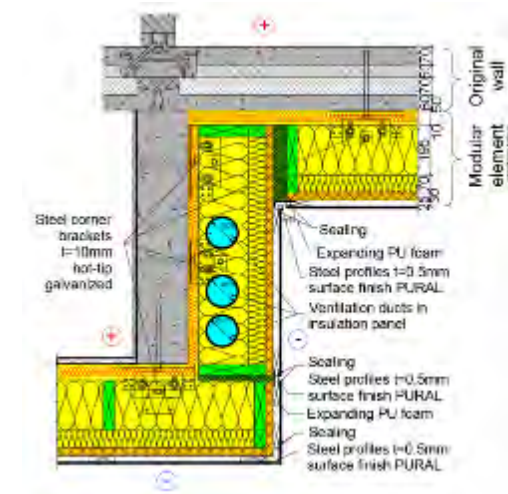
Independent



LayeredRemovable



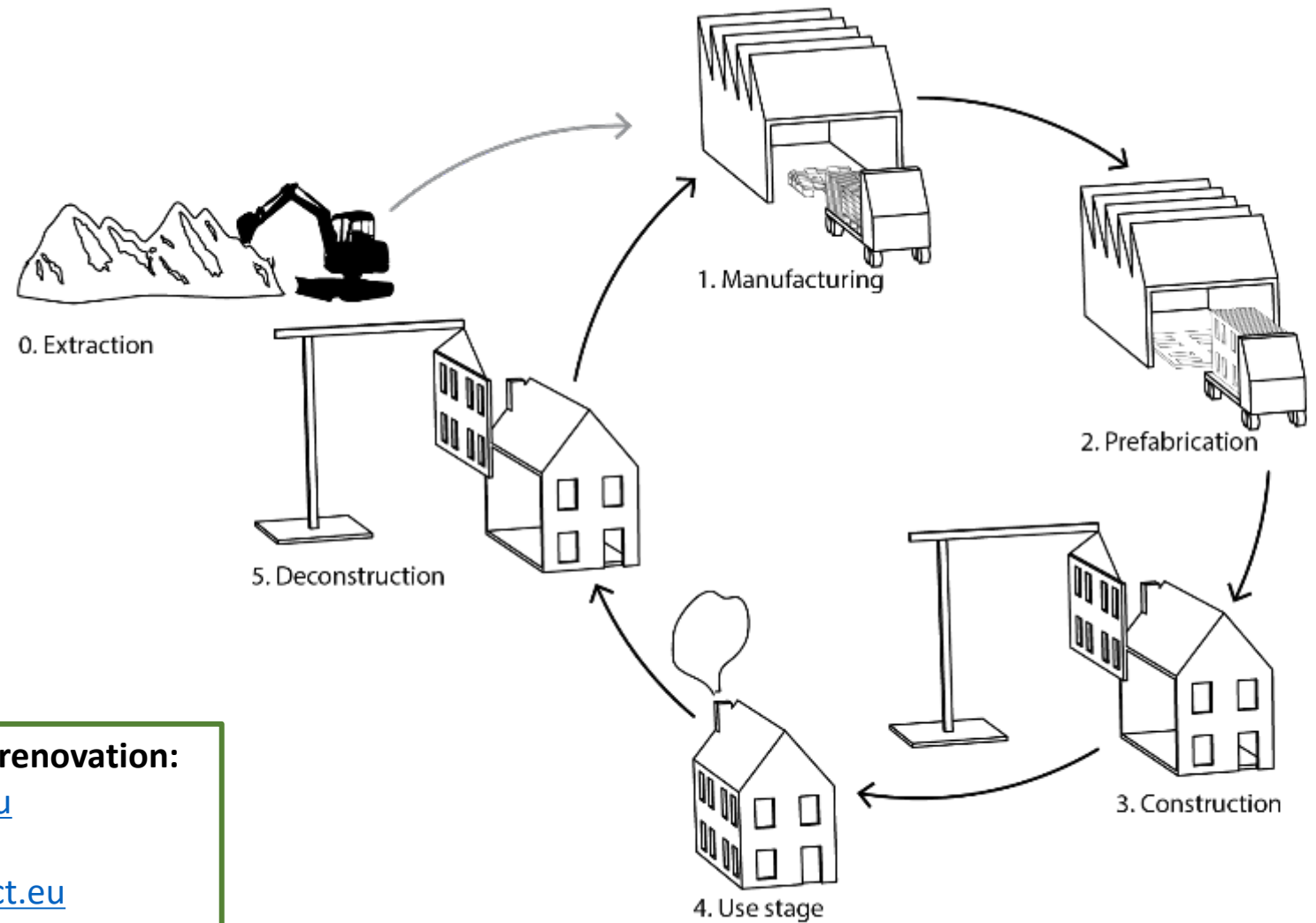
Example integrated multi-functional façade H2020 MORE-CONNECT (Pilot Estonia)



