Virtual Workshop

STUDY ON MEASURING THE APPLICATION OF CIRCULAR APPROACHES IN THE CONSTRUCTION INDUSTRY ECOSYSTEM

23 March 2023

Disclaimer: this presentation has been prepared on the basis of a study performed for the European Commission, it reflects the views only of the authors and not those of the Commission.

Measuring the application of circular approaches in the construction industry ecosystem

Stakeholder workshop

23 March 2023

Philippe Moseley,
Policy Officer, Construction Unit, DG GROW

Policy context

Political imperative

European leadership

Changing legislative context

Environmental impacts of construction

Opportunities of a shift from linear to circular economy

European Commission

The EU construction industry ecosystem

- 9.6% of EU Gross Value Added (EUR 1 158 billion)
- 25 million jobs, 5.3 million firms
- Low productivity
- Low innovation uptake
- High environmental impact

Annual Single Market Report 2023:
https://ec.europa.eu/docsroom/documents/48877

European Commission

Transition Pathway

Transition pathway: https://europa.eu/!FcbxNr

- Introduction

1. Competitiveness
2. Skills and talent
3. Enabling framework
4. Research, Innovation, Technology
5. Funding
6. Towards a fair and safe built environment

- Annexes

European Commission

New study on end-of-waste criteria

- “Background data collection for future EU end-of-waste criteria of construction & demolition waste”
- Ends March 2024
- JRC scoping study March 2022 already identified aggregates & mineral wool as priority CDW streams. https://europa.eu/!t7WKdK

European Commission

High Level Construction Forum

20 April: session on the green transition of construction (online)

- 2050 Whole life carbon roadmap for buildings: presentation of modelling results and work to develop the roadmap
- Study on measuring circular approaches
- EU end-of-waste background data study
- Sign up for HLCF mailing list: https://europa.eu/!dXKubx

European Commission

EU Taxonomy for sustainable activities

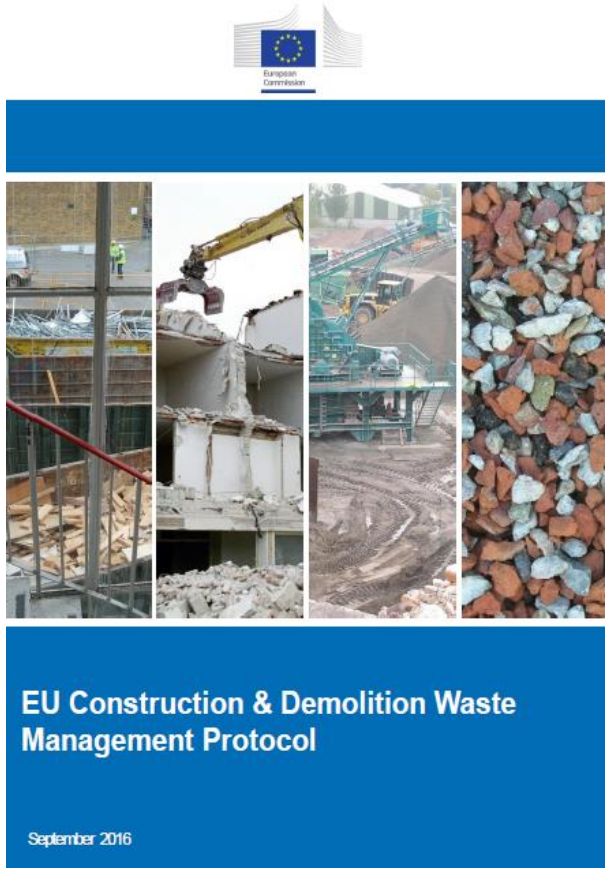
- Objective: direct investments towards “sustainable” projects
- Climate Change Adaptation & Mitigation (in force since January 2022)
- Water, Biodiversity, Pollution, Circular Economy (expected soon)

EU Taxonomy:
https://europa.eu/!WV46yv

European Commission

Guidance

- **EU Construction & Demolition Waste Management Protocol**
- Available in 15 languages
- https://ec.europa.eu/docsroom/documents/20509/
- Revision being planned



European Commission

Thank You! Merci! Gracias! Diolch!

https://single-market-economy.ec.europa.eu/sectors/construction/construction-transition-pathway_en

EU Construction Ecosystem

Agenda

Timing	Agenda item	Speakers
9:30-9:35	**Welcome by the Commission**	Philippe Moseley (DG GROW)
9:35-9:40	**1. Scope and goal of the workshop** • Project overview • Objective of the workshop and instructions for the workshop • Interactive session on circularity approaches	Study team
09:40-09:55	**2. Interim results** • Summary from project team of the shortlisted indicators and other interim findings	Study team
09:55-10:25	**3. Products/ materials focus:** • Presentations: 1. DG GROW: Presentation on CPR, ESPR and « the others » … 2. ITACA protocol: a possible path to sustainability in the governance of the building process • Interactive session on product/material indicators	1. Manfred Fuchs (DG GROW) 2. Massimiliano Bagagli (ITACA) Study team

Agenda

Timing	Agenda item	Speakers
10:25-11:20	**4. Buildings/infrastructure focus** • Presentations: 1. Circular indicators for infrastructure: The Dutch approach 2. Presentation of BTPFlux and the PEMD Platform 3. Example of Level(s) implementation: Circular renovation of a corporate office 4. Towards circularity in Statsbygg • Interactive session on building/asset indicators	1. Evert Schut (Dutch Ministry of Infrastructure and Water management) 2. Edouard Sorin (CSTB) 3. Ignasi Cubina (Eco Intelligent Growth/ Construcía Group) 4. Lars Petter Bingh (Statsbygg) Study team
11:20-11:30	**Coffee break**	
11:30-12:00	**5. Organisation level & urban level focus** • Process/organisation level presentation: 1. Circular approaches at process / organisation level • Interactive session on organisation level indicators • Urban/ regional level presentation: 1. Be Circular: Reuse in circular building sites • Interactive session on urban level indicators	1. Wouter Schik (Arcadis) 2. Yannick D'Otreppe (Brussels Environment) Study team
12:00-12:25	**6. Panel discussion on:** • Overall insights on circularity indicators for the circularity industry • Overall insights on drivers and barriers	Evert Schut (Dutch Ministry of Infrastructure and Watermanagement), Kaie Small-Warner (CIRCuIT), Christophe Sykes (Construction products Europe, Circular Economy Club), Sue Arundale (EFCA)
12:25-12:30	**7. Closing**	Study team Philippe Moseley (DG GROW)

Workshop set-up

To ensure active and effective participation

Be **present and active**

Use the **chat** if you have a **question**. After each presentation some minutes will be given for a Q&A.

Please go on **mute** when not speaking

Have your **phone** with you to **participate** in interactive parts of the workshop

Scope and goal of the workshop

Interim results

Product/ material focus

Buildings/ infrastructure focus

Coffee break

Urban level & organisation level focus

Panel discussion

Tour de table – Today's facilitators

Deloitte and Reusefully

Luc Chalsège

- Project Manager
- *Deloitte Belgium*

Indi de Graaf

- Senior consultant
- *Deloitte Belgium*

Project Overview

Study on Measuring the application of circular approaches in the construction industry ecosystem

Task I

Current data and relevant actors

- Detailed overview of the **currently available data** relating to circular approaches reported by **actors** in the EU construction ecosystem.
- **Roles and influences of the actors** in generating such data.

Task II

Identification and selection of indicators

- List of **indicators** against which actors in the construction ecosystem could **report**, including methodology of data collection.

Task III

Barriers and drivers for collection of data

- Detailed **analysis of barriers and drivers** to the **collection of data** that would measure the uptake of circular approaches across the construction ecosystem.

The final study report will be delivered in Q2 2023.

Purpose

Support the **uptake of circular approaches in construction** by defining indicators and providing an overview of the status quo of circular approaches in the construction industry.

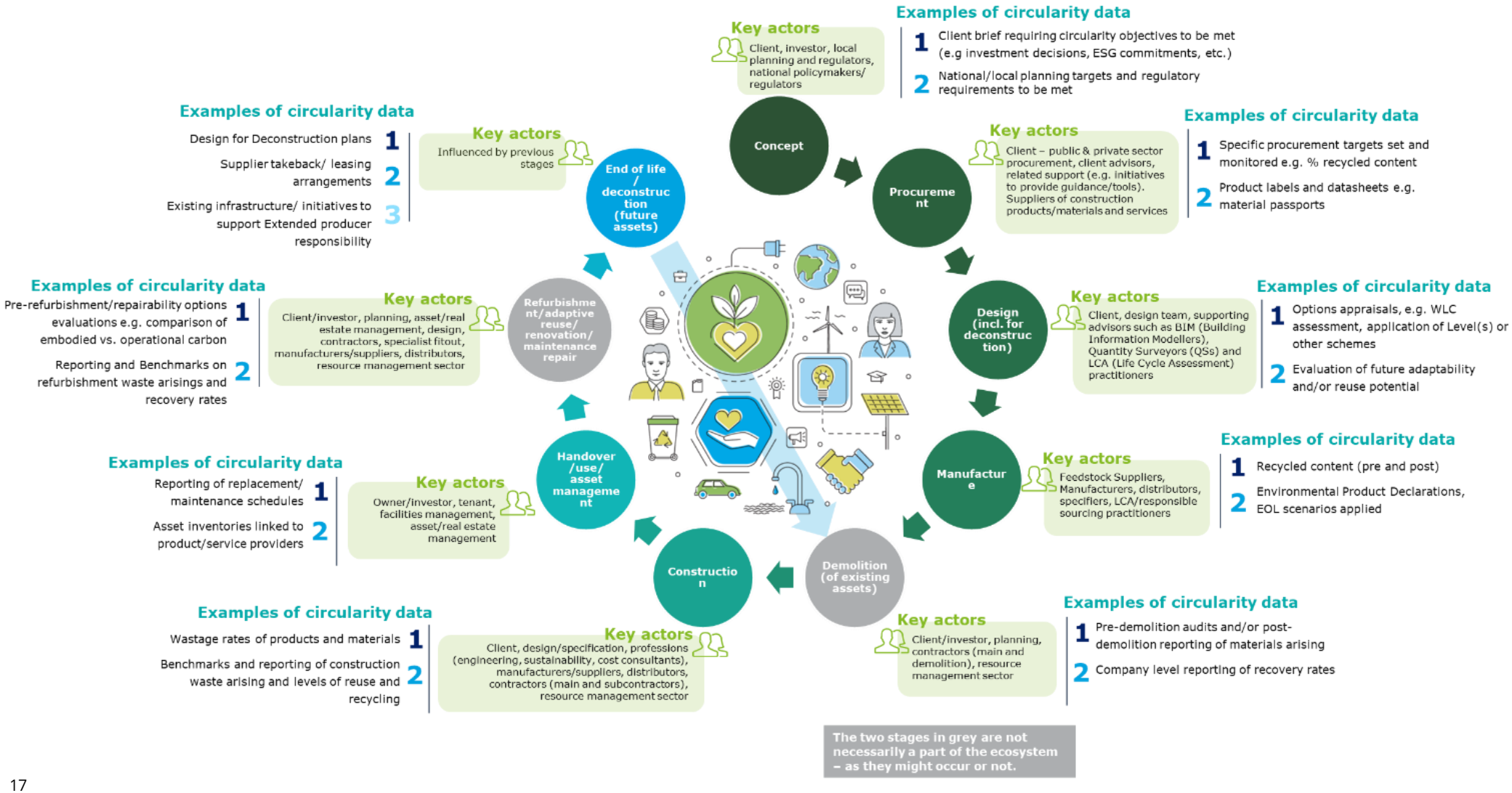
Key objectives

- Analyse the **role and ability of actors** in the construction ecosystem to **report relevant data.**
- **Measure the uptake of circular approaches** in the construction ecosystem.
- Gain **insights into the status quo of the circular economy** in the ecosystem across design, construction, operation and end of life processes.
- **Analyse results and provide conclusions** about the availability of information on the circular economy in construction.

Methodological approach

- **Desk research**
- In-depth **interviews and surveys**
- **Workshops**
- **Outreach** activities
- **Assessing** inputs and **reporting** recommendations

The construction value chain, its actors and circularity data



Workshop objectives

What is the purpose of this workshop?

Present the study, the objectives and methodological approach.

Present the preliminary findings obtained during the first phase of the study.

Validate our preliminary **results** with the construction industry ecosystem.

Gain insights into the **status quo of the circular economy** in the ecosystem.

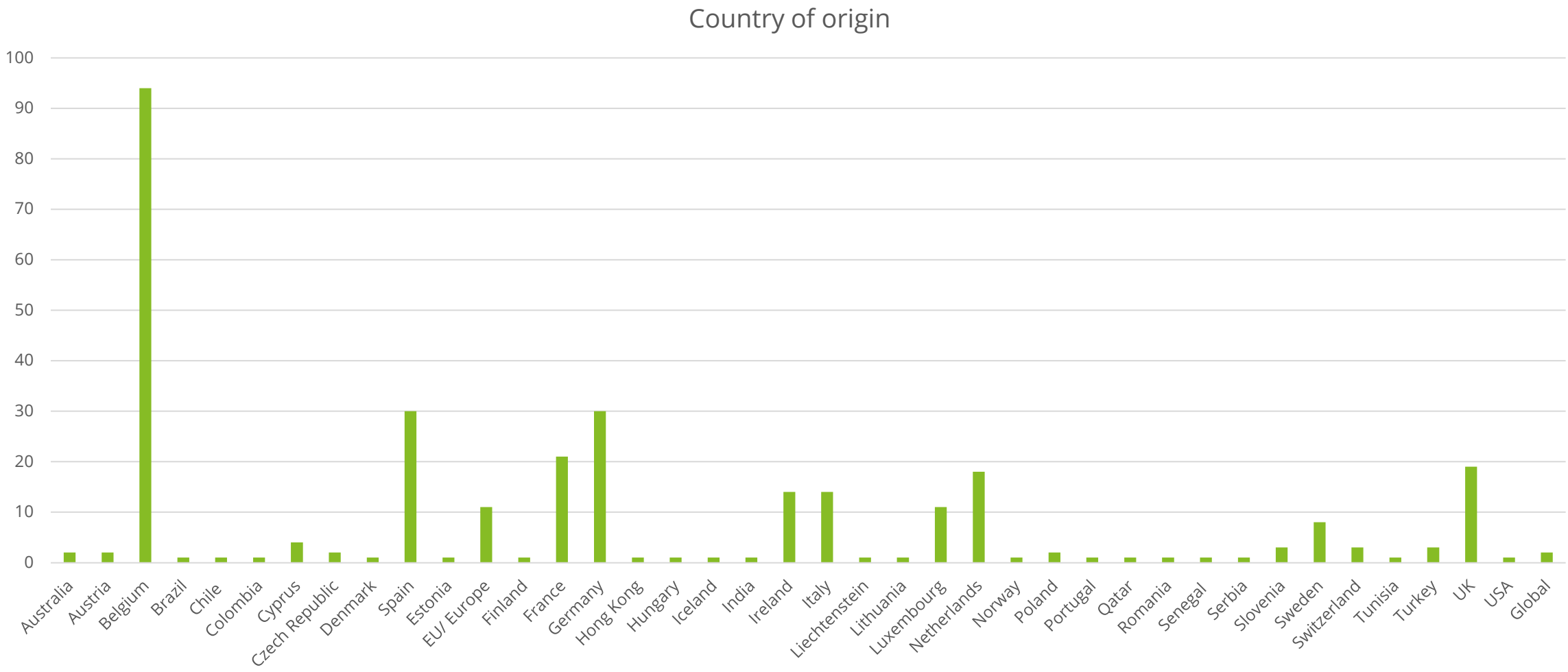
Join us for an interactive session on wooclap!

1 Go to wooclap.com

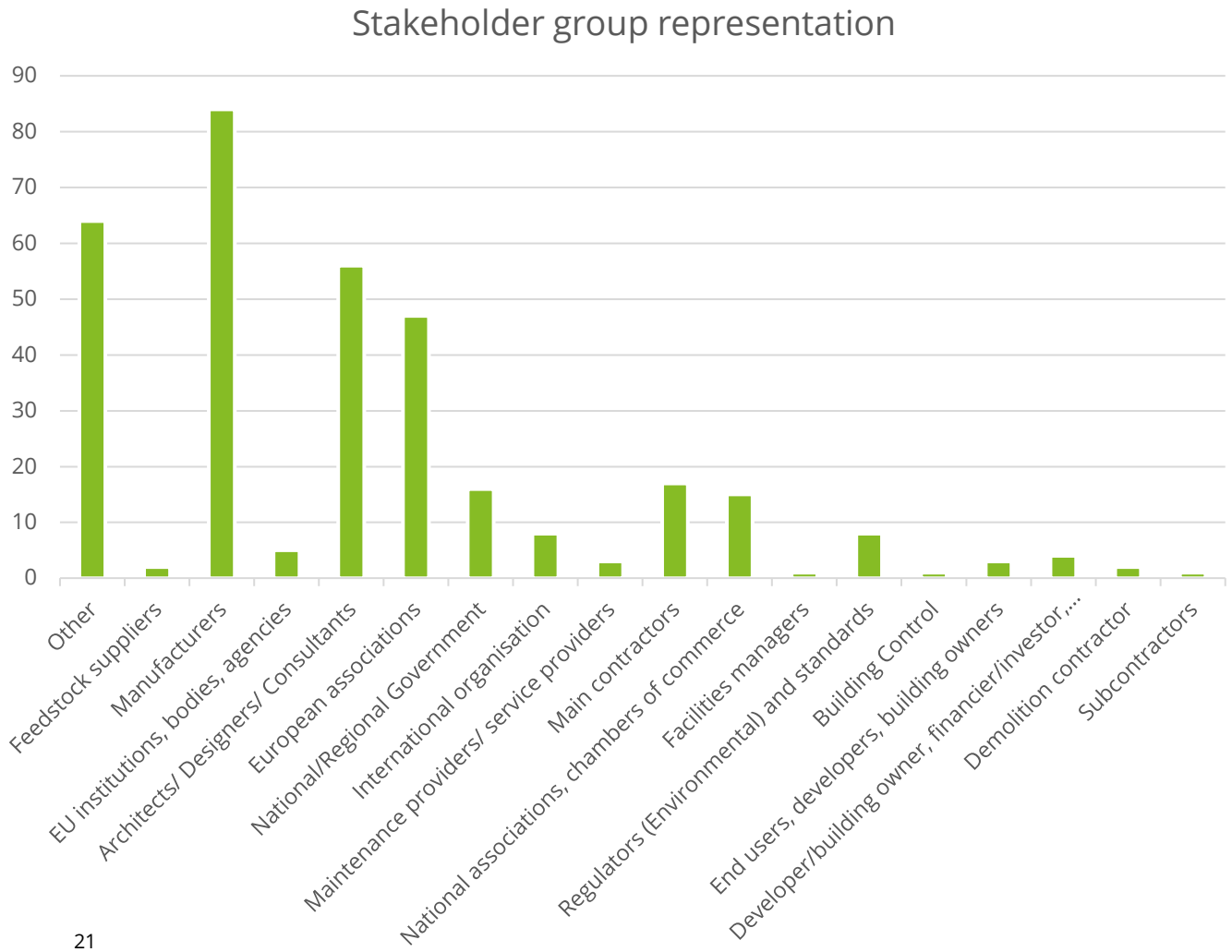
2 Enter the event code in the top banner