Layeredaccessible



Prefabrication



H2020 projects on prefab plug & play deep renovation:

MORE-CONNECT

www.more-connect.eu

ProGETonE

www.progetone.eu

P2Endure

www.p2endure-project.eu

4RinEU

<http://4rineu.eu/>

BERTIM

www.bertim.eu

Prefabrication

inHAUS



Prefabrication + Renewable eco-friendly materials

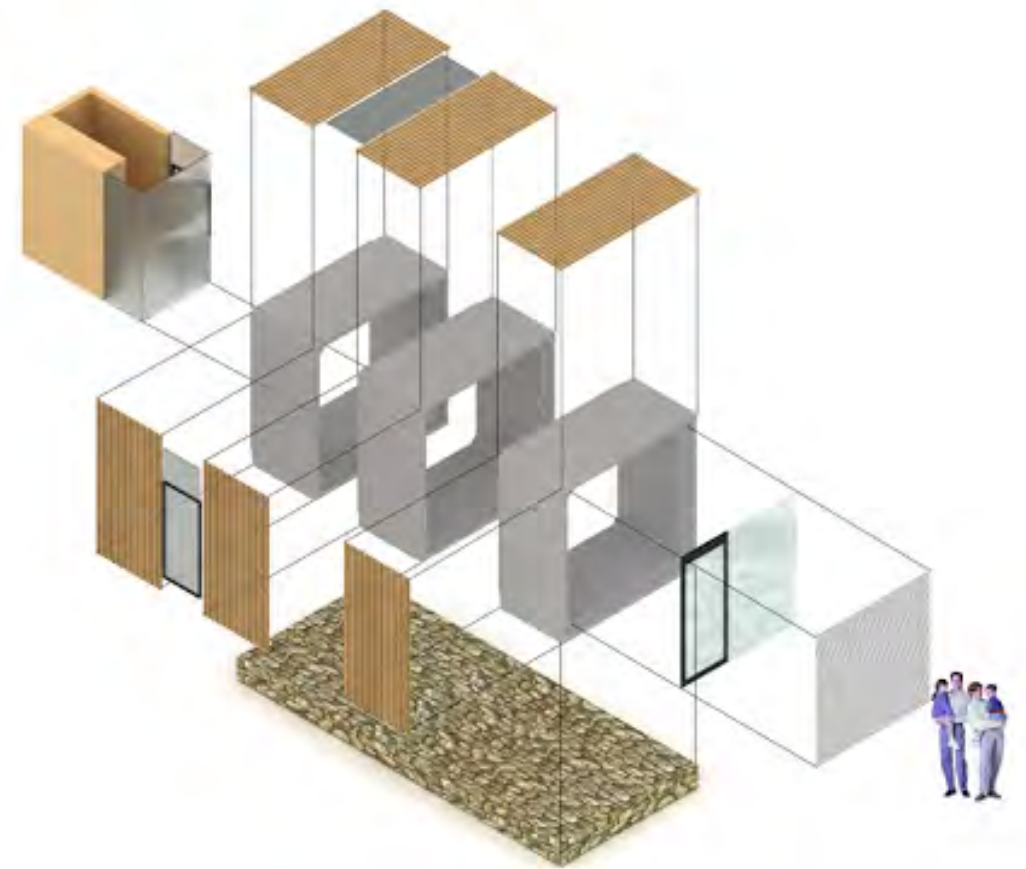
OKAMBUVA. Bioconstruction. Prefabricated rice straw panels.