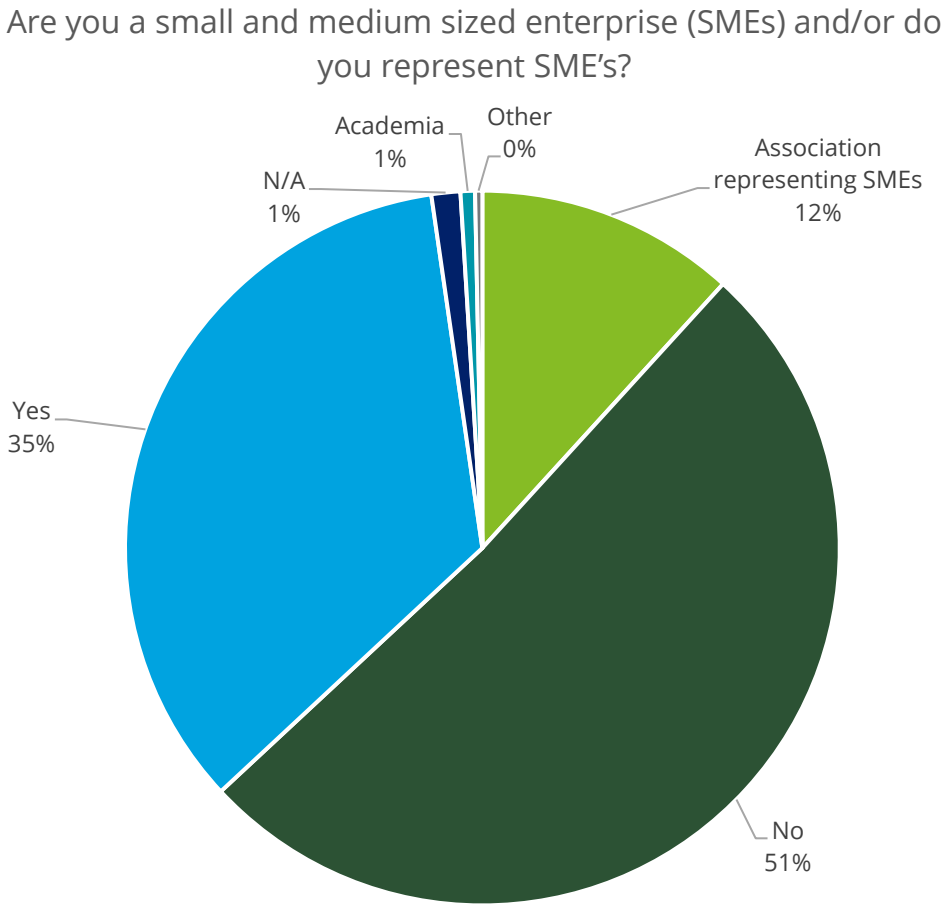
Event code
FSYSSH

Results from survey registration form



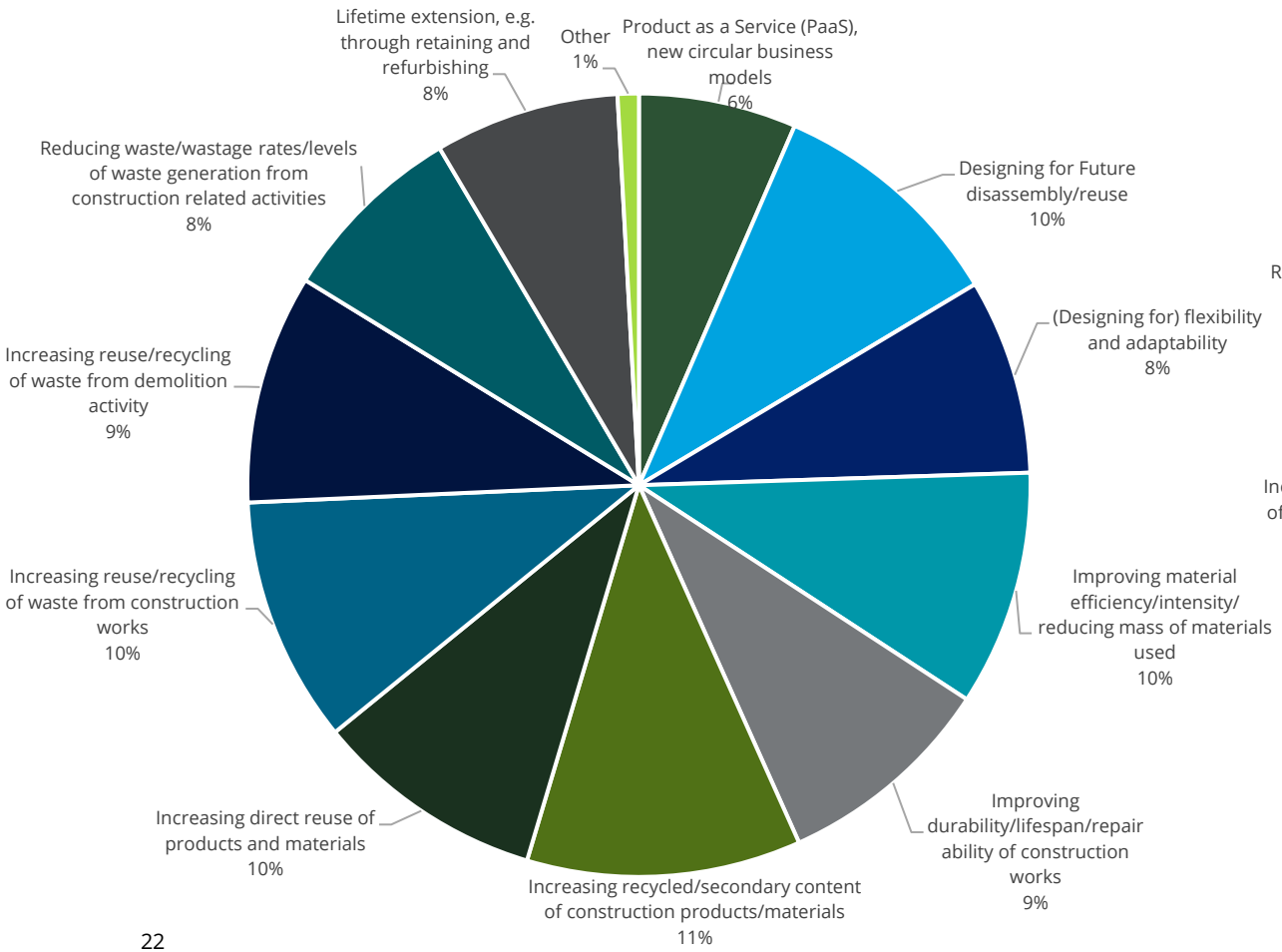
Results from survey that people filled out to register



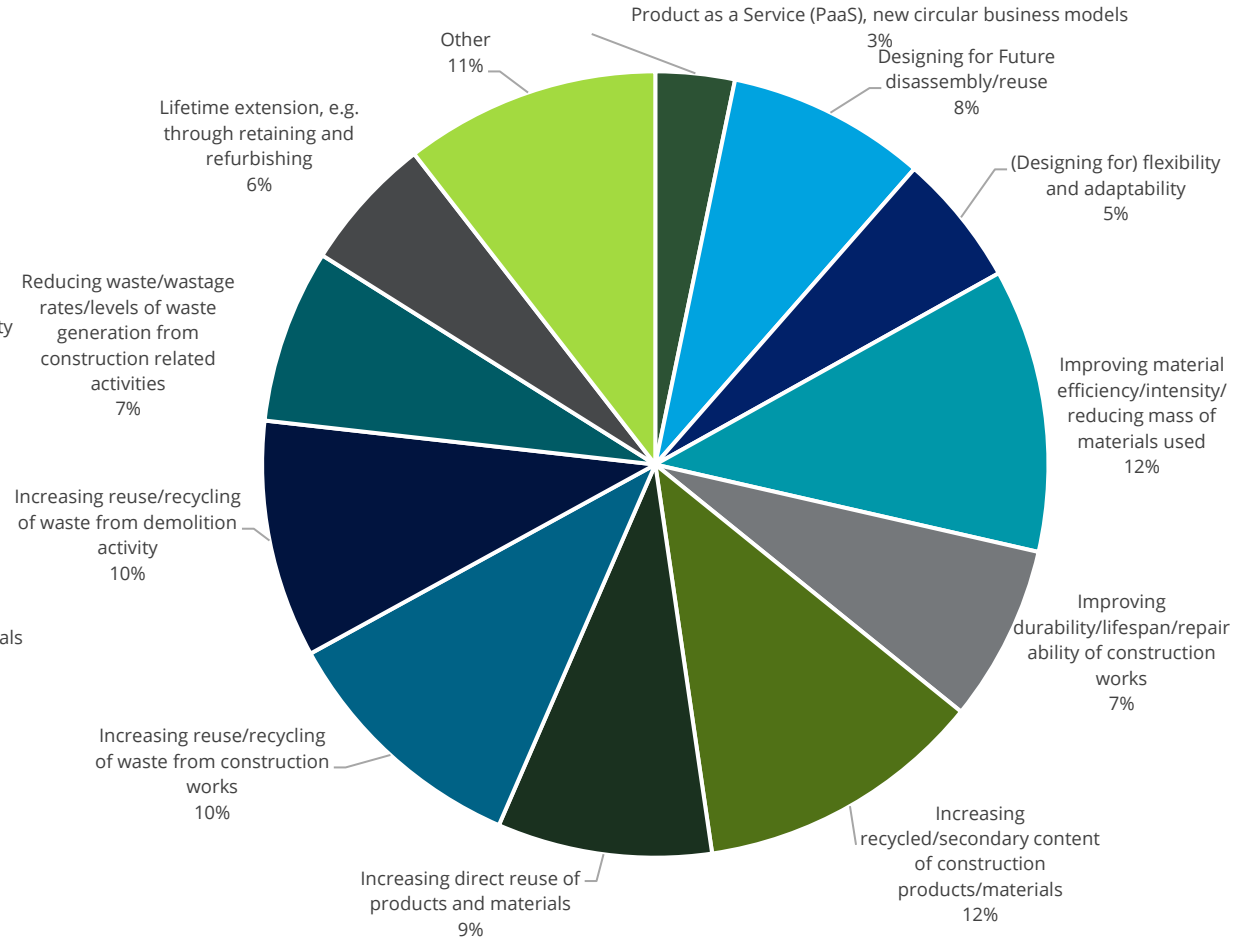


Results from survey that people filled out to register

Which of the following circularity approaches are you particularly interested in/ implementing?



Are you actively measuring performance in any of these areas?



Scope and goal of the workshop

Interim results

Product/ material focus

Buildings/ infrastructure focus

Coffee break

Urban level & organisation level focus

Panel discussion

Tour de table – Presenters

Deloitte and Reusefully

Gilli Hobbs

- Sustainability and Circular Economy Advisor
- *Reusefully*

Katherine Adams

- Consultant and Director of Reusefully
- *Reusefully*

Andreas Mitsios

- Manager, Expert in Sustainable Construction
- *Deloitte France*

We agreed on the following 11 circular approaches

1. Product as service, new business models
2. Designing for future disassembly and reuse
3. Designing for flexibility and adaptability
4. Improving material efficiency/intensity/mass of materials used
5. Improving durability, lifespan, repairability of construction works
6. Increasing recycled and secondary content of construction products and materials
7. Increasing direct reuse of products and materials
8. Increasing reuse/recycling of waste from construction works
9. Increasing reuse/recycling of waste from demolition works
10. Reducing waste/wastage rates/waste generation from construction activities
11. Life time extension e.g. through retaining and refurbishing

To shortlist circularity indicators, we used six criteria

Data
Score primarily based on availability but also considering accuracy and timeliness of available data

Availability of standard measurement methodology
Score based on the availability of methodologies to measure them

Current measurement
Score primarily based on whether this is part of existing standards, if they are being measured now

Ease of measurement
Score based on the ease of them being measured now and in the future, an analysis of the indicator – e.g. judgement

Relevance
Score based on assessment of the link between the indicator and broader circularity goals

Drivers and barriers
Score based on link to drivers and barriers for data collection

The shortlist includes 10 indicators at product/material level and 16 indicators at building/infrastructure level

PRODUCT/MATERIAL LEVEL

- Reused product
- Remanufactured/reused content
- Recycled/secondary content
- Design for disassembly and circularity
- Wastage rate
- Predicted service life
- Hazardous waste
- Realistic end of life scenarios developed
- Residual value per unit product/material at end-of-life
- Part of an Extended Producer Responsibility system (i.e. take-back system)

BUILDING/ INFRASTRUCTURE LEVEL

- At concept stage: comparison of asset life cycle costs
- At concept stage: comparison of asset life cycle assessment
- At design stage: Material intensity/ dematerialisation
- At design stage: reused content
- At design stage: recycled content
- Designed for adaptability and flexibility
- Designed for disassembly/ deconstruction
- Construction waste generated on and off site
- Hazardous waste generated during construction
- Construction waste reused, recycled, recovered, landfilled
- Construction related waste generated through in-use/ refurbishment cycles
- Effective utilisation of building (e.g. levels of occupancy) or asset; Intensiveness of use
- At end of use of building/asset: proportion of building/asset retained (mass) for further use
- Demolition waste generated
- Hazardous waste generated at demolition
- Demolition waste reused, recycled, recovered, landfilled

The shortlist includes 5 indicators at urban level and 9 indicators at organisation level

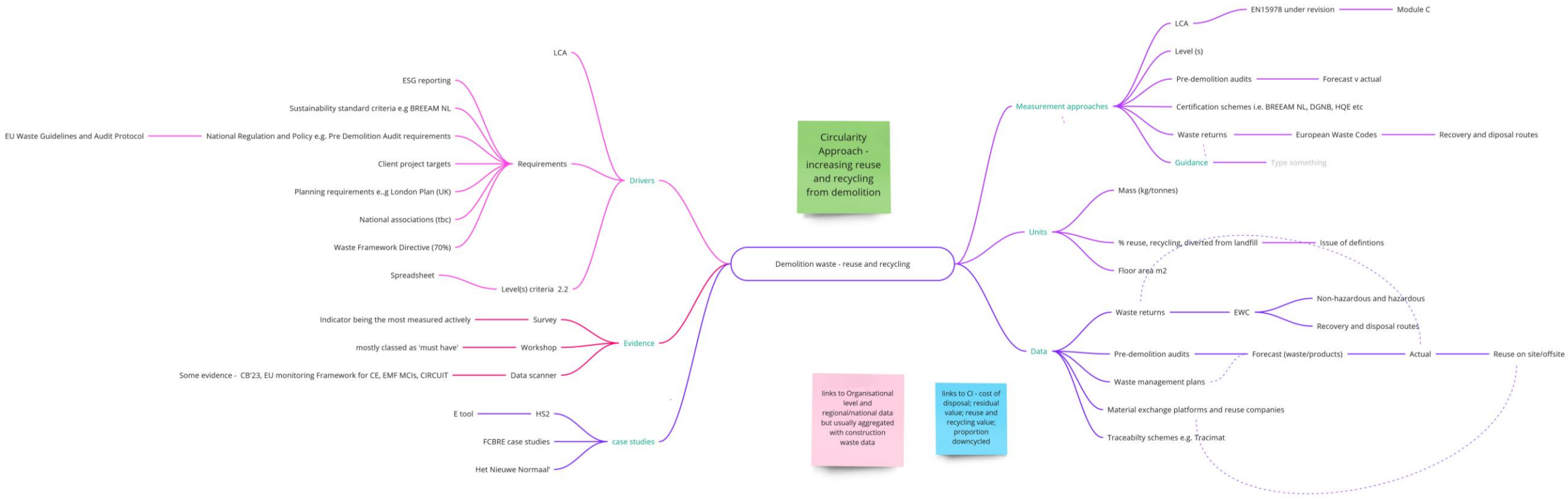
URBAN LEVEL

- Demolition waste generated
- Recycling/recovery rate of construction and demolition waste
- Refurbishment and transformation rate relative to new construction
- Demolition rate
- Average age at demolition

ORGANISATIONAL LEVEL

- Refurbishment/transformation rate of buildings/infrastructure portfolio
- Predicted service life of buildings/infrastructure portfolio
- Average reused and recycled content in new buildings/infrastructure (circular inputs)
- Reused and secondary content input
- Non hazardous waste arisings
- Hazardous waste
- Waste management routes
- Requirements set for specification of circular economy approaches including recycled + reused products and materials
- Requirements set for pre-demolition audits and subsequent implementation

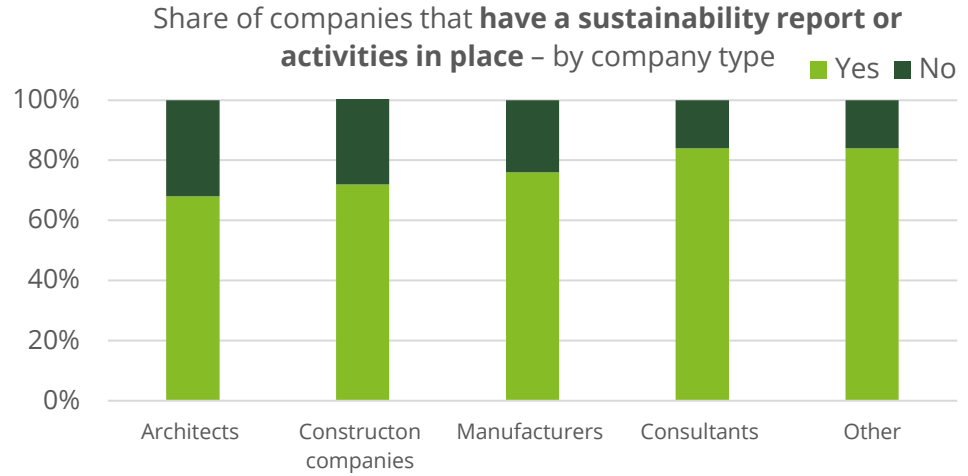
Circularity indicators example
Building level: Demolition waste

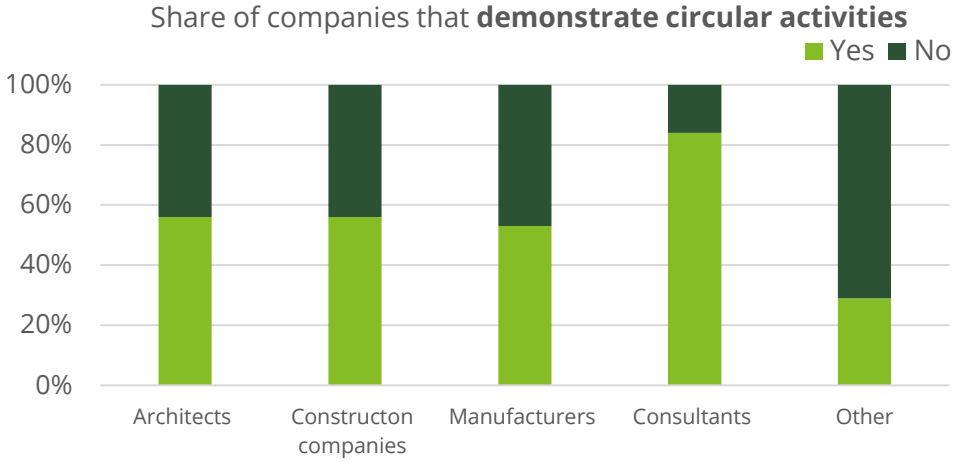


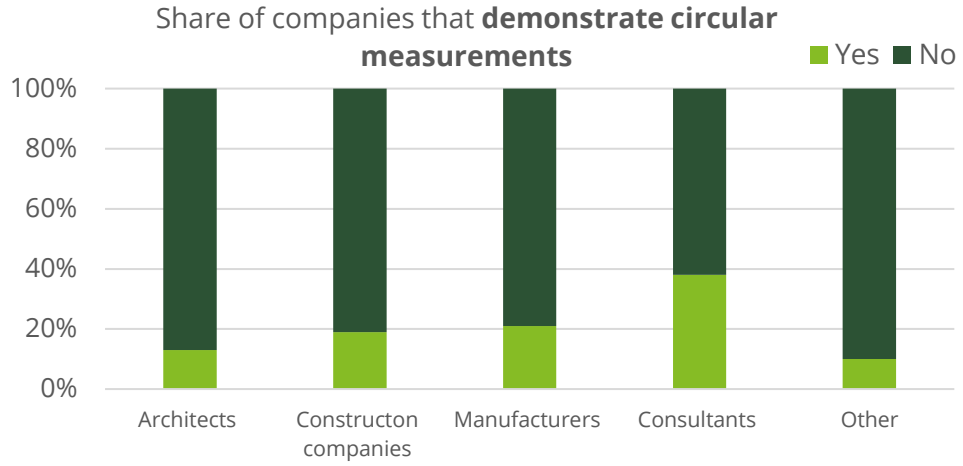
Data (6/6)	Availability of standard measurement methodology (3/3)	Current measurement (3/3)	Ease of measurement (2/3)	Relevance (3/3)	Drivers and barriers (5/6)	**Overall Score – 22/24**

Circularity indicators – Results of company analysis

So far, we have scanned 199 companies to track their sustainability and circularity activities that they have currently in place







Drivers and Barriers

We are defining the drivers and barriers for the uptake of circular economy approaches and the collection of relevant data in relation to the indicators. The analysis so far has identified a number of drivers and barriers that will be refined and linked to specific indicators.

Shortlisted indicators	Barriers	Drivers
BUILDING OR INFRASTRUCTURE LEVEL		
At Concept stage comparison of infrastructure life cycle costs	High cost associated with the collection, reporting or delivering the data	More consistent data formats along the supply chain
At Design stage - Material intensity/ dematerialisation	Difficulty to track origin of products and their constituent materials	Requirements set by project investors and clients
Designed for adaptability and flexibility	Technical uncertainty associated with circular economy practices and what needs to be achieved	Establishment of a functioning business model around circular economy
ORGANISATIONAL LEVEL		
Refurbishment/Transformation rate of buildings/ infrastructure portfolio	Limited data availability	Investments on financial and human resources
Predicted service life of buildings/ infrastructure portfolio	Data confidentiality / potential impact on business	Business procurement practices
Average reused and recycled content in new buildings/infrastructures (circular inputs)	Data interoperability / lack of standardisation	Internal targets within organisation
URBAN LEVEL		
Total Construction & Demolition waste generated (city/region/national level)	Inaccuracy and reliability of data	Standardised indicators provided by European standards to encourage companies to provide data to the market

Scope and goal of the workshop

Interim results

Product/ material focus

Buildings/ infrastructure focus

Coffee break

Urban level & organisation level focus

Panel discussion

We will now hear two presentations on the application of circular approaches at product/ material level

Manfred Fuchs

DG GROW: Presentation on CPR, ESPR and « the others » …

By Manfred Fuchs (Policy Senior Assistant, DG GROW)

CPR, ESPR and « the others » …

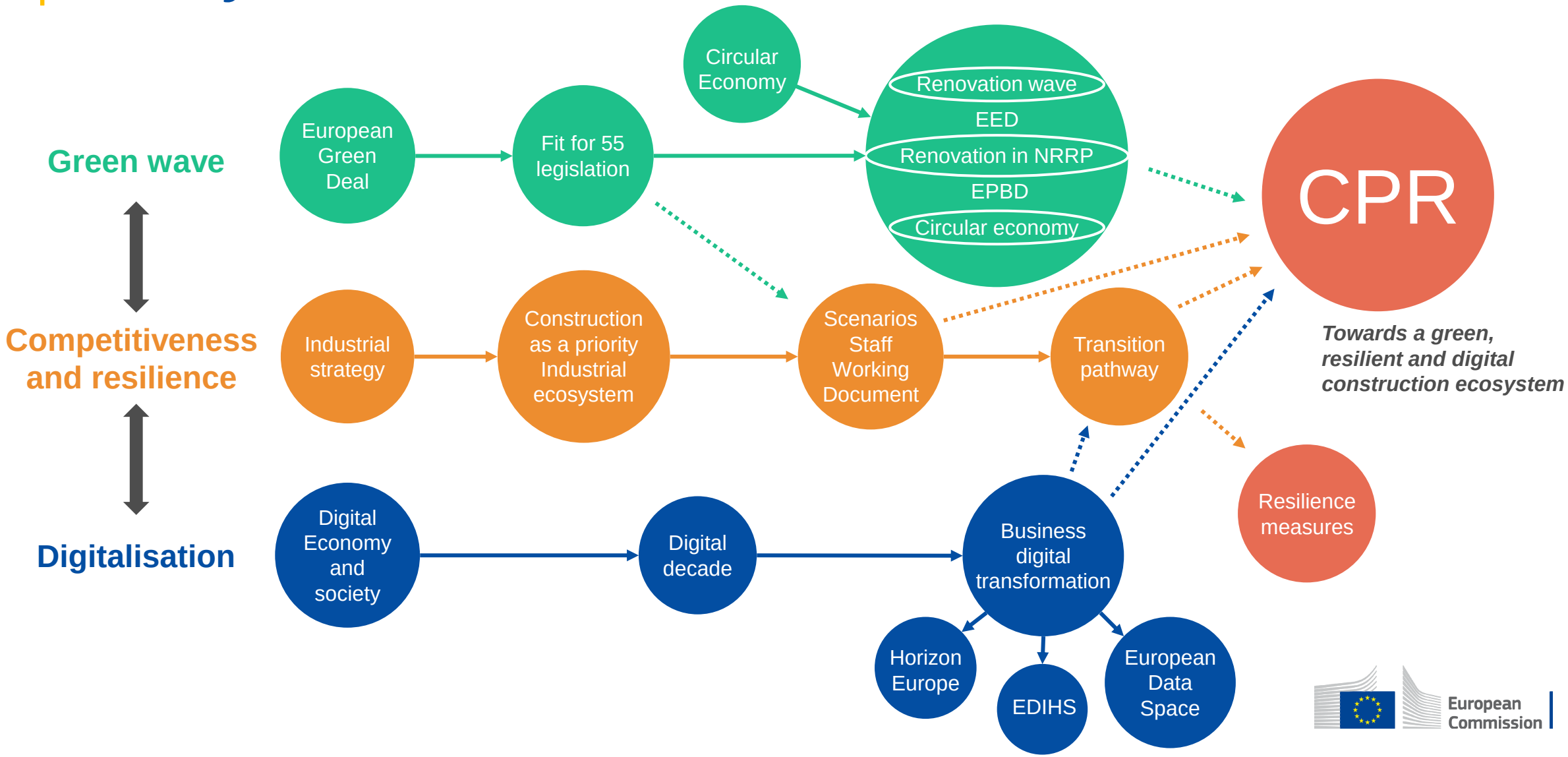
DG GROW unit H.1

European Commission

The new CPR proposal

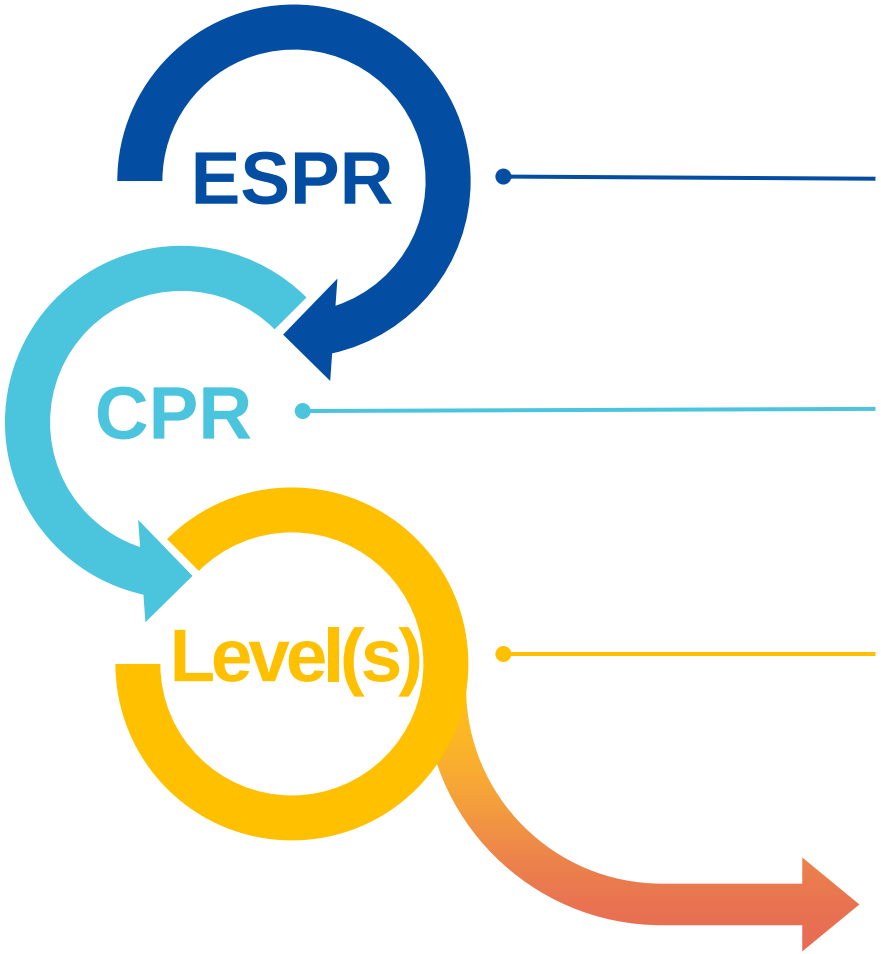
- Focus on (technical) information needed by users (for the whole life cycle)
- Embedded in sustainability policies and instruments
- Not “inventing the wheel again” – use existing formats and structures
- ESPR as basis – addition: EN 15804

Transition pathway of the construction ecosystem and the CPR



European Commission

EU Regulatory framework



Ecodesign for Sustainable Products Regulation
Setting performance and information requirements for products placed on the Single Market

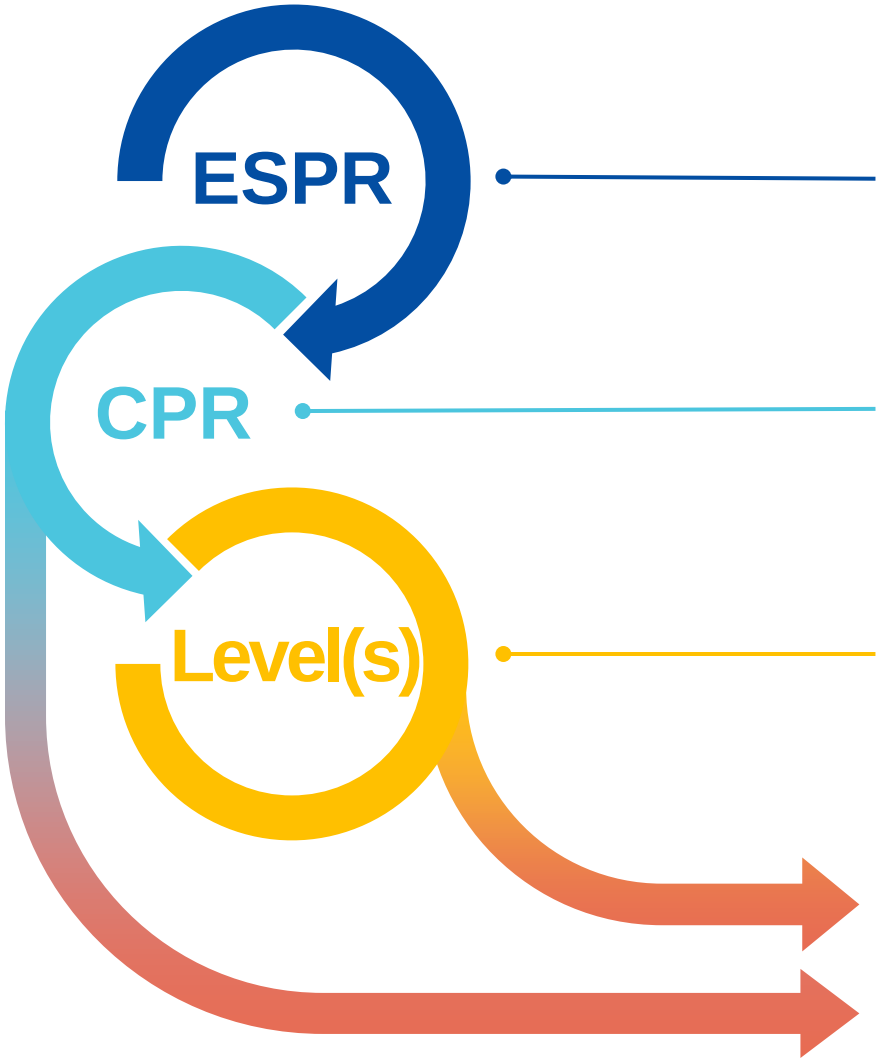
Construction Products Regulation
Delivery of environmental information from construction products and implementation of requirements

Level(s) methodology
Sustainability assessment of buildings

Taxonomy
Sustainable activities
EPBD
Sustainable buildings
EED
Public procurement of buildings

European Commission

National Regulatory framework



Ecodesign for Sustainable Products Regulation
Setting performance and information requirements for products placed on the Single Market

Construction Products Regulation
Delivery of environmental information from construction products and implementation of requirements

Level(s) methodology
Sustainability assessment of buildings

National approach
Environmental building assessment
Product Public procurement

European Commission

Essential characteristics

Core indicators

- Climate change – total / fossil / biogenic / land use and land use change
- Ozone Depletion
- Acidification
- Eutrophication aquatic freshwater
- Eutrophication aquatic marine
- Eutrophication terrestrial
- Photochemical ozone creation
- Depletion of abiotic resources – mineral and metals
- Depletion of abiotic resources – fossil fuels
- Water use

Additional indicators

- Particulate matte remissions
- Ionizing radiation, human health
- Ecotoxicity (freshwater)
- Human toxicity, cancer effects
- Human toxicity, non- cancer effects
- Land use related impacts / soil quality

Same indicators and modelling used in PEF except for end of life calculation and GWP biogenic

Essential characteristics

Resource use indicators

- Use of renewable primary energy
- Total use of renewable primary energy resources
- Use of non-renewable primary energy
- Total use of non-renewable primary energy
- Use of secondary material
- Use of renewable secondary fuels
- Use of non-renewable secondary fuels
- Net use of fresh water

Waste related indicators

- Hazardous waste disposed
- Non-hazardous waste disposed
- Radioactive waste disposed

Output flows

- Components for re-use
- Materials for recycling
- Materials for energy recovery
- Exported energy

Biogenic carbon content

- Biogenic carbon content in product
- Biogenic carbon content in accompanying packaging

“Old” & “new” CPR

- Updating mandates/requests for technical specifications to CEN for construction products (« Technical Acquis »)
- Two versions:
  - one for the current CPR
  - one for the requirements of the future CPR

Steering group

Fire

Dangerous substances

Environmental sustainability

2021	1	Precast concrete products	13	Floorings	25	Gypsum
2021	2	Structural metallic products	14	ETICs	26	Anchors and fasteners
2022	3	Reinforcing prestressing steel	15	Curtain walling	27	Membranes
2022	4	Doors, windows and shutters	16	Wood based panels	28	Glass
2023	5	Cement	17	Structural bearings	29	Geotextiles
2023	6	Thermal insulating products	18	Kits and assemblies	30	Sanitary appliances
…	7	Structural timber products	19	Wall and ceiling finishes	31	Pipes and tanks
	8	Concrete, mortar and grout	20	Space heating appliances	32	Cables
	9	Masonry	21	Roof coverings	33	Chimneys
	10	Aggregates	22	Circulation fixtures	34	Sealants
	11	Fixed firefighting equipment	23	Waste water disposal		
	12	Road construction products	24	Adhesives		

European Commission

“Old” & “new” CPR

- How to ensure data quality – comparability of data?
- How to deal with EPDs based on national/regional baselines?

We will now hear two presentations on the application of circular approaches at product/ material level

Massimiliano Bagagli

ITACA protocol: a possible path to sustainability in the governance of the building process

By Massimiliano Bagagli (ITACA Working Group Coordinator, ITACA)

ITACA PROTOCOL: A POSSIBLE PATH TO SUSTAINABILITY IN THE GOVERNANCE OF THE BUILDING PROCESS

Massimiliano Bagagli
ITACA Working Group Coordinator

STUDY ON MEASURING THE APPLICATION OF CIRCULAR APPROACHES IN THE CONSTRUCTION INDUSTRY ECOSYSTEM

European Commission

Deloitte.

ITACA

About ITACA

ITACA – the Italian Institute for Innovation and Transparency in Public Procurement and Environmental Compatibility, is a technical supporting body to the Conference of the Italian Regions

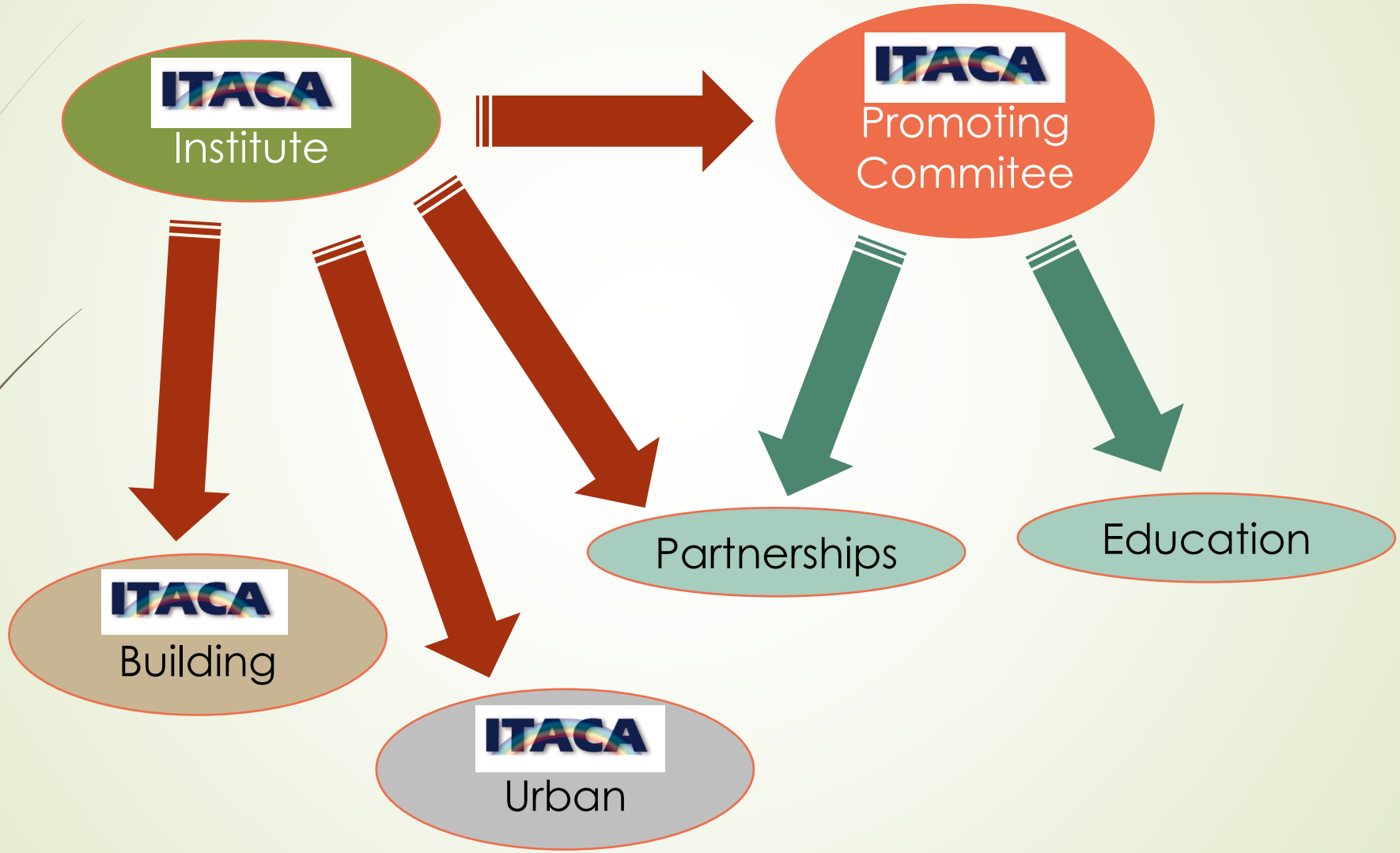
5 THEMATIC AREAS OF ACTIVITY:

- Public contracts for construction works, services and supplies;
- **Energy and environmental sustainability;**
- Safety at Work;
- Technical specifications;
- Regional Contracts Observatory.

- **14 Italian regions out of 20 using ITACA Protocol as tool for assessing green buildings**

- **Thousands of buildings have been evaluated with ITACA Protocol**

About ITACA


ITACA
Institute
ITACA
Promoting
Commitee
Partnerships
Education
ITACA
Building
ITACA
Urban

The UNI PdR 13:2019 – ITACA Protocol

ITACA Protocol, also called UNI PdR 13:2019, is a multicriteria building environmental sustainability assessment tool and it has been developed from the international evaluation model SBTool.

ITACA Protocol has become an UNI Reference Practice "Environmental sustainability in construction - Operational tools for assessing sustainability". UNI is the Italian national standardisation body.