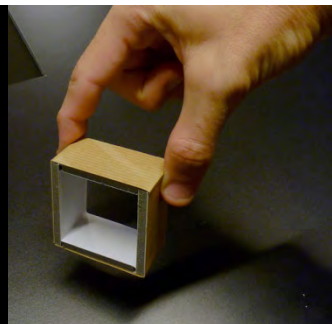
Expandable and flexible Modularity



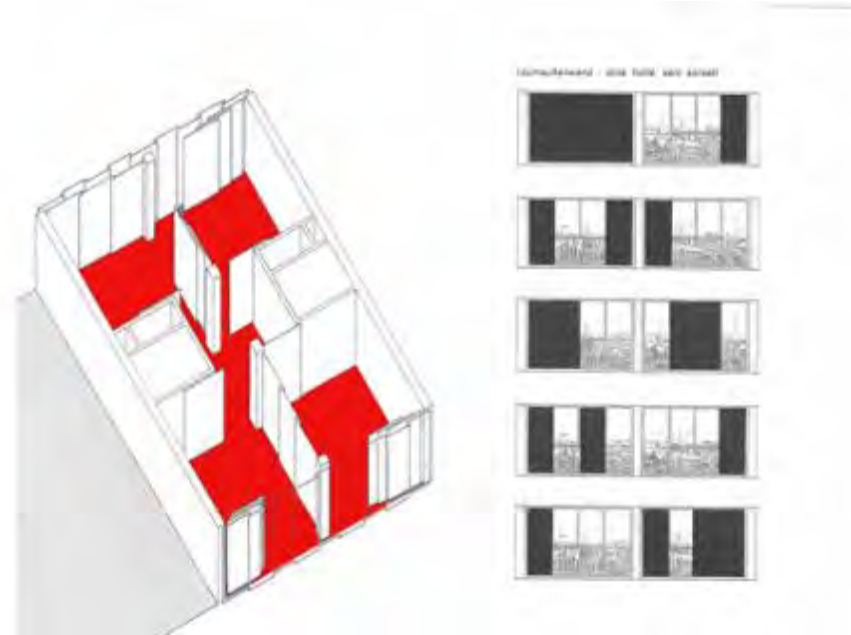
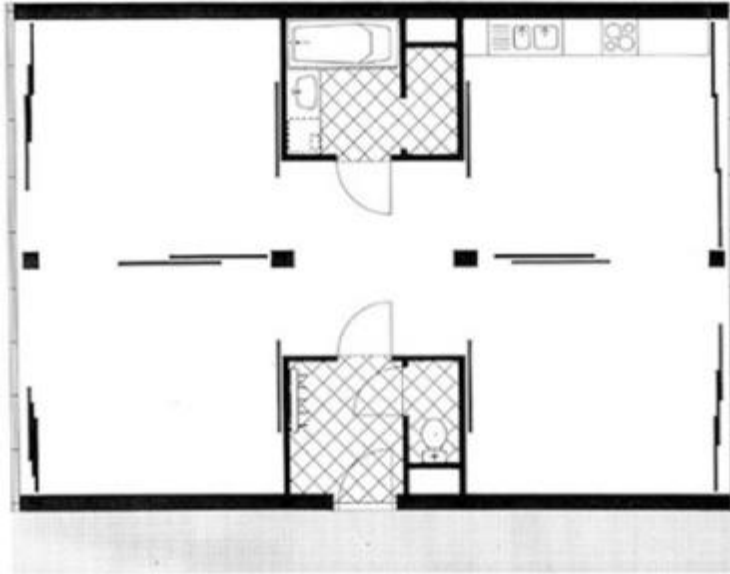
Expandable and flexible Modularity