Structure: 3 chapters, 5 evaluation, areas, 19 categories

PdR 13:2019 – 0 Methodology	PdR 13:2019 – 1 Residential Buildings	PdR 13:2019 – 2 Not Residential Buildings

Area A – Site quality
Cat. A.1 Site selection
Cat. A.2 Project infrastructure and services

Area B – Energy and resource consumption
Cat. B.1 Non renewable primary energy
Cat. B.3 Energy from renewables
Cat. B.4 Eco-friendly materials
Cat. B.5 Use of drinking water
Cat. B.6 Envelope performance

Area C – Environmental loadings
Cat. C.1 CO2 emissions
Cat. C.3 Solid waste
Cat. C.4 Wastewater
Cat. C.6 Impact on project site

Area D – Indoor environmental quality
Cat. D.2 Indoor air quality and Ventilation
Cat. D.3 Air temperature and relative humidity
Cat. D.4 Daylighting and illumination
Cat. D.5 Noise and acoustics
Cat. D.6 Electromagnetic emissions

Area E – Service quality
Cat. E.2 Functionality and efficiency
Cat. E.3 Controllability
Cat. E.6 Maintenance of operating performance
Cat. E.7 Social aspects

The UNI PdR 13:2019 – ITACA Protocol

B.4 ECO-FRIENDLY MATERIALS

B.4.6 Use of recycled materials

B.4.7 Use of renewable materials

B.4.8 Local materials

B.4.10 Use of dismounting materials

B.4.11 Certified materials

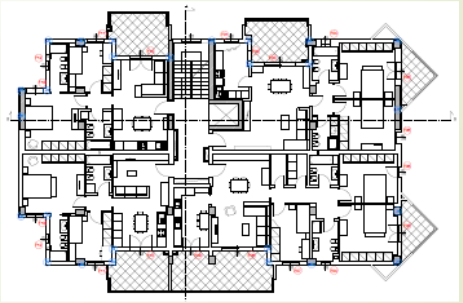
- Foundation structure
- Elevation structure
- Vertical closure
- Lower horizontal closure
- Horizontal closure on external spaces
- Upper closure
- Vertical interior partition
- Horizontal interior partition
- Interior sloping partition
- Vertical exterior partition
- Horizontal exterior partition
- Inclined exterior partition
- Basement partitions

Materiali riciclati/recuperati

AREA DI VALUTAZIONE	CATEGORIA	
B. Consumo di risorse	B.4 Materiali eco-compatibili	
ESIGENZA	**PESO** nella categoria	**DEL** nel sistema completo
Favorire l'impiego di materiali riciclati e di recupero per diminuire il consumo di nuove risorse a favore dell'economia circolare.		
INDICATORE DI PRESTAZIONE	**UNITÀ DI MISURA**	
Percentuale in peso dei materiali riciclati e/o di recupero e utilizzati nell'intervento in aggiunta alla percentuale limite di legge.	%	

SCALA DI PRESTAZIONE

	%	PUNTI
NEGATIVO	<0,0	-1
SUFFICIENTE	0,0	0
BUONO	3,0	3
OTTIMO	5,0	5



The UNI PdR 13:2019 – ITACA Protocol

B.4 ECO-FRIENDLY MATERIALS
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B.4.11 Certified materials

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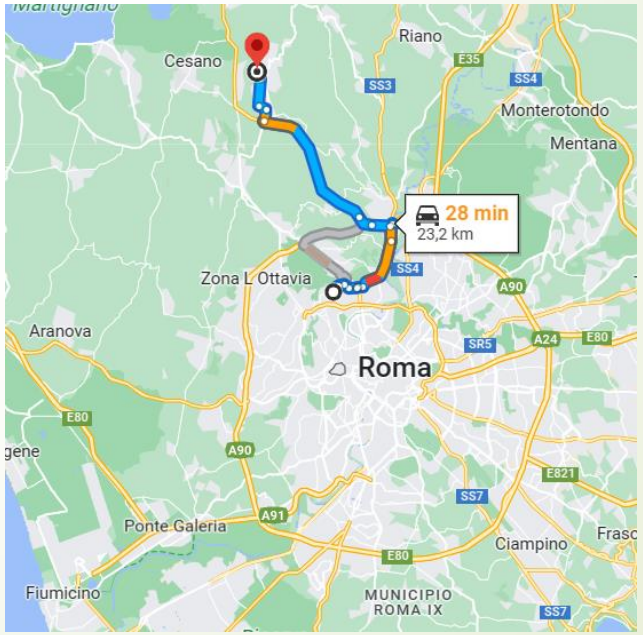
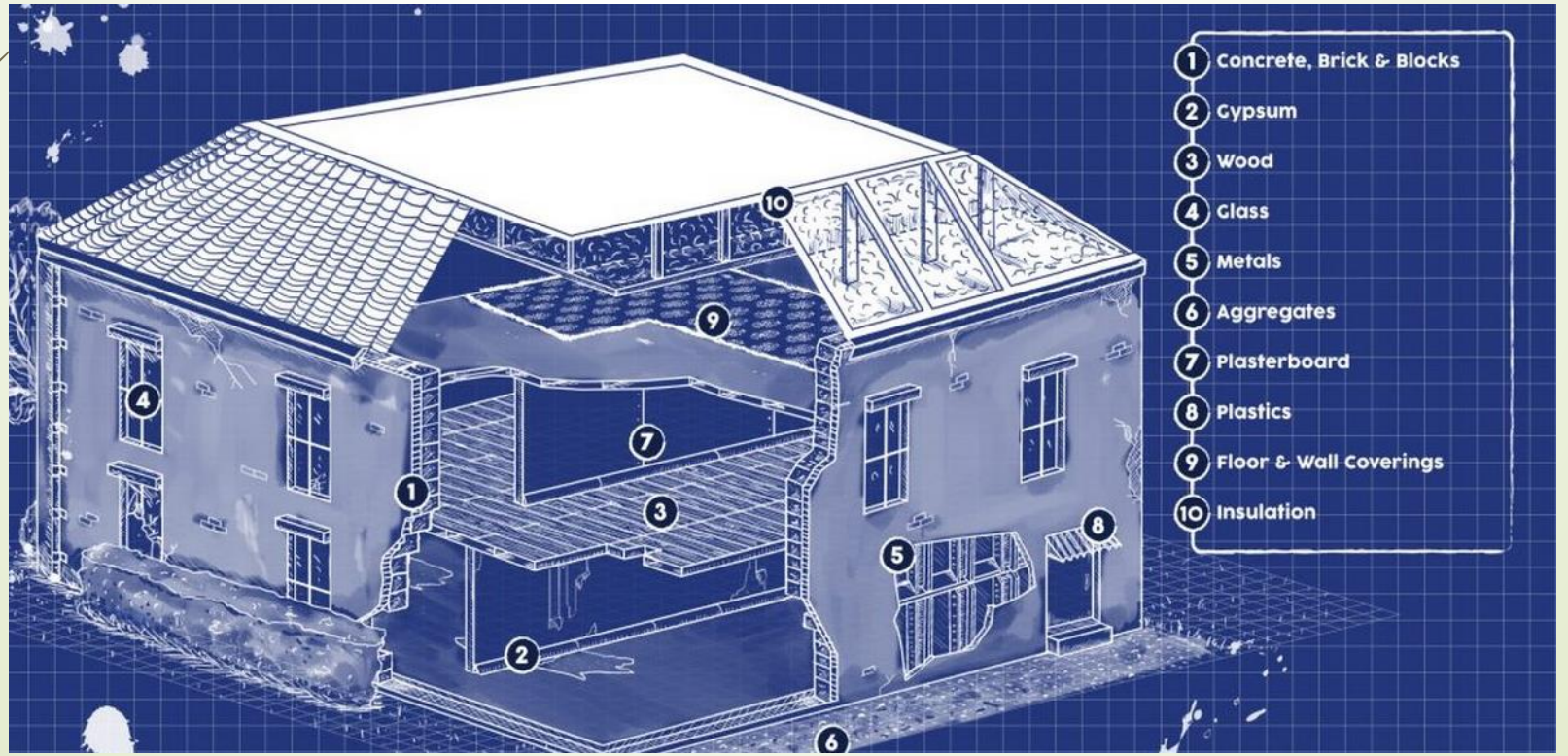
- Inclined exterior partition
- Basement partitions



The UNI PdR 13:2019 – ITACA Protocol

B.4 ECO-FRIENDLY MATERIALS
B.4.6 Use of recycled materials
B.4.7 Use of renewable materials
B.4.8 Local materials
B.4.10 Use of dismounting materials
B.4.11 Certified materials



The UNI PdR 13:2019 – ITACA Protocol

B.4 ECO-FRIENDLY MATERIALS

B.4.6 Use of recycled materials

B.4.7 Use of renewable materials

B.4.8 Local materials

B.4.10 Use of dismounting materials

B.4.11 Certified materials

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² URBANSCAPE Extensive Green Roof System

Parameter	Unit	A1-A3	A4	A5	B1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	3.97E+0	6.68E-1	2.02E+0	-1.50E+1	5.33E-2	1.96E+1	5.03E-1	-1.78E+0
ODP	[kg CFC11-Eq.]	3.74E-10	3.07E-12	1.41E-10	0.00E+0	2.45E-13	1.01E-11	4.32E-10	-3.20E-10
AP	[kg SO_2-Eq.]	2.44E-2	1.65E-3	6.64E-4	0.00E+0	1.31E-4	1.94E-3	4.29E-5	-2.63E-3
EP	[kg $(PO_4)^{3-}$-Eq.]	3.86E-3	3.81E-4	1.14E-4	0.00E+0	3.04E-5	5.12E-4	7.62E-6	-3.17E-4
POCP	[kg ethene-Eq.]	1.51E-3	-4.62E-4	5.30E-5	0.00E+0	-3.69E-5	2.88E-4	4.34E-6	-2.67E-4
ADPE	[kg Sb-Eq.]	1.35E-6	4.45E-8	4.46E-8	0.00E+0	3.55E-9	2.97E-7	2.36E-9	-4.32E-7
ADPF	[MJ]	7.80E+1	9.20E+0	1.78E+0	0.00E+0	7.34E-1	5.73E+0	7.65E-2	-2.23E+1

If you can't measure it, you can't improve it

LORD WILLIAM THOMSON KELVIN

Massimiliano Bagagli m.bagagli@itaca.org

Indicators at product/material level

PRODUCT/MATERIAL LEVEL

- Reused product
- Remanufactured/reused content
- Recycled/secondary content
- Design for disassembly and circularity
- Wastage rate
- Predicted service life
- Hazardous waste
- Realistic end of life scenarios developed
- Residual value per unit product/material at end-of-life
- Part of an Extended Producer Responsibility system (i.e. take-back system)

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Event code
FSYSSH

Scope and goal of the workshop

Interim results

Product/ material focus

Buildings/ infrastructure focus

Coffee break

Urban level & organisation level focus

Panel discussion

We will now hear four presentations on the application of circular approaches at buildings/infrastructure level

Evert Schut

Circular indicators for infrastructure: The Dutch approach

By Evert Schut (Senior expert circular economy, Dutch Ministry of Infrastructure and Water management)

Rijkswaterstaat
Ministry of Infrastructure and Water Management

Circular indicators for infrastructure

The Dutch approach

Evert Schut

March 23, 2023

A sustainable procurement strategy for road infrastructure

23 March 2023

Gemeente Rotterdam

bigbuyers for climate & environment

Léon Dijk MSc

Sustainable procurement of infrastructure in the Netherlands

- In 2008 Rijkswaterstaat started awarding sustainability using MEAT criteria (Most Economically Advantageous Tender) and DuboCalc: LCA based design instrument
- Methodology:
  - A bidding construction company is required to assess the environmental impact of their design using Dubocalc (or other allowed LCA software)
  - The result is an aggregated indicator for the environmental costs *in Euro's*.
  - These costs are added to the price of the bid, and the project is awarded to the bid with the lowest price (including the environmental costs).
- Performance orientated:
  - Construction companies are free to make a design that complies to the technical specifications with the lowest environmental performance
  - Environmental impact performance plays a major role in selecting the winning bid
- By the way: this not a "True Pricing" method, the environmental costs are only used to determine the lowest integral price point. The sustainable design aspects included in the bid are however mandatory and will be controlled at the construction phase.
- Many other infrastructure client organisations have taken over the approach, but it is not mandatory.

Dubocalc: Sustainable Construction Calculator (“SuCocalc?”)

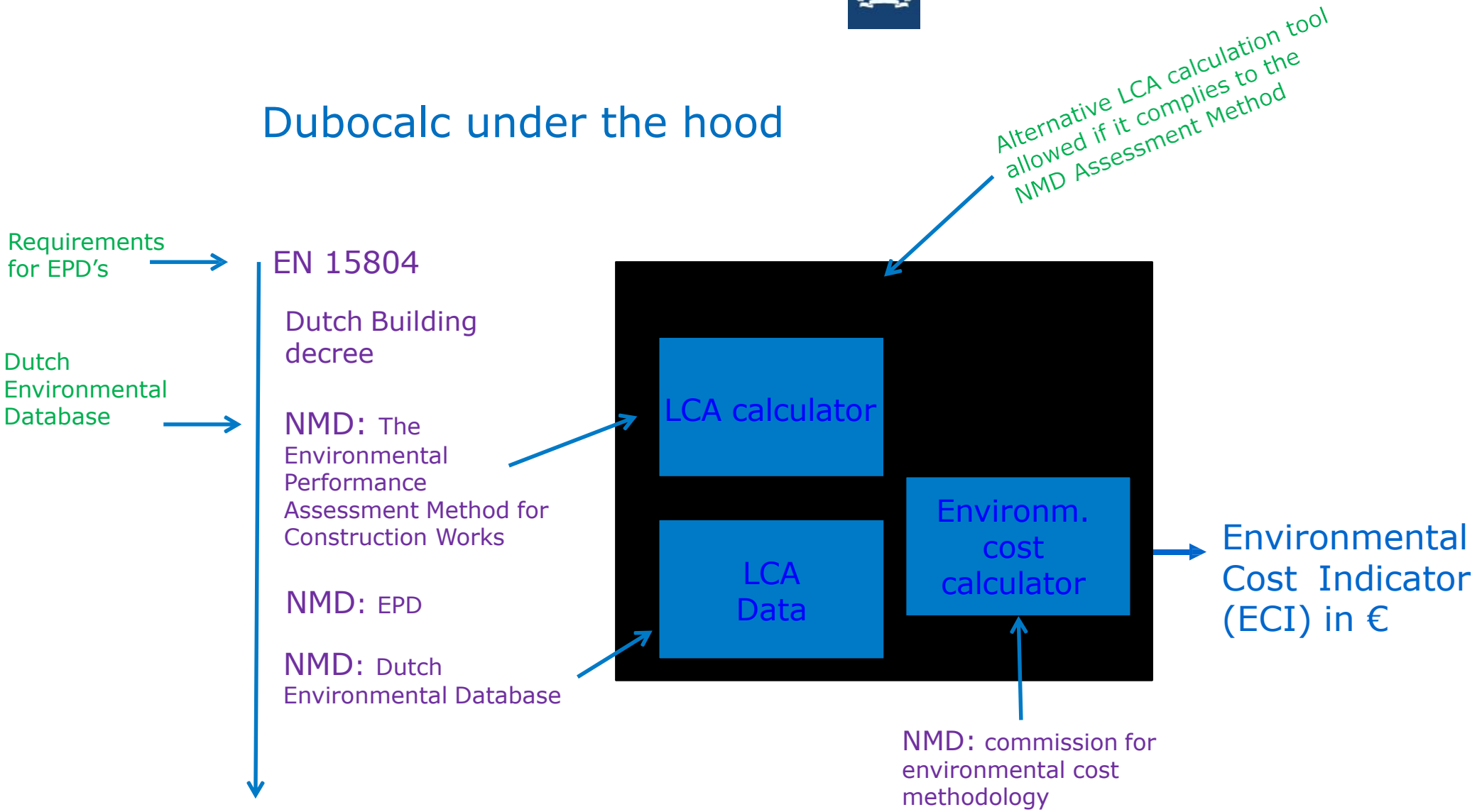
Input
(design specs)

. Bill of materials
. Transport distance
. Process steps

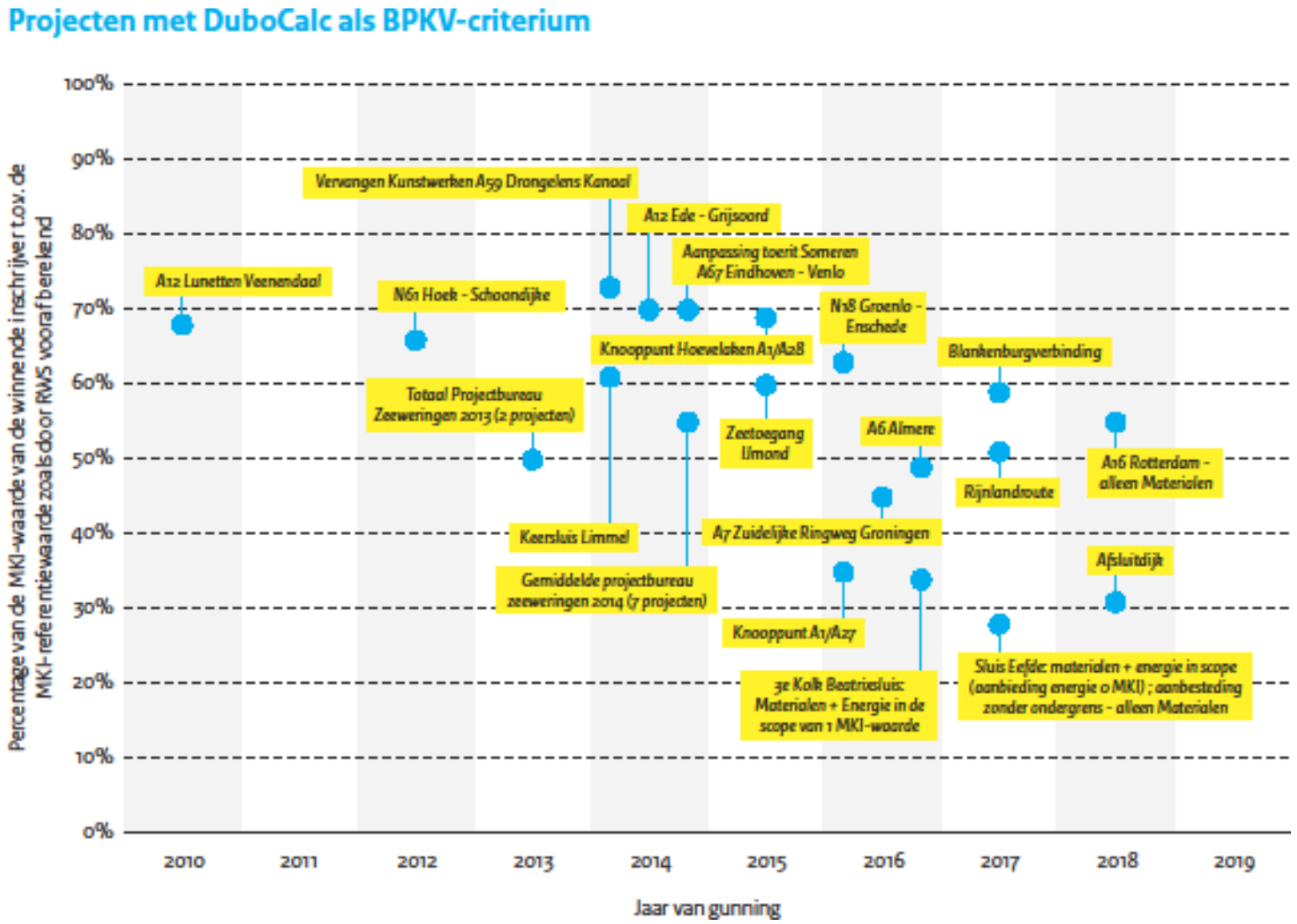
Output

Environmental Cost Indicator (ECI) in €

Dubocalc under the hood



Results Rijkswaterstaat sustainable procurement with MKI (ECI) indicator



Limitations to sustainable procurement

- For instance:
  - Design flaws, limiting life span of materials/ products/ constructions:
    - eg. lacking accesibility hampers maintenance and repair (won't show up in any LCA)
  - Functionality is much shorter than expected, because of lacking adaptability in the design
    - E.g. large scale reconstruction of a traffic node after only 15 years
  - Lacking execution at construction stage
    - because we don't allow our construction companies enough time
  - Recyclability is limited to downcycling because of lacking detachability
- These are all aspects of *circular* -design, -construction and -assetmanagement.
- A more circular, more *technical* approach is required!

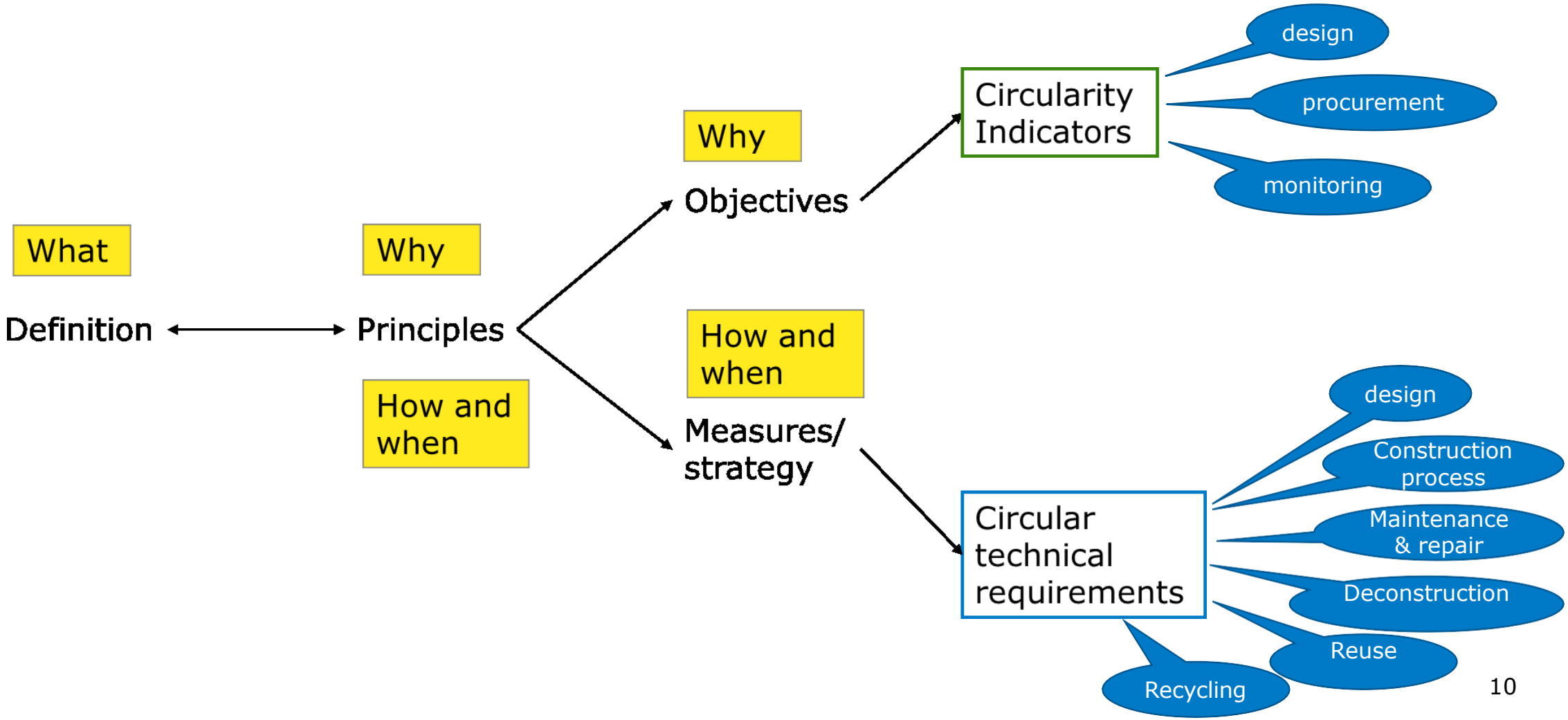
Rijkswaterstaat and Circular construction

- Aspects of circularity were always part of the sustainability mix, but not a priority, and not an integral part of the work process
- In 2016 Rijkswaterstaat adopted the ambition to “work in a fully circular manner by 2030”
- Whatever that may mean….
- Reason to form a team to find out what circular construction would mean and start implementing it
- We realised we could not do this alone, we needed our partners in the construcion value chain
- Initiative to start Platform CB’23 (circular construction 2023), together with our national Standardisation Institute NEN
  - Over 300 participants from the construction sector (both buildings *and* infrastructure)
  - find agreement on whatever is needed to start working in a more circular manner in the whole sector

CB’23 Guideline “Measuring circularity”

- Approach:
  - Why do we need circular construction and what are the objectives we want to achieve?
    - Protect the environment (including climate change)
    - Protect resource availability
    - Protect value
  - For each objective find measurable indicators:
    - Environment: LCA methodology
      - Covered by the EN 15804 and the National Building Decree/ NMD Assessment method
    - Resource availability: MFA – based on LCI
      - assess the results with an indicator for scarcity
    - Value….. Which value?
      - Functional, technical/ material and economic value

Working from principles to assessment



Assessment of technical-circular requirements

- Answering questions like:
  - "Which test method is needed to provide evidence that a product achieves a required technical circular performance?"
- For instance: a test method that gives adequate information on the long term detachability of a construction product
- Other examples of technical circular requirements:
  - adaptability,
  - reparability,
  - maintainability,
  - lifespan,
  - reusability
  - recyclability.
- It requires a horizontal standard at a principle level, and specific technical standards at product group level.