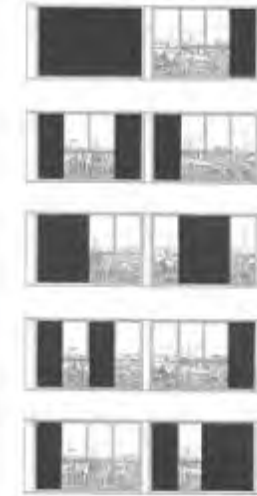
MANUEL CERDÁ PÉREZ
ARQUITECTURA



Versatile Multi-deployable



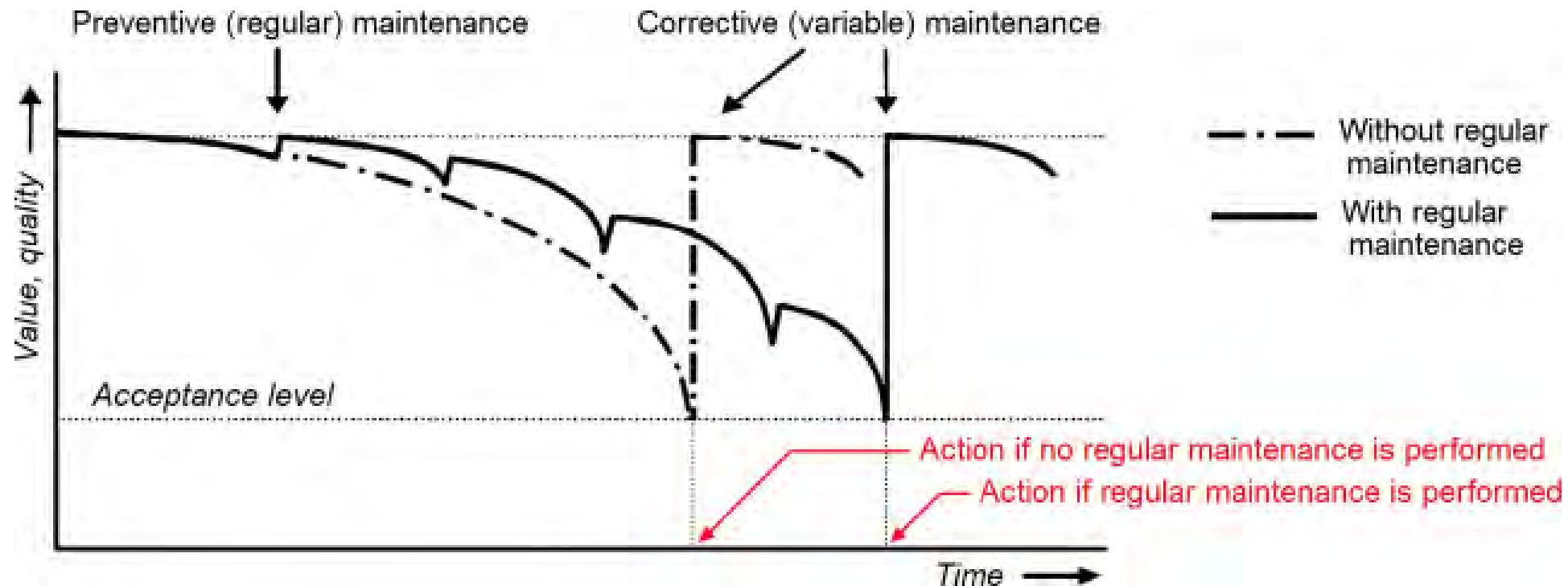
100m x 100m / 100m x 100m



Reversible



i Improve **MAINTENANCE**, Repair, Renovate and Upgrade !



H2020 DRIVE 0 Project

Driving decarbonization of the EU building stock by enhancing a consumer centred and locally based circular renovation process

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This project has received funding from the European Union's H2020 framework programme for research and innovation under grant agreement no 841850.