- CB'23 and NEN are working on a first set of technical requirements
- CEN TC 350/ sub-commission "Circular Construction" will probably follow

Thank you for listening

We will now hear four presentations on the application of circular approaches at buildings/infrastructure level

Edouard Sorin

Presentation of BTPFlux and the PEMD Platform

By Edouard Sorin (Research & expertise engineer in circular economy, CSTB)

CSTB
le futur en construction

Presentation of BTPFlux and the PEMD Platform

March 28th, 2023

2023 a tipping point regarding regulatory context in France

- Environmental regulation for new buildings construction – RE2020

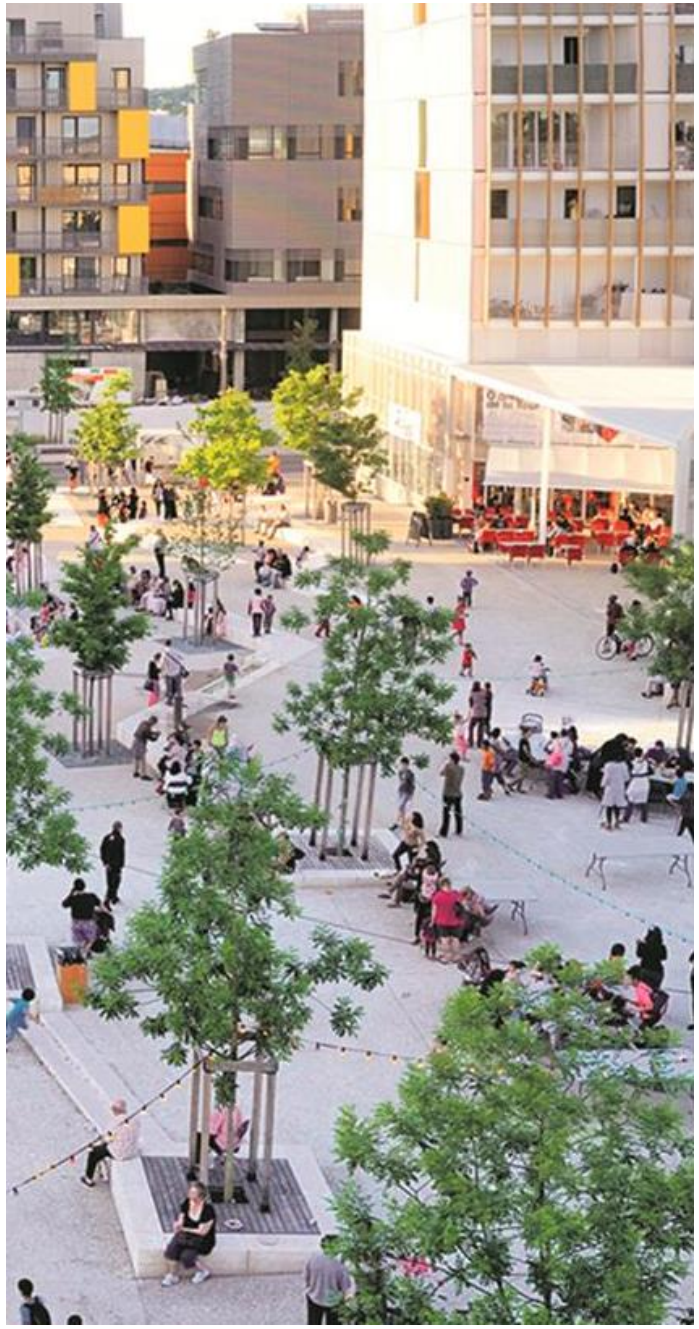
- Generalize Life Cycle Analysis for new buildings
- Promote reuse / recycling if lower embodied CO2 emissions

- Mandatory diagnostic/audit for demolition or important renovation operations
- diagnostic PEMD

- Analyse the valorisation potential for building materials
- Show availability of deposits by localizing and quantifying them

- Extended Producer Responsability

- Building material valorisation costs supported by building material sellers
- Objectives set by public bodies



BTPFlux

BTPFLux

A flow analysis model for buildings components

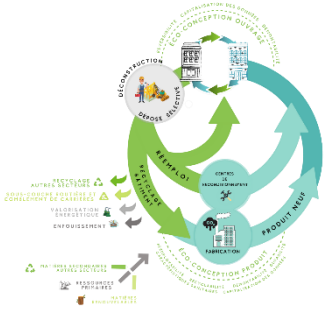
CSTB
le futur en construction

Objectives

1

Important issues to be managed by local decision makers

⇒ Management and treatment of the Products, Equipements, Materials and Waste (PEMW)
⇒ Development of localwaste management and valorisation sectors
⇒ Ensure the supply of resources (local when possible)
⇒ Reduction of the ecological footprint of their territory



2

Anticipate and optimize the flow of PEMW associated with the building sector (Urban Mining)

⇒ Construction *-> consumption*
⇒ Deconstruction *-> production*
⇒ Renovation and Rehabilitation *-> consumption and production*

3

Conduct studies at different scales

⇒ France
⇒ Region/Province
⇒ Territorial communities
⇒ Municipalities/Neighborhood

Modeling issues

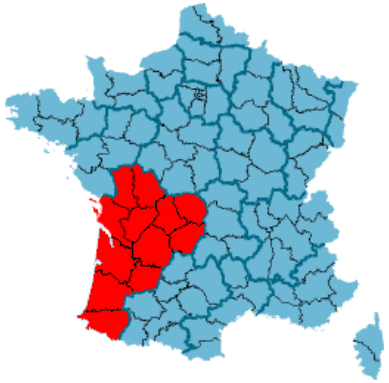
A **Incorporating territorial specificities**

⇒ Architectural considerations
⇒ Building stock dynamics *-> construction, deconstruction, …*
⇒ Capacity for management and processing*-> by category of PEMW*
⇒ Local production capacity *-> resources, firms, …*

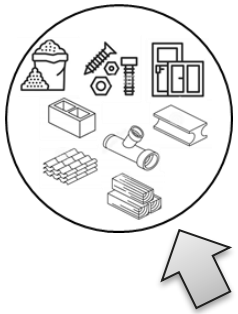
B **Help to establish a circular economy strategy**

⇒ Quantification and identification of flows *-> by category of PEMW*
⇒ Resource sustainability
⇒ Valorisation potential *-> building components*
⇒ Socio-economic impacts *-> Number of direct or indirect local jobs*
⇒ Prospective scenarios *-> carbon trajectory, population growth, …*

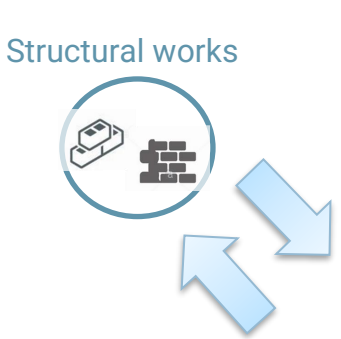
Structure of the model

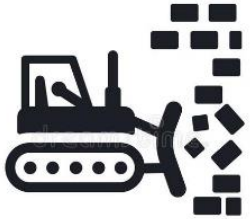


Selection of a territory in metropolitan France

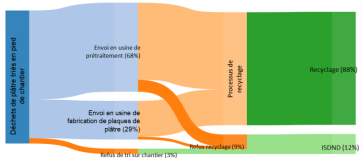


Estimation of the existing components stock





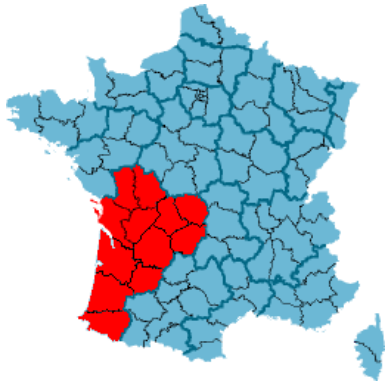
Estimation of additions and removals of components



Analysis of related flow management

Identification of strategic sectors

Territory selection



Metropolitan France
Region
Department
Metropolis
Collectivity

Incorporate territorial specificities

⇒ Architectural considerations

⇒ Building stock dynamics *-> construction, deconstruction, …*

Use of the Base de Données Nationale de Bâtiments (BDNB) (French National Building Database)

Geospatial cross-referencing of over 20 national databases

⇒ Partially in open data : [Base de données nationale des bâtiments (BDNB) - data.gouv.fr]

Estimation of a territory component stock in buildings

Database of building components

BTPFlux

Database of generic components (TyPy)

⇒ Over 300 components with different information :

- Density or surface density
- Thermal properties
- Material and waste composition
- LCA data
- ….

Estimation of a territory component stock in buildings

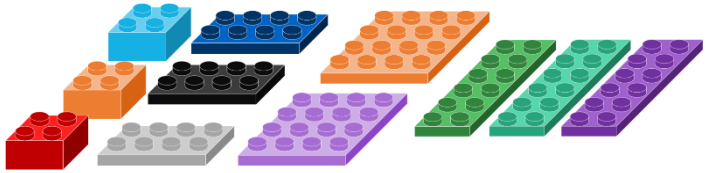
Materiality estimation

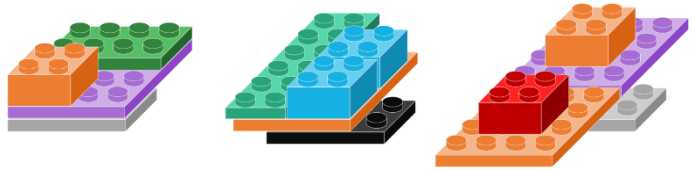
« Reconstruction » of a building using generic components

⇒ Creation of a macro-component from an assembly of components

⇒ Creation fo a macro-component from an assembly of macro-components

⇒ A building is a macro-component



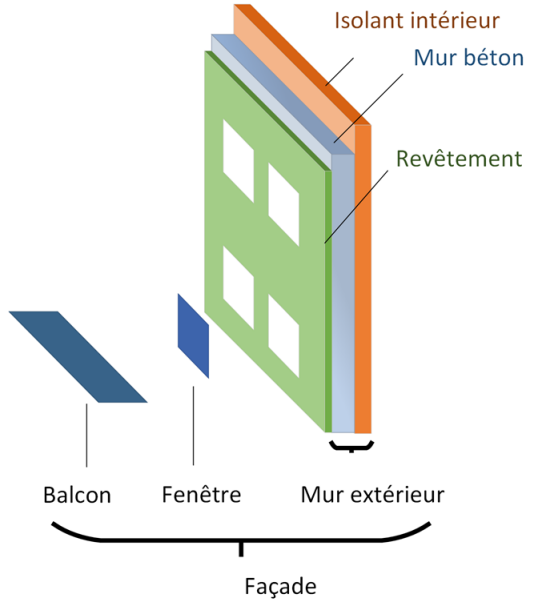


Sizing of each component

⇒ Inheritance of sizing

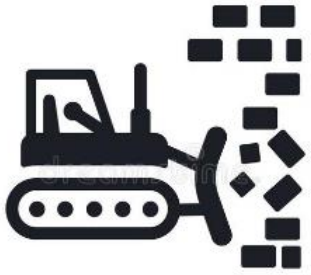
⇒ Rules on component or macro-component

- Facade surface *-> size of each component (window, wall, etc …)*
- Specific attribute *-> dimensions of a door*



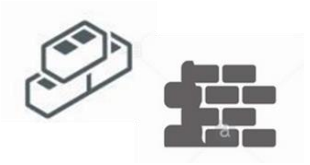
Estimate the addition and removal of components

Building stock dynamic



Deconstruction

⇒ 100% of the component are removed

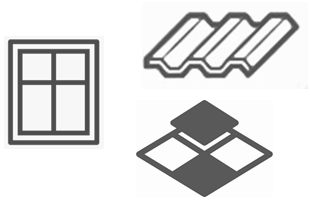


Mass = Structural work

Thermal renovation

⇒ Installation and removal scenario

- Added and removed component
- Renovation gesture performed

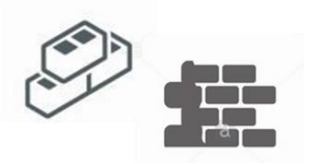


Mass = Finishes

Construction *(incoming)*

⇒ Need in components

⇒ Construction waste



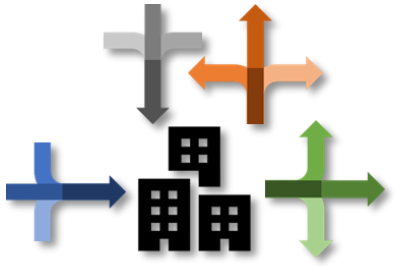
Mass = Structural work

Rehabilitation *(incoming)*

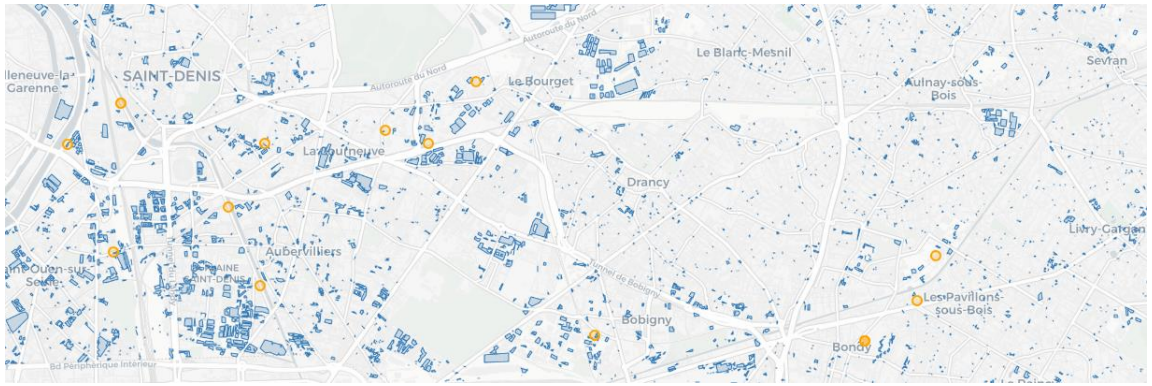
⇒ Installation and removal scenario

- Added and removed component
- Renovation gesture performed

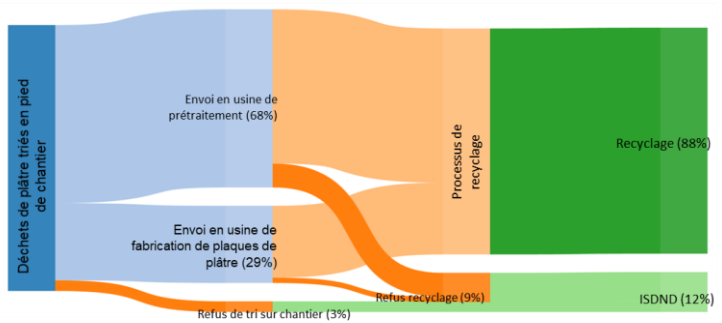
Flow analysis
Repartition in the waste end destinations



Flow origins
⇒ Deconstruction/renovation/construction
⇒ Neighbourhood development project
⇒ Territory

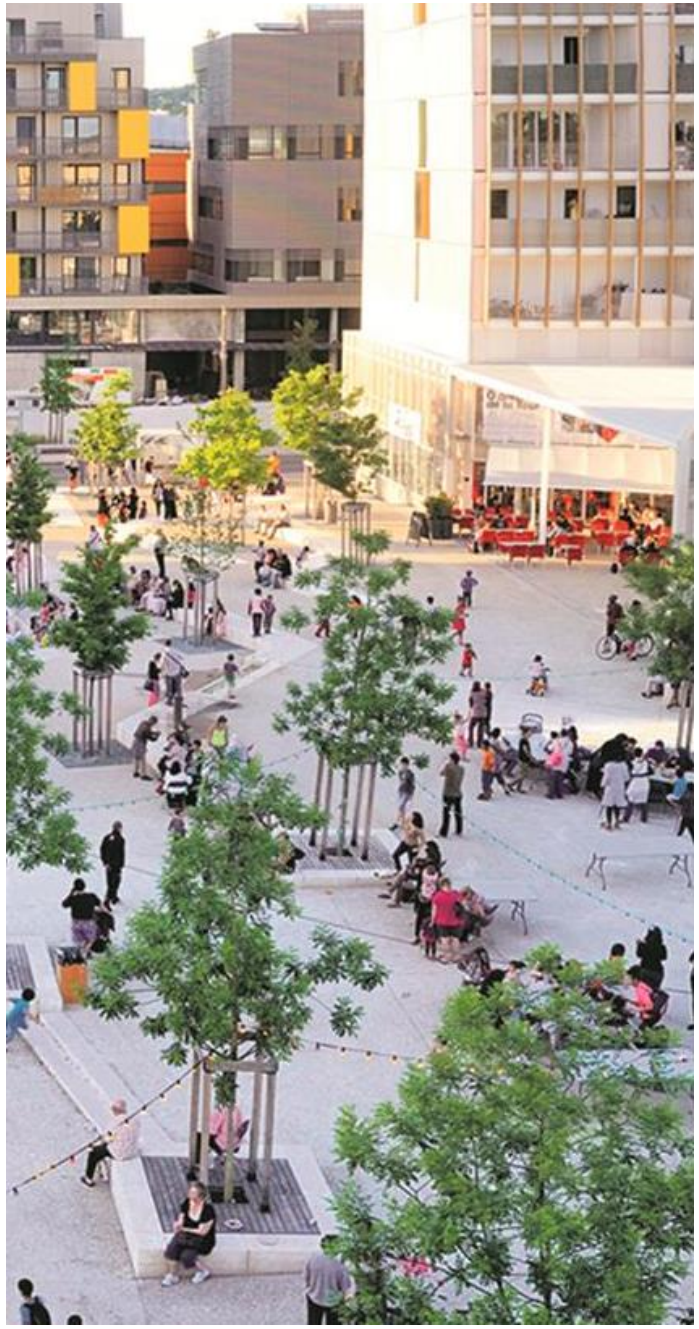


Cartographic tool developped by the CSTB



Example of the repartition for the gypsum

Repartition in the *waste end destinations*
⇒ By category of PEMW
⇒ According to diferent scenarios
⇒ Repartition rates in the *waste end destinations*
⇒ Match of supply and demand for the management of PEMW in a territory



PEMD platform presentation

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le futur en construction

Context
Legal obligation – Carrying out a PEMD audit

- **Article 51 of the anti-waste for a circular economy (AGEC) law – France**
- Initially planned for application on the 1st January 2022
- Should be applied during 2023
- Who : Contracting authority
- Scope
  - Operation type : Deconstruction and significant rehabilitation
  - Building :
    - Area superior to 1000 m²
    - At least one building that has hosted:
      - Agricultural
      - Industrial
      - Commercial activity
      - Storage, manufacture or distribution of classified or dangerous substances

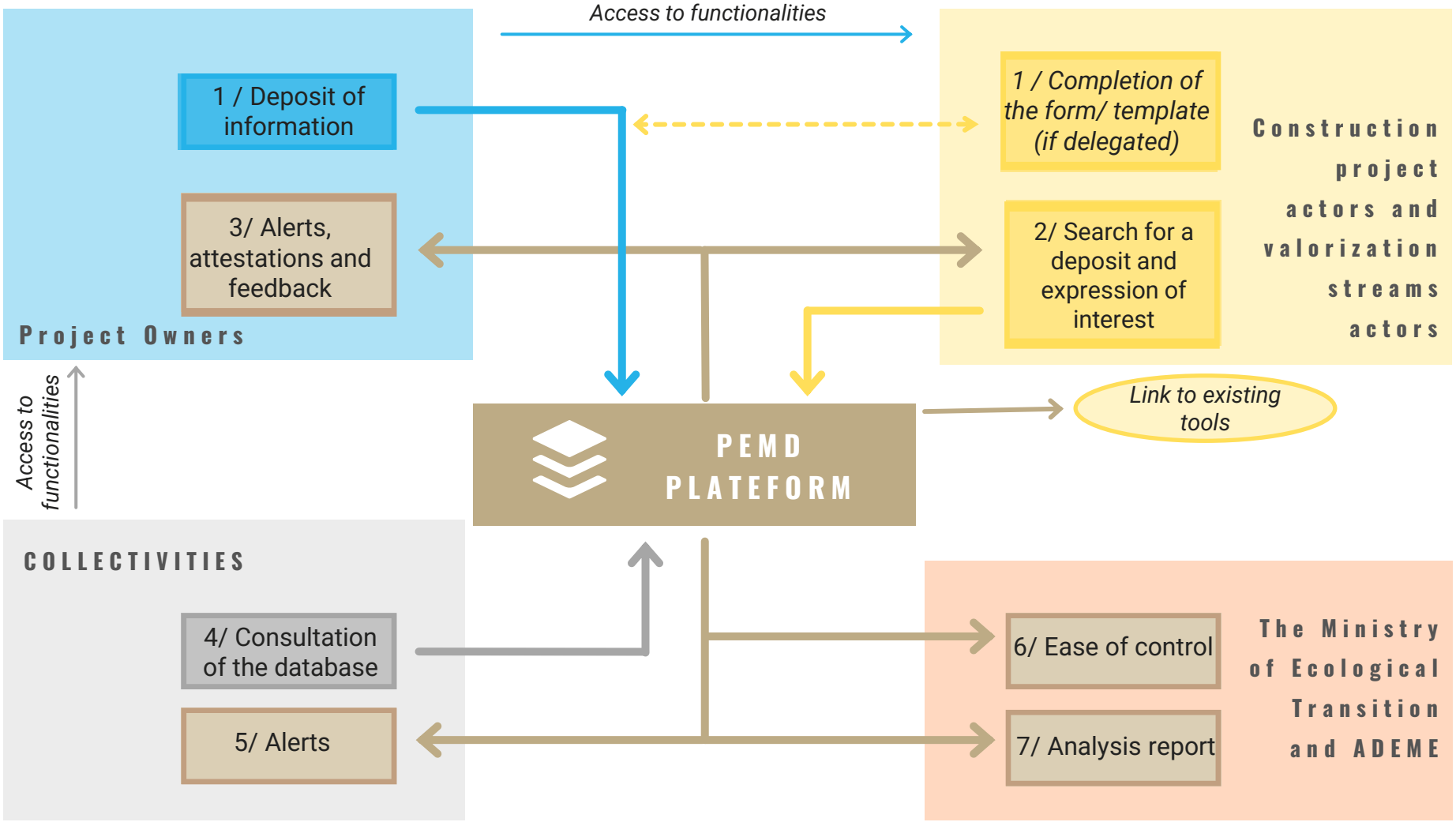
Specificty of the PEMD audit

- **Reinforcement of reuse:** product, equipment and materials vision in addition to the waste vision
- **Hierarchy of treatment and valorization methods:** Identification of potential for reuse, recycling, material recovery, disposal and associated channels
- **Competencies of the auditor:** reinforcement of the skills required of the diagnostician with 3 axes : building techniques, construction economics, waste prevention and management
- **Transmission:** Obligation to transmit the diagnosis and the verification form to CSTB allowing for a control of compliance with regulations and statistical feedback
- **Possibility of making the audit public:** Allow reuse and recovery sectors to identify potential pools upstream of the operation
- **Harmonization of the template/form (CERFA in France):** to be defined by a decree

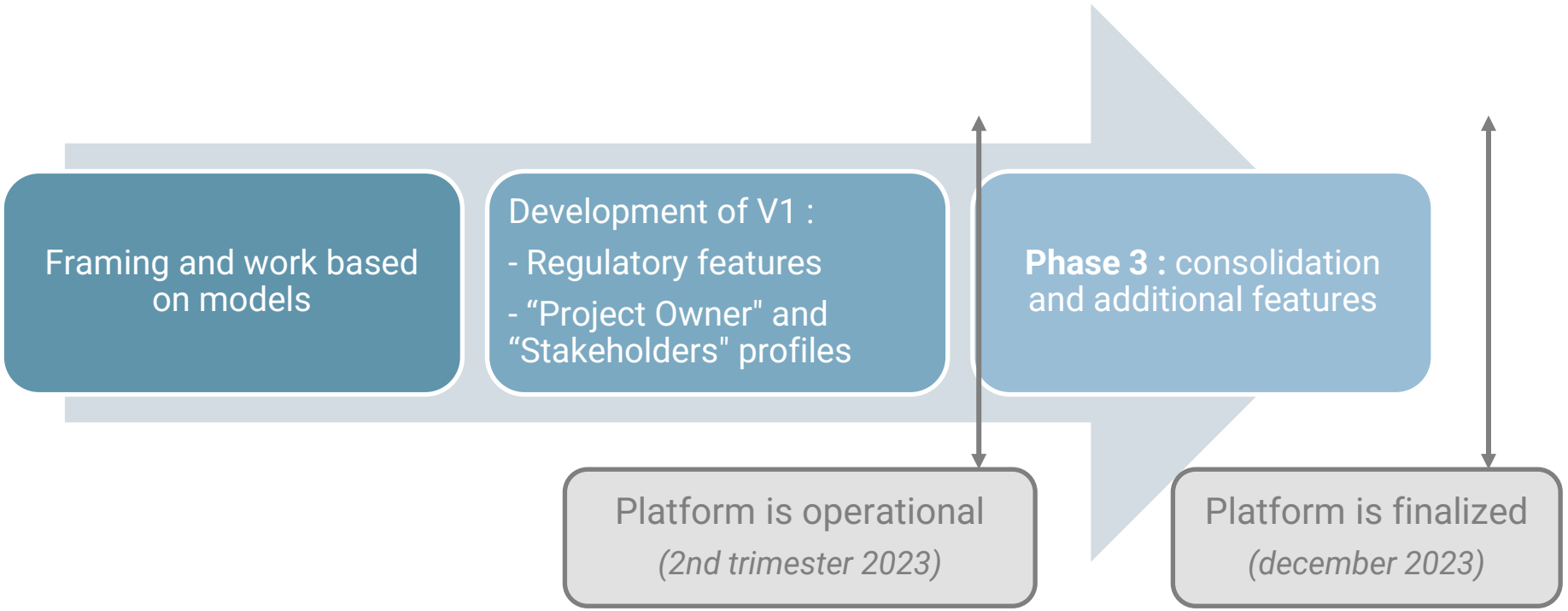
Presentation of the PEMD platform
Objectives

- Functionalities :
  - Allow **contracting authority to meet their regulatory obligations** ;
  - **Ensure the visibility and the accessibility of the PEMD audits** before launching deconstruction and renovation works, in order to mobilize waste and material recovery channels as soon as possible
  - Organize feedback to the project owners to ensure a constant interest in providing information on the audits on the platform;
  - Create the conditions so that the public authorities can control the correct application of the regulations.
- Involve future users as much as possible

Presentation of the PEMD platform
User profiles and functionalities



Presentation of the PEMD platform
Development schedule



Thank you for your attention !

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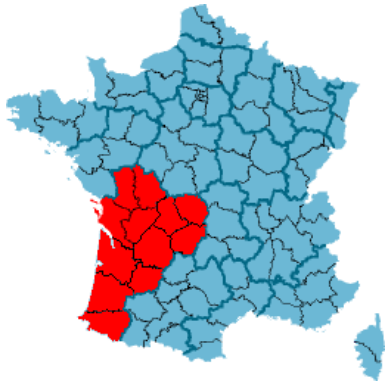
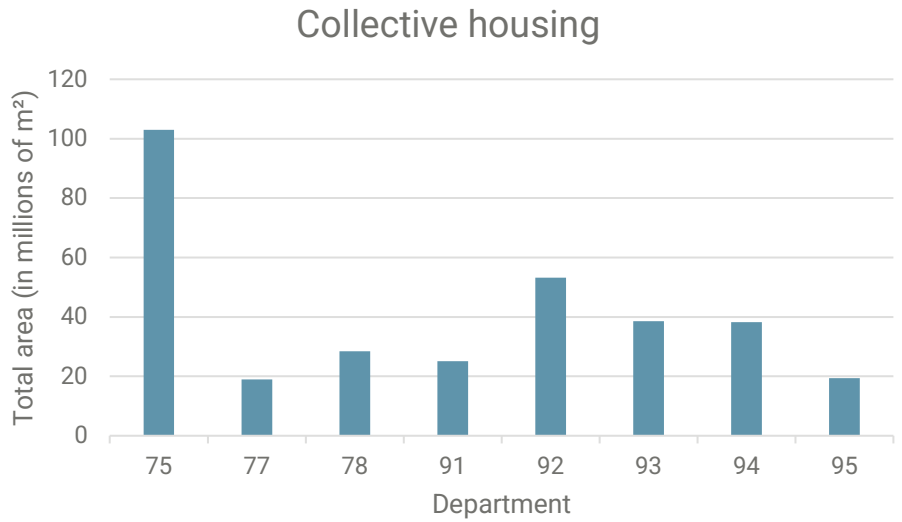
Appendices

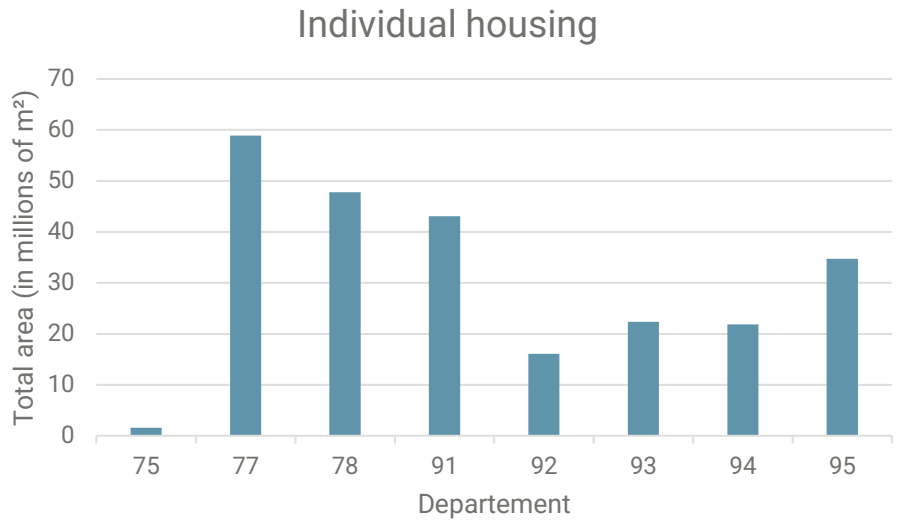
Territory selection
Building stock description



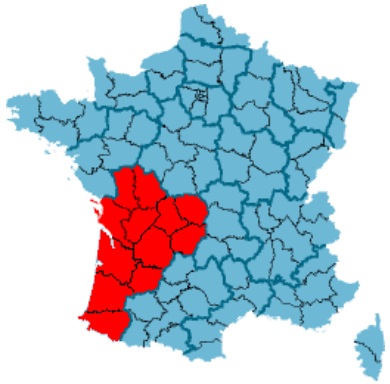
Basic information on the majority of buildings

⇒ Areas *-> ground surface, premises, …*
⇒ Construction year
⇒ Main building use
⇒ Main structural material
⇒ …





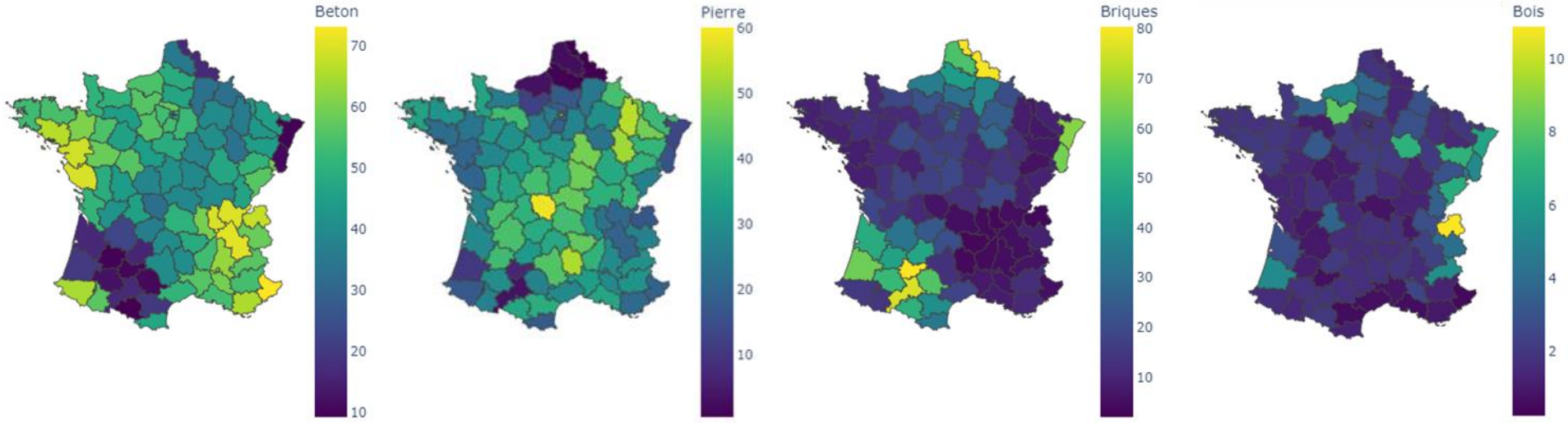
Territory selection
Building stock description



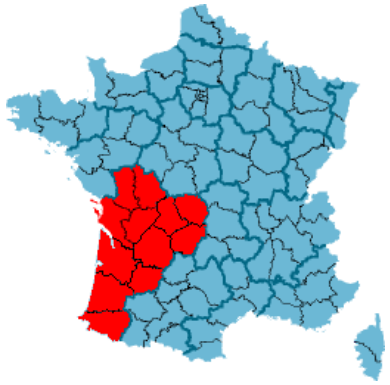
More detailed information on a number of residential buildings (DPE)

⇒ Wall material
⇒ Type of insulation
⇒ Type of floors
⇒ Ratio of glazed surface
⇒ …

Breakdown of wall materials by department according to DPE information (Residential)



Territory selection
Building stock description dynamic

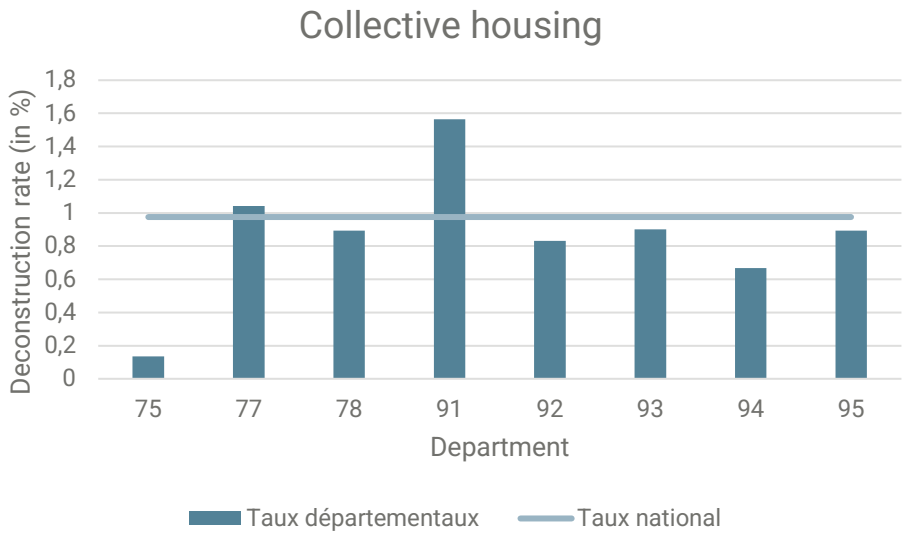


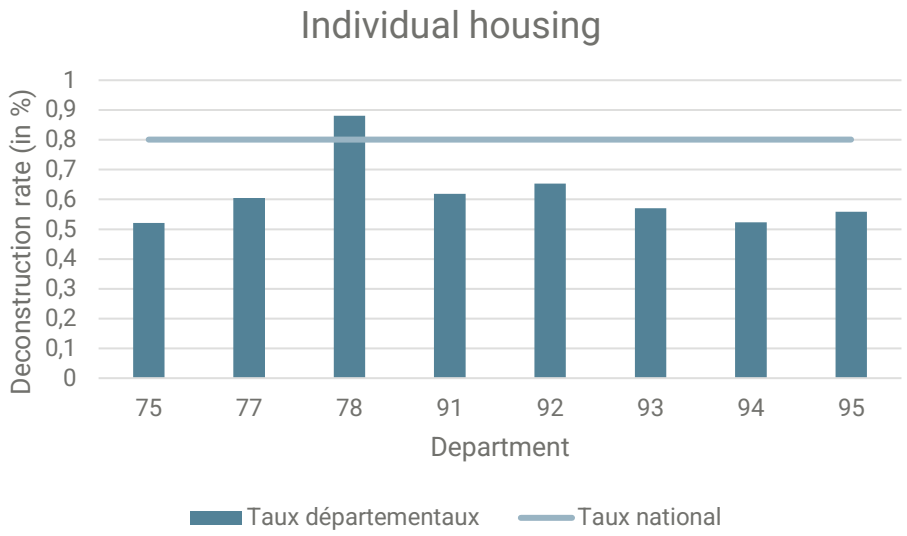
Study of several vintages to deduce building stock dynamics

⇒ Current deconstruction rates by department

⇒ National renovation rates

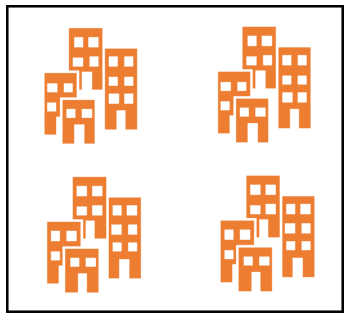
⇒ Construction rates (incoming)





Estimation of a territory component stock in buildings

Application to a given territory

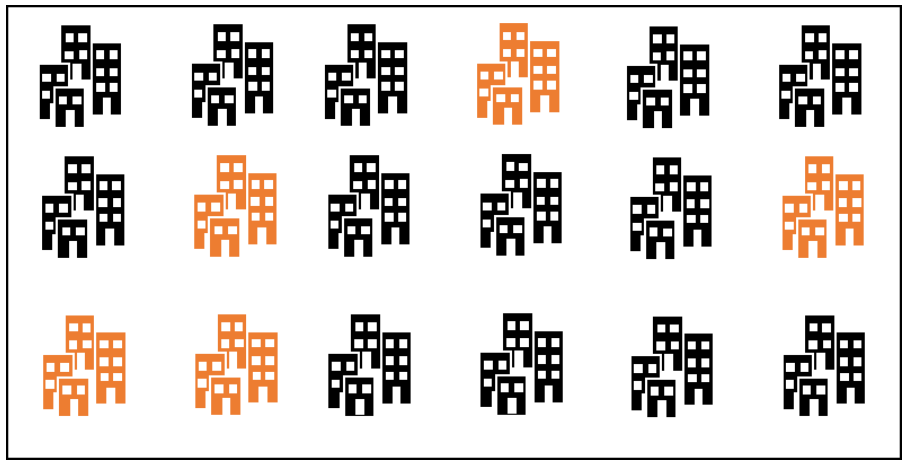


Choice of a building sample

⇒ Buildings with a good information completion

- ➢ Residential ➔ Buildings with a representative DPE
- ➢ Non-residential ➔ Buildings with local area and construction period
  - Currently only 3 main building use -> Office, Education and Industrial