H2020 DRIVE 0 Project

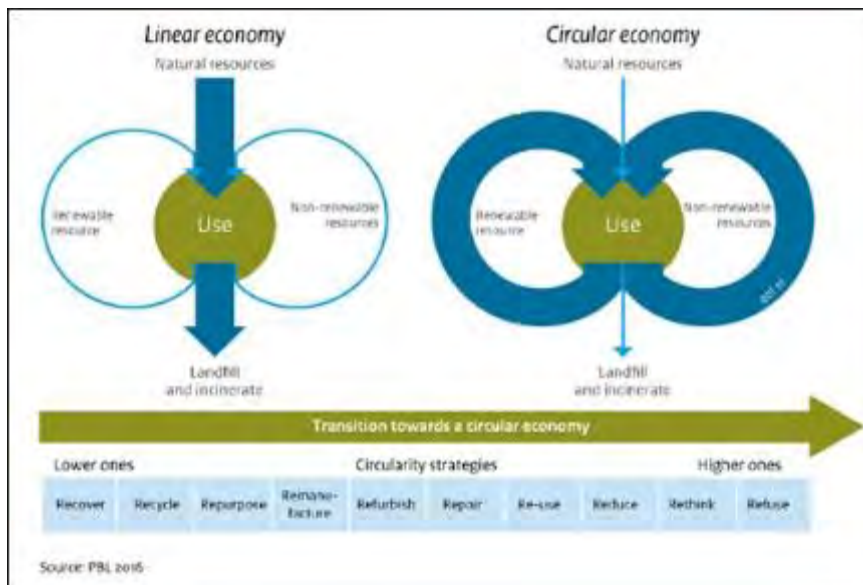
‘Driving decarbonization of the EU building stock by enhancing a consumer centred and locally based circular renovation process’

- **Duration:** 1 Oct 2019 – 31 Sep 2023
- **Call for proposal:** H2020-LC-SC3-EE-1-2018
- **Topic:** Decarbonisation of the EU building stock: innovative approaches and affordable solutions changing the market for buildings renovation
- **Funding scheme:** IA – Innovation action



Drive 0: How can we apply this and go towards circular renovation?

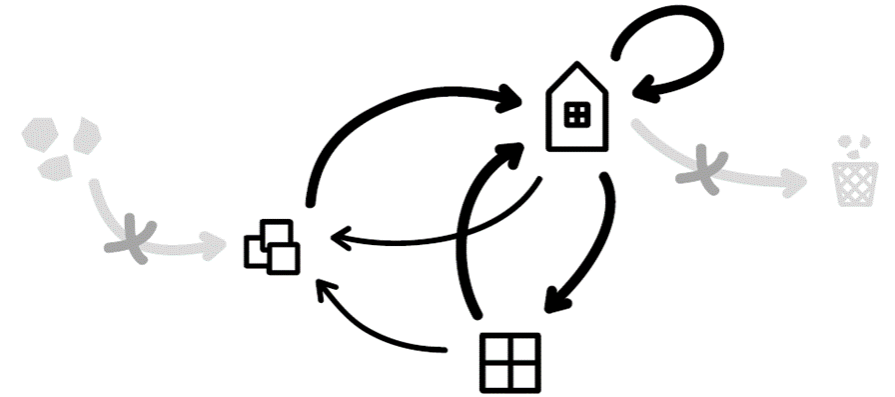
Defention: A **circular deep renovation**, which contributes to a circular built environment, is based on **100% life cycle renewable energy**, and all materials used within the system boundaries are part of **infinite technical or biological cycles** with **lowest quality loss** as possible.



The transition from a linear economy to a circular economy based on the 10-R model

The DRIVE 0 Approach

1. Market ready renovation products & concepts
→ ***circular renovation products & concepts***:
 - Based on local availability;
 - Use of bio based materials and components;
 - Emphasis on modular plug & play prefab solutions for building envelope elements and services;
 - Automated BIM controlled production processes.
2. Developing attractive *consumer centred* ***business models*** based on circular renovation concepts.
3. Providing **occupants** with *attractive and understandable* information on building performances in use.
4. Providing relevant stakeholders **evidence** of performance of the developed DRIVE 0 solutions by *local study and demonstration cases* initiated by 'local drivers'.



Solutions to be further circular developed in the Drive 0



WEB



fab construction



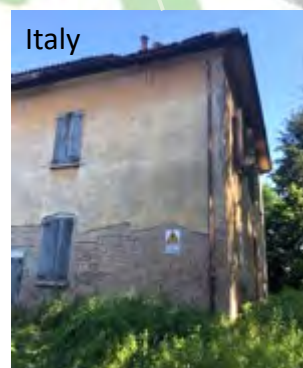
Knauf Insulation with
ECOSE technology



Factory 0 compact installation kits



ALIVA Alucovering facade



Can we do it? Yes we can!