⇒ Estimation of the component stock for the building sample



Extrapolation of the results

⇒ Buildings category

- ⇒ Main building use
- ⇒ Construction period
- ⇒ Main structural material

⇒ Statistical weight calculated on the local surface

Estimation of the component quantity in all the building stock of the territory

We will now hear four presentations on the application of circular approaches at buildings/infrastructure level

Ignasi Cubiñá

Example of Level(s) implementation: Circular renovation of a corporate office

By Ignasi Cubiñá (Founder of Eco Intelligent Growth/ Chief Strategy and Sustainability Officer at Construcía Group)

Example of Level(s) implementation

Circular renovation of a corporate office

Ignasi Cubiña,
Chief Strategy and Sustainability Officer at Grupo Construcía
Co-founder of EIG

Eco Intelligent Growth

A circular economy advisory and innovation company, based on the Cradle to Cradle® principles since 2005.

grupo construcía

General Constractor

Engeneering, HVAC

C2C Circular Economy Consultancy

Positive impact investment company

We help companies find better solutions for **safe, circular and sustainable construction for people and our planet**,

by pioneering innovative products and services with a **measurable net positive impact.**

Project presentation

Pilot of office dismantling and renovation

Client: French insurance company

Location: France

Surface : 502 m2

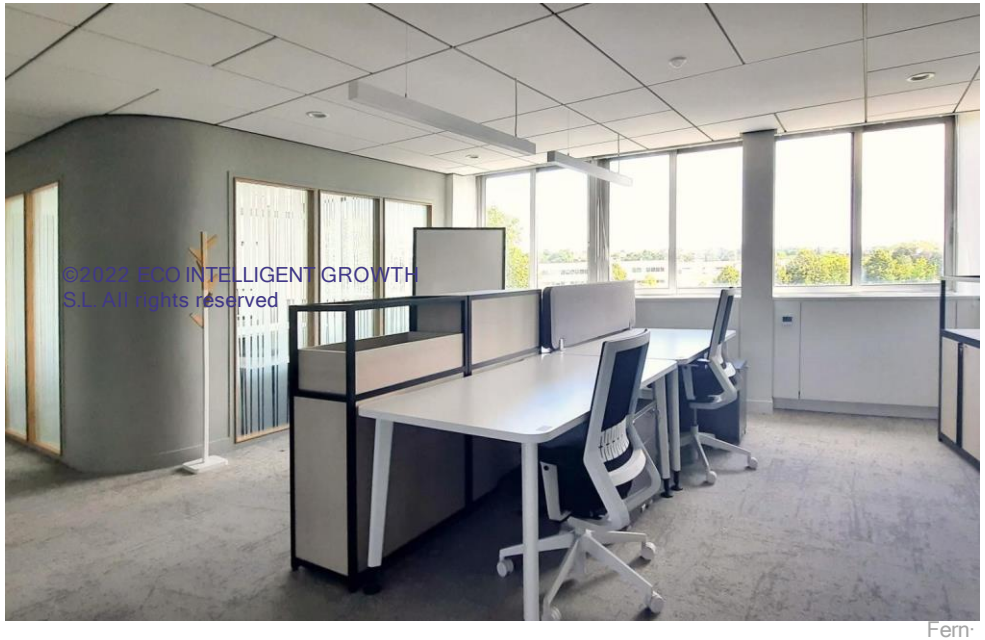
Year : 2022

Architect and project management: Fern

C2C Circular Economy consultant: Eco Intelligent Growth

Local ecosystem: transformers, contractors, suppliers

interior design, electrical installations and
heating, ventilation and air-conditioning



Fern·

Pilot Project, beyond compliance

Initial need

Renovation of part of the headquarters

Client's Mission

- **Controlling the ecological footprint**
- **Reducing waste and litter**
- **Adopting best practices to protect the planet**

Regulatory context

- **EU Green Deal**
- **EU Taxonomy criteria**
- **New Circular Economy Action Plan**
- **SFRD**
- **French regulations such as the Agec law (anti-waste for a circular economy)**

Objetives & Action Plan

Pilot project to commit to the implementation of the circular transition of client's real estate assets and assess the environmental impact of the building throughout their entire life cycle beyond GHG emissions.

1. Know

Review existing materials to facilitate their circularity

- **Selective diagnosis before dismantling**

2. Plan

Improve construction systems for circularity

- **Material Passport**
- **Selection of circular, safe and healthly materials** (ideally C2C Certified®)
- **Level(s) framework**

3. Make and Measure

Optimise the production process

- **Lean2Cradle®**
- **Training of teams**

Measure the impacts

- **Level(s) framework**
- **LCA of the building**
- **L2C True Value®**
- **Circular Signature**

Level(s)

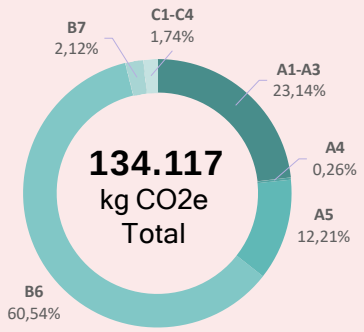
Level(s)

L1, L2, L3

Main results

1.2 Global Warming Potential (GWP) of the life cycle

L3



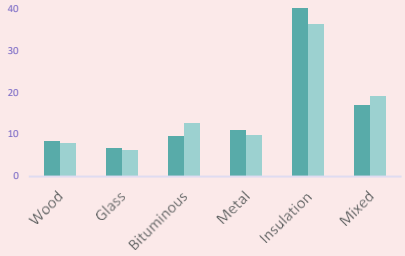
Climate warming kg CO2e
Lifecycle stages

2.1 Bill of quantities, materials & lifespans

L3

Construction materials quantity (tones)

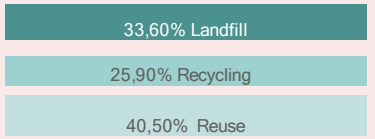
Building use cycle materials quantity (tones)



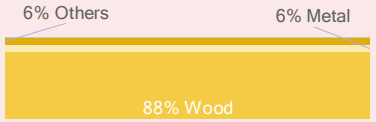
2.2 Construction and Demolition material & waste

L3

Destiny of the disassembled materials



Disassembled materials' type



2.3 Design for adaptability and renovation

L3

Adaptability index

28,5%*

*or **67,5% -** Highest weighted rating for the project, dismissing the existing structure and façade

2.4 Design for deconstruction, reutilization and recycling

L3

72,4%
Global circularity index

Materials with better performance

100%	Lighting
99%	Sanitary
98%	Comms & security
93%	Roof
90%	Hot water supply
89%	Pipes
81%	Interior partitions and doors
75%	Climatization

3.1 Use stage water consumption

L1

Risk of water scarcity
in the basin in which the building is located :

WEI+ = 9,01%
Excluded from water scarcity area

Kitchen faucet carefully selected to **reduce water consumption.**

4.1 Interior air quality

L2

Exterior air quality
In the area where the offices are located:

Good

Materials specification control to preserve the
Interior air quality
And health of the occupants by the **selection of materials with low VOCs and formaldehyde emissions**.

4.3 Lighting and visual wellbeing

L1

Lighting Study

Done

To maximize the **use of natural light** as much as possible and **and optimize artificial lighting design**.

Installation of motion sensors to save energy.

4.4 Acoustics & noise protection

L1

Acoustic performance study

Done

In advance, to inform the **material selection and design**.

Better performance partitions for spaces with higher noise rate; connections to the floor and ceiling sealed with a flexible joint; acoustic absorbent applied to walls, ceiling and floor; furniture with PET coating; and other solutions.

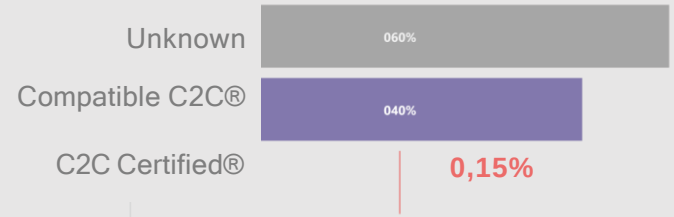
Circular Signature

COMPOSITION

27,4 t of materials included in the new project

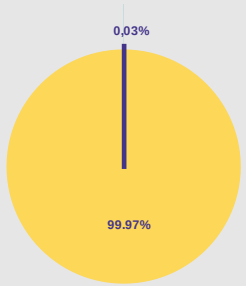
10% were directly reused

MATERIAL HEALTH

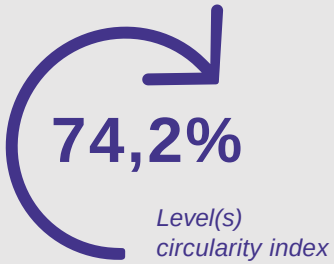


TRACEABILITY

99,97% of the homogenic materials were identified



CIRCULARITY



Level(s) circularity index

12%
Products including recycled materials in their composition

62%
Maximum cyclability potential (reutilization, recycling)

CARBON FOOTPRINT

134,4 t CO2 eq.

15 years

GHG Reduction* **-46%**

267,2 kg CO2 eq./sqm

**As a result from the materials' choise, compared with a traditional refurbish*

Project: corporate office

Type: Refurbish

Use: Offices

Location: France

Area 502 sqm

Project budget: 635.630,00 €

Year: 2022

Developed by:

L2C ® TRUE VALUE

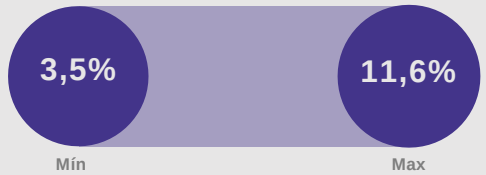
93.524 €
Reduction on social costs compared to a regular project

85%
Due to the ecotoxcity reduction (throughout the whole expected use cycle of the offices), protecting biodiversity and ecosystems

RESIDUAL VALUE

Developed by: upcyclea

The future value of the deposits may vary between 3,5% and 11,6% of the initial value of the new materials featured.



We will now hear four presentations on the application of circular approaches at buildings/infrastructure level

Lars Petter Bingh

Towards circularity in Statsbygg

By Lars Petter Bingh (Head of section climate and environment, Statsbygg)

STATSBYGG

Towards circularity in Statsbygg

Lars Petter Bingh, head of section, environment and climate

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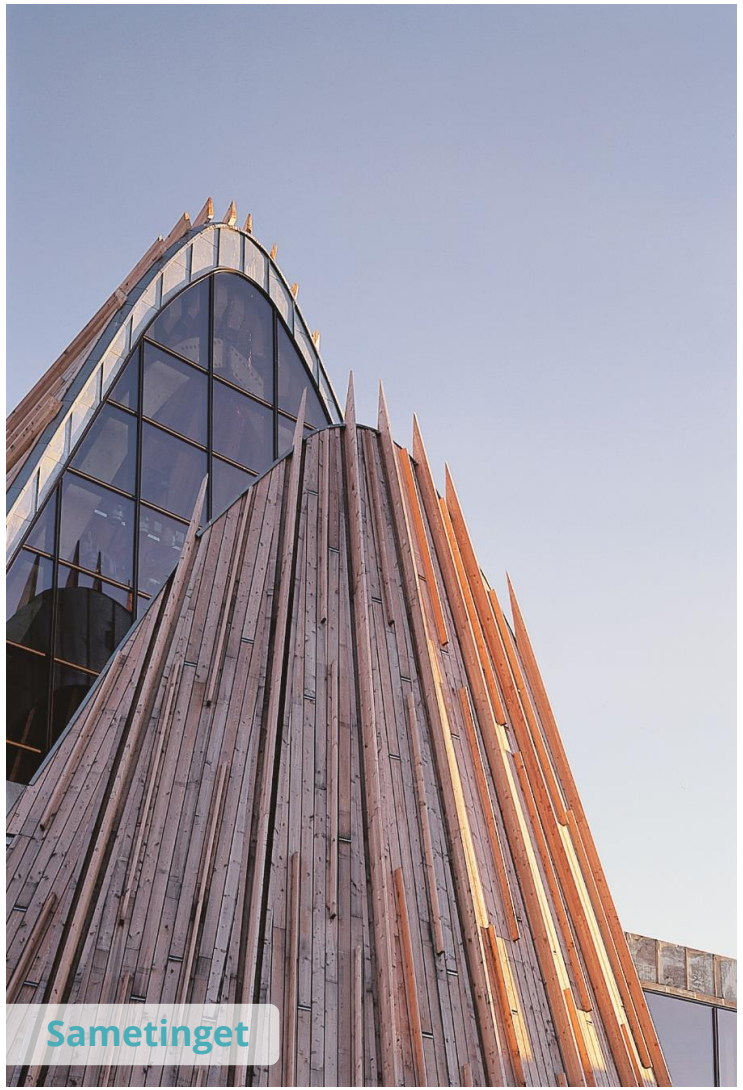
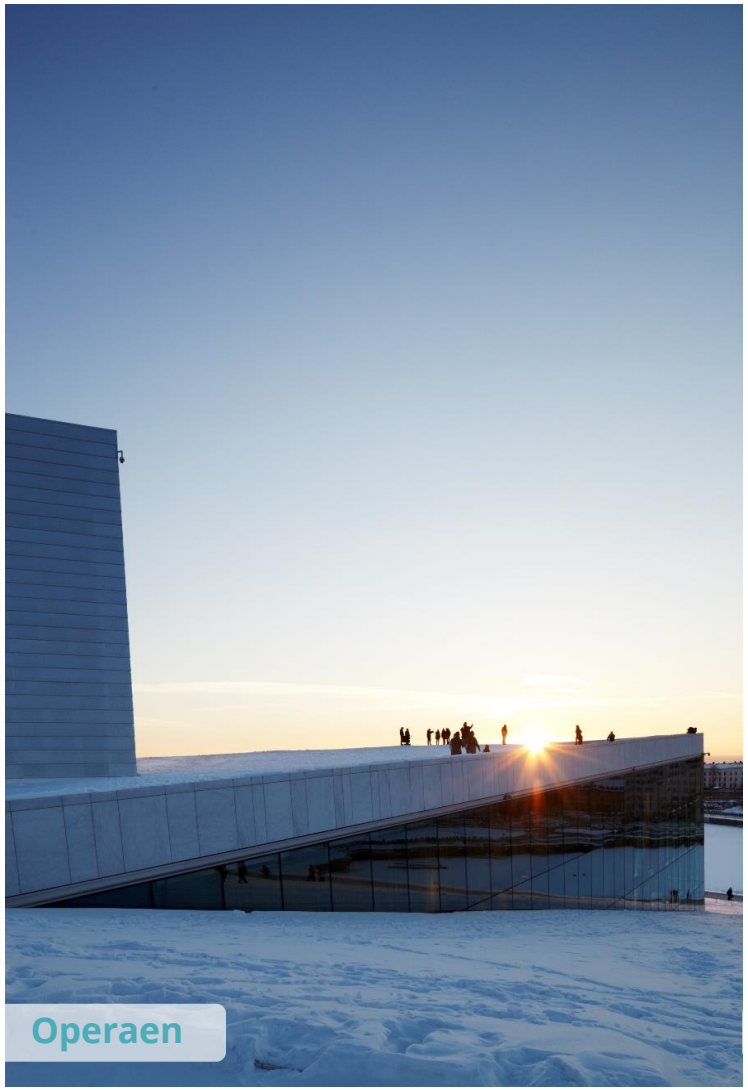
Buildings shape a nation


Sametinget


Operaen


Eidsvoll

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Strategy for public buildings

Fossil free construction sites by 2025

GHG-emissions from material use to be reduced

The public **construction** sector – work **together** with the industry to apply materials with lower GHG-emissions

Utilize existing public **buildings** – prefer existing before new

Reuse building components where possible and **sufficient**

Cost-effective energy efficiency measures to be implemented

Address the **possibility** to install renewable energy production at the **building**

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Two levels: reuse of buildings – and reuser of building materials

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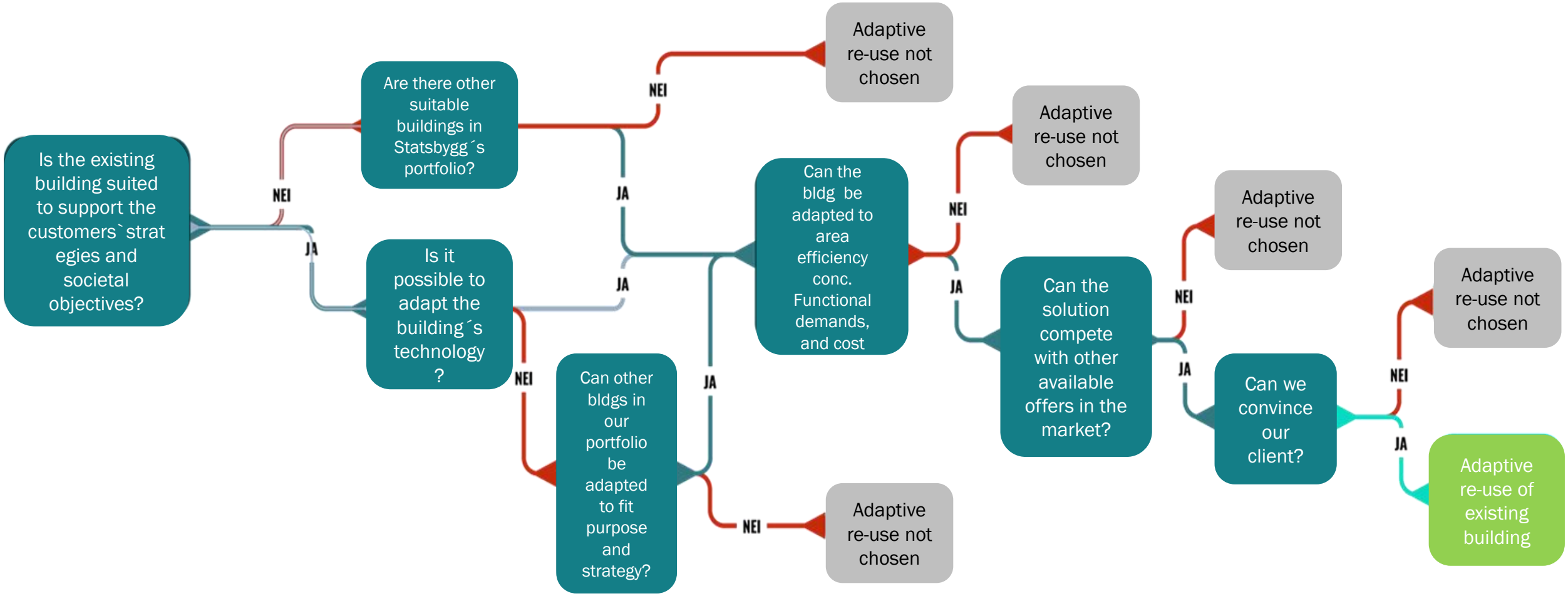
New built or re-use?
A simplified analysis of key decision points



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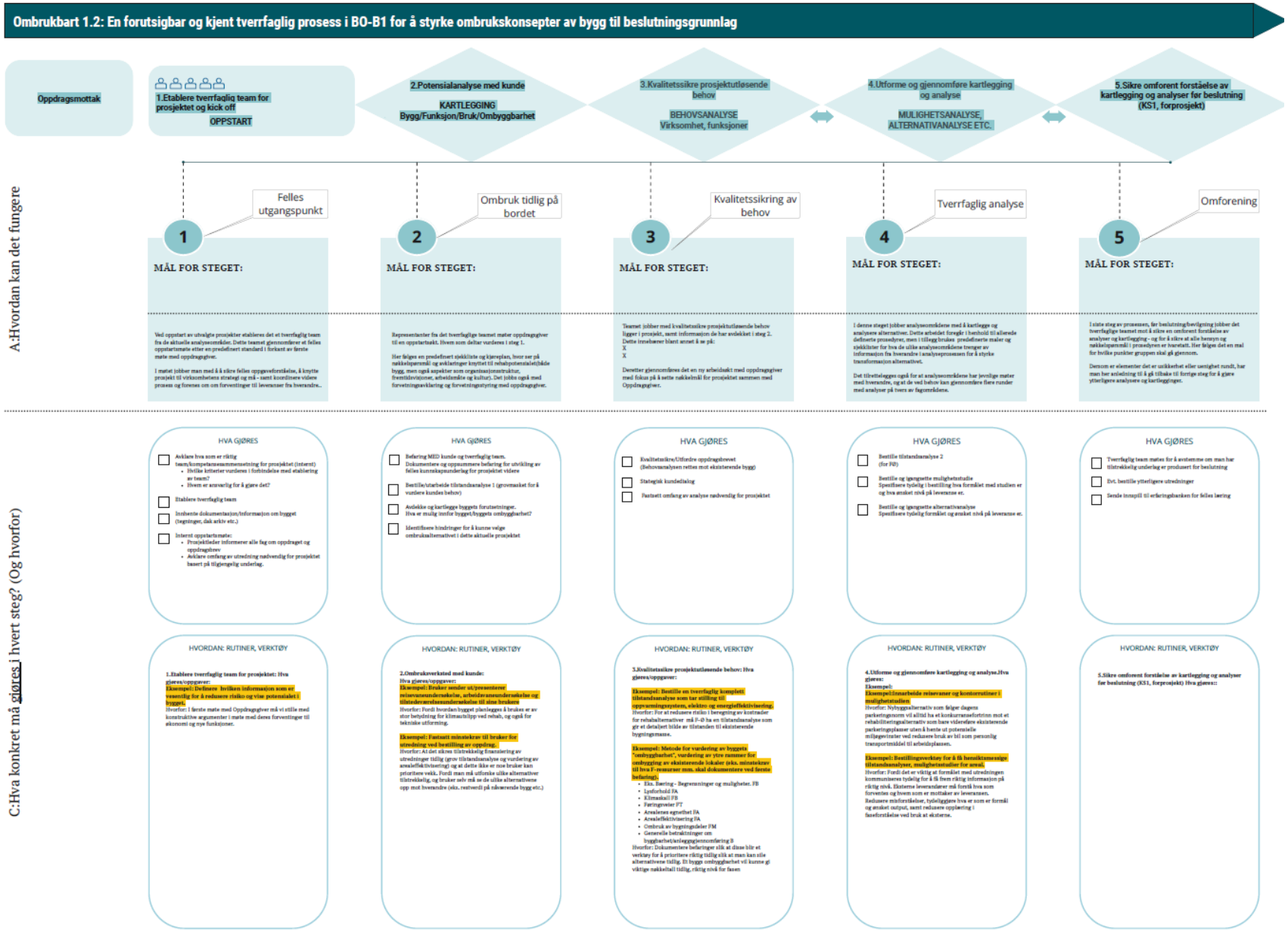
METHOD FOR RE-USE OF BUILDINGS

Aiming for a predictable and transparent interdisciplinary process to strengthen the quality of concepts re-using existing buildings in early analysis stages



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Circular ambitions – reusing materials

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Statsbygg made guidance on how to evaluate reuse potential

NYHETER

Ny veileder for kartlegging av ombruk

Å bruke byggematerialer om igjen er et viktig klimatiltak. På Arendalsuka lanserte Statsbygg og Grønn Byggallianse en ny veileder for bestilling av ombrukskartlegging før riving og rehabilitering av bygg.