A practical example: The Super Circular Estate project (SUPERLOCAL)
Bleijerheide, Kerkrade, The Netherlands

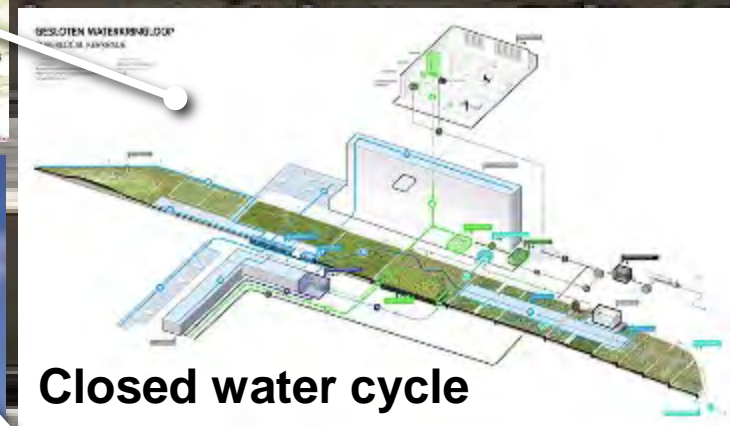




Upscaling:
20 single-family dwellings



Pilot: 3 dwellings



Closed water cycle



Experiment: Expo building



Renovation apartment building

EXPO-building

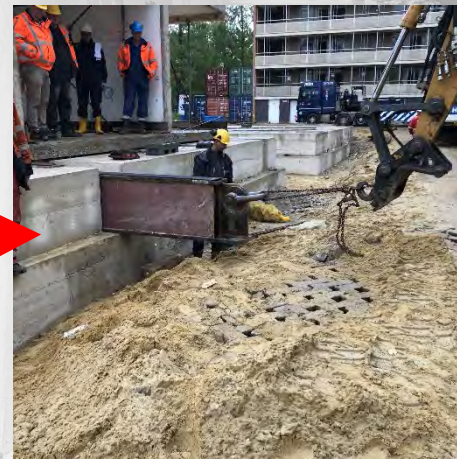
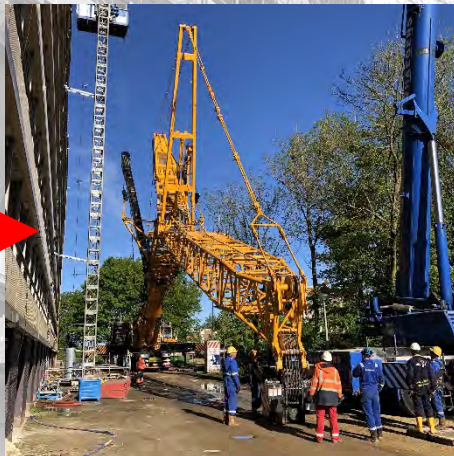


Fenix-3

pilot 3 circular dwellings







Can we do it alone? No, collaboration is the key!

Want to join the action?

Then join our **Drive 0 Stakeholders Advisory Board!**

Approach me during the break or write us to get more info: info@drive0.eu





Architects' Council of Europe
www.ace-cae.eu

COADY
ARCHITECTS

Coady Architects
www.coady.ie



Aliva
www.aliva.it



University of Bologna
www.unibo.it



Institute for Innovation and Development of University of Ljubljana
www.iri.uni-lj.si/



Knauf Insulation
www.knaufinsulation.nl/



International Union of Property Owners
www.uipi.com



Housing Europe
www.housingeurope.eu



Pich Architects
www.picharchitects.com



Tallinn University of Technology
www.ttu.ee



Dublin Institute of Technology
www.dit.ie/



Salfo & Associates SA
www.salfo.gr



Valencia Institute of Building
www.five.es/



Factory 0
www.factoryzero.nl/



Huygen Installatie Adviseurs
www.huygen.net/



National and Kapodistrian University of Athens
en.uoa.gr

Timbeco
www.timbeco.ee

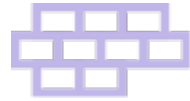


WEBO
www.webo.nl/

Zuyd Hogeschool

Zuyd Hogeschool
www.zuyd.nl/





Thank you for your attention.

Any questions?

Feel free to contact us later

Leticia Ortega, lortega@five.es

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H2020 Drive 0

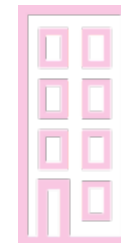


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www.drive0.eu



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