PUBLISERT **17.8.2021** FOTO **VEIDEKKE**

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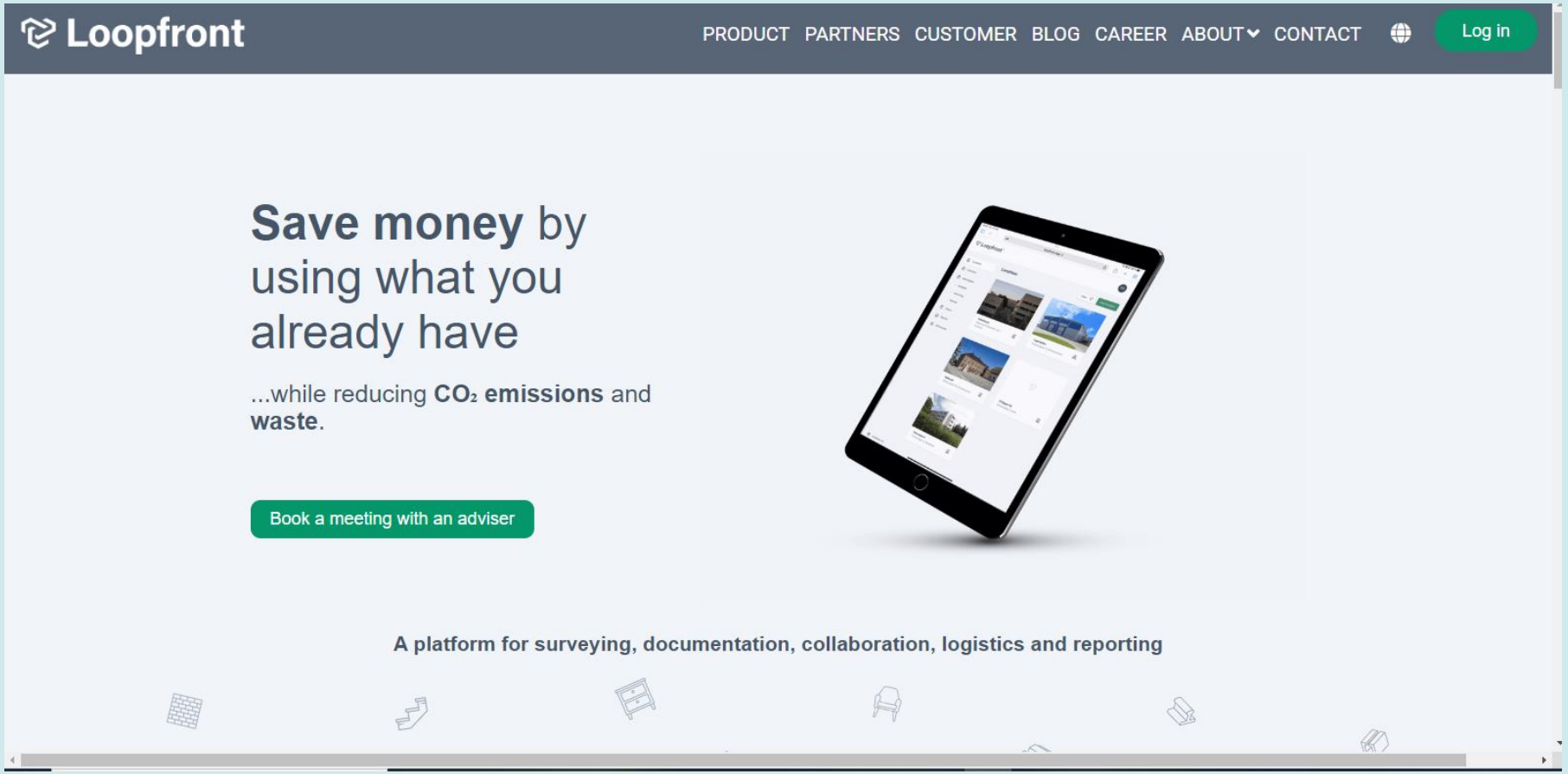
Building experience on reuse platforms



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Madaster – tool to implement requirements in contracts?

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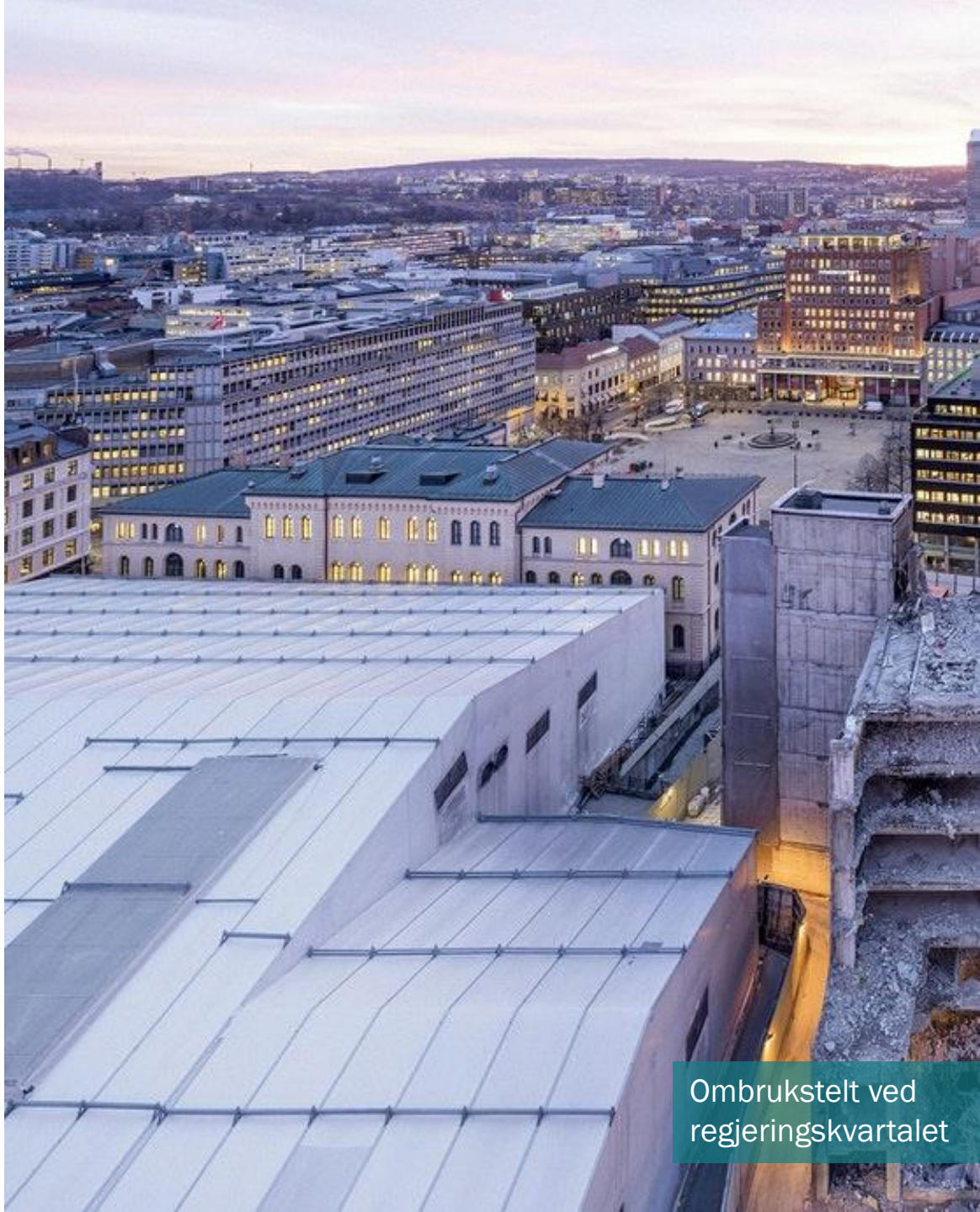
Overcome barriers – Statsbygg reuse building cover as a storage centre for reusable materials



Ombrukstelt ved regjeringskvartalet

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Standardizing performance on reused products

Krav til kompetanse for utarbeidelse av bruksspesifikk ytelseserklæring 1) ja/nei 2) kompetansekrav **1) Nei 2) Ikke relevant**
Ytelser ***~~Sortering fasthetsklasse:~~*** ~~Ikke relevant~~ ***Skjevhet:*** Visuell kontroll, se retthetskrav OK ***Store sprekker og skruehull*** Forenklet visuell kontroll OK ***Fukt*** Normverdi ikke over 20% trefuktighet. Ja / Nei (Håndsjekk. Ved mistanke sjekk med fuktmåler eller sortér ut.) ***Råte og mugg*** Visuell kontroll Ja / Nei ***Årstall:*** *(Impregnert trevirke eldre enn 2002 har arsen)* ***Gammel impregnering / giftstoffer:*** ***Skadedyr*** Visuell kontroll Ja / Nei ***Støtsskader***: Visuell kontroll Ja / Nei
Forbehold om maks. 10% avvik på geometriske ytelser. Skjevhet kontrolleres ved E.R.Wærners metode.

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Establishment methods and practice

- How to sell or give away reused products
- How to document quality when reusing
- What incentives or contract requirements will support reuse

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Circular ambitions – stimulate the use of materials produced from recycled raw materials

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Requirements in contracts

- Reinforcing steel 100 % produced from scrap steel
- Aluminium in facade minimum 75 % recycled content
- Minimum three products – free to select – shall include minimum 80 % recycled content
- Waste sorting at construction site minimum 90 % sorted in other fractions than mixed waste

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CASE 02.

KONKURRANSEFORM: TOTALENTREPRISE
Byggplater i resirkulert plast til samisk nybygg

Økt bruk av resirkulert plast i offentlige anskaffelser

Byggplater i resirkulert plast til samisk nybygg

Det Samiske Nasjonalteatret Beaivváš og Samisk videregående skole og reindriftsskole skal samlokaliseres i Kautokeino. Statsbygg er byggherre og Econor i Tromsø er hovedentreprenør for byggingen.

Kontrakten Statsbygg har inngått med Econor er en totalentreprise med krav om at det skal identifiseres minst 3 produkter som skal inneholde mer enn 80 % resirkulerte råvarer

Omlag 20 tonn resikulert plast i nybygget

Totalt vil det dreie seg om innkjøp av ca 35 tonn isolasjonsplater, ca 1600 kg føtter til anleggssikring og 400 avfallssekker til nybygget. For å estimere hvor mye dette innkjøpet vil resultere i økt bruk av resirkulert plast, har vi satt opp følgende regnestykke:

Produkt	Areal m²	Tykkelse m	Volum m³	Massetetthet kg/m³	Total masse tonn	Andel pcr* %	Mengde pcr tonn
EPS	6000	0,25	1500	22,00	33	50	16,50
XPS	900	0,1	90	24,45	2,2	50	1,10
Sum							17,60

*massebalanse i produksjon pr år

	Antall	Vekt pr stk	Total masse kg	Andel pcr %	Mengde pcr tonn
Anleggsføtter	200	8	1600	100	1,60
Avfallssekker	440	0,14	60,1	100	0,06
Sum					1,66

Basert på dette estimatet, vil nybygget i Kautokeino kunne bidra til nesten 20 tonn med resirkulert plast.

KRAV OG DOKUMENTASJON

Statsbygg satte følgende krav og dokumentasjon i MOP-en til nybygget:

Krav
Det skal identifiseres minst 3 produkttyper som skal inneholde mer enn 80 % resirkulerte råvarer. Det kan være plastprodukter, gulv med knust stein, betong eller flis, treplater, gipsplater, isolasjon etc. Krav som sikrer anskaffelse av disse produktene skal inkluderes i MOP.

Dokumentasjon
Dokumentasjon må framlegges for hvert produkt. Resirkulert innhold i det aktuelle produktet må komme tydelig fram.

Viktig med leverandørkartlegging og oversikt over produkter i resirkulert plast

Prosjektet «Økt bruk av resirkulert plast» hadde i mai 2021 dialog med Statsbygg om krav og dokumentasjon til bruk av resirkulert plast i byggeprosjekter. Våre kommentarer ble sendt Statsbygg, og innspillene ble hensyntatt og benyttet i MOP-en knyttet til totalentreprisen for det samiske nybygget. I tillegg har prosjektet gjennomført en enkel leverandørundersøkelse for hovedentreprenøren.

– Det å få oversikt over hvilke produkter som er produsert i resirkulert plast og hvem som produserer dem - inkludert kontaktinfo, er veldig nyttig for oss. Videre er det viktig at leverandører kan dokumentere resirkulert innhold i form av EPD-er eller ulike sertifiseringer.

Raymond Isaksen, innkjøpsleder i Econor

For Statsbygg har det å kunne tilby byggeprosjektet hjelp til leverandørundersøkeler og det å kunne gi dem oversikt over hvilke produkter som finnes på markedet, vært et vikitg bidrag for å øke bevisstheten omkring det å benytte resirkulert materiale i nybygg og rehabilitering av bygg.

– Vi ser også hvor viktig det er å tørre å sette krav til våre entreprenører og bidra til å skape et bedre og større marked for produkter i resirkulerte materialer, sier Kristine Kolhus, fungerende avdelingsdirektør i Faglig ressursenter i Statsbygg.

STATSBYGG

www.statsbygg.no

BYGG MED MENING

Indicators at buildings/ infrastructure level

BUILDINGS/ INFRASTRUCTURE LEVEL

- At concept stage: comparison of asset life cycle costs
- At concept stage: comparison of asset life cycle assessment
- At design stage: Material intensity/ dematerialisation
- At design stage: reused content
- At design stage: recycled content
- Designed for adaptability and flexibility
- Designed for disassembly/ deconstruction
- Construction waste generated on and off site
- Hazardous waste generated during construction
- Construction waste reused, recycled, recovered, landfilled
- Construction related waste generated through in-use/ refurbishment cycles
- Effective utilisation of building (e.g. levels of occupancy) or asset; Intensiveness of use
- At end of use of building/asset: proportion of building/asset retained (mass) for further use
- Demolition waste generated
- Hazardous waste generated at demolition
- Demolition waste reused, recycled, recovered, landfilled

Join us for an interactive session on wooclap!

1 Go to wooclap.com

2 Enter the event code in the top banner

Event code
FSYSSH

Scope and goal of the workshop

Interim results

Product/ material focus

Buildings/ infrastructure focus

Coffee break

Urban level & organisation level focus

Panel discussion

Scope and goal of the workshop

Interim results

Product/ material focus

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Panel discussion

We will now hear one presentation on the application of circular approaches at urban level

Wouter Schick

Circular approaches at process / organisation level

By Wouter Schick (Senior consultant sustainable design and development Arcadis Netherlands, member EFCA European Green Deal committee)

Circular approaches at process / organisation level

wouter schik

efca
European Engineering Consultancies
ARCADIS

Circularity, yes but …

- Unclear
- Complex
- Requires new knowledge and more time
- New and unknown risks

➢ Not only What, but also How

Question municipality

Best circular solution for making a specific street climate robust: permeable paving or infiltration sewer?

Solution

- Redesign barren greenspaces between buildings into lush playgrounds where water can be stored and infiltrate

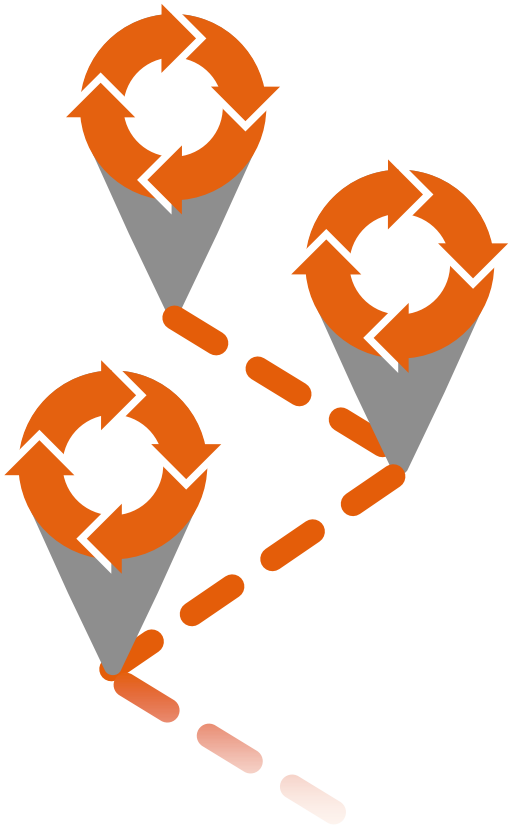
- Reuse disbanded overflow system into nearby wood to reduce drought problems

➢ Less materials, lower TCO, more added value

What is required?

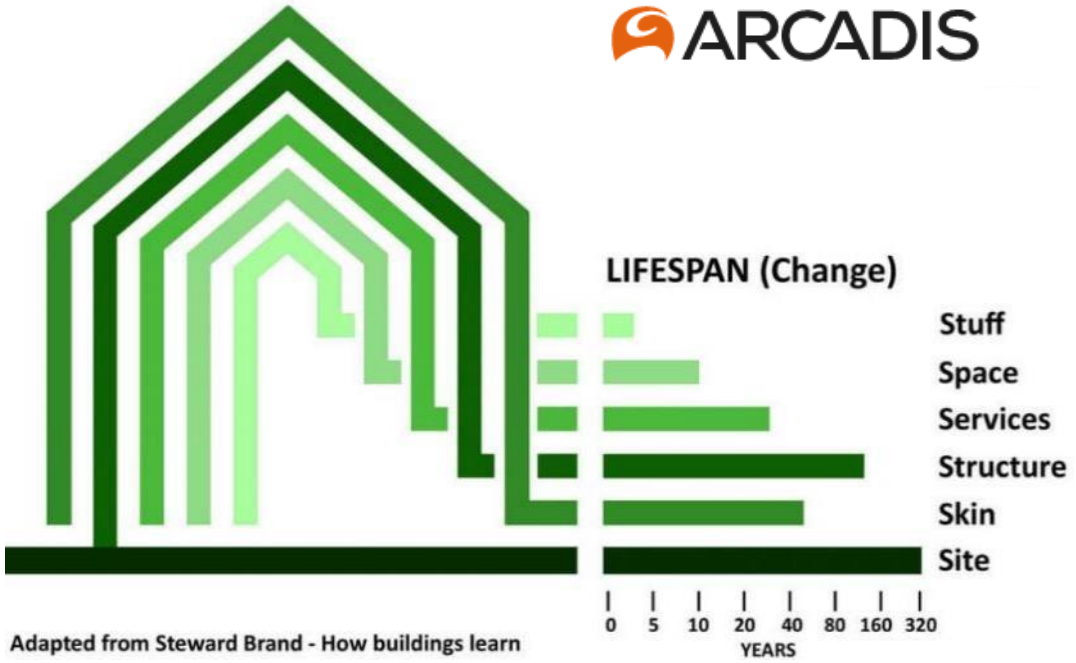
Make it as easy and clear as possible!

1. Program / plan ahead
2. Standardise and automate
3. Structured cooperation and sufficient capacity
4. Learn and improve by doing and monitoring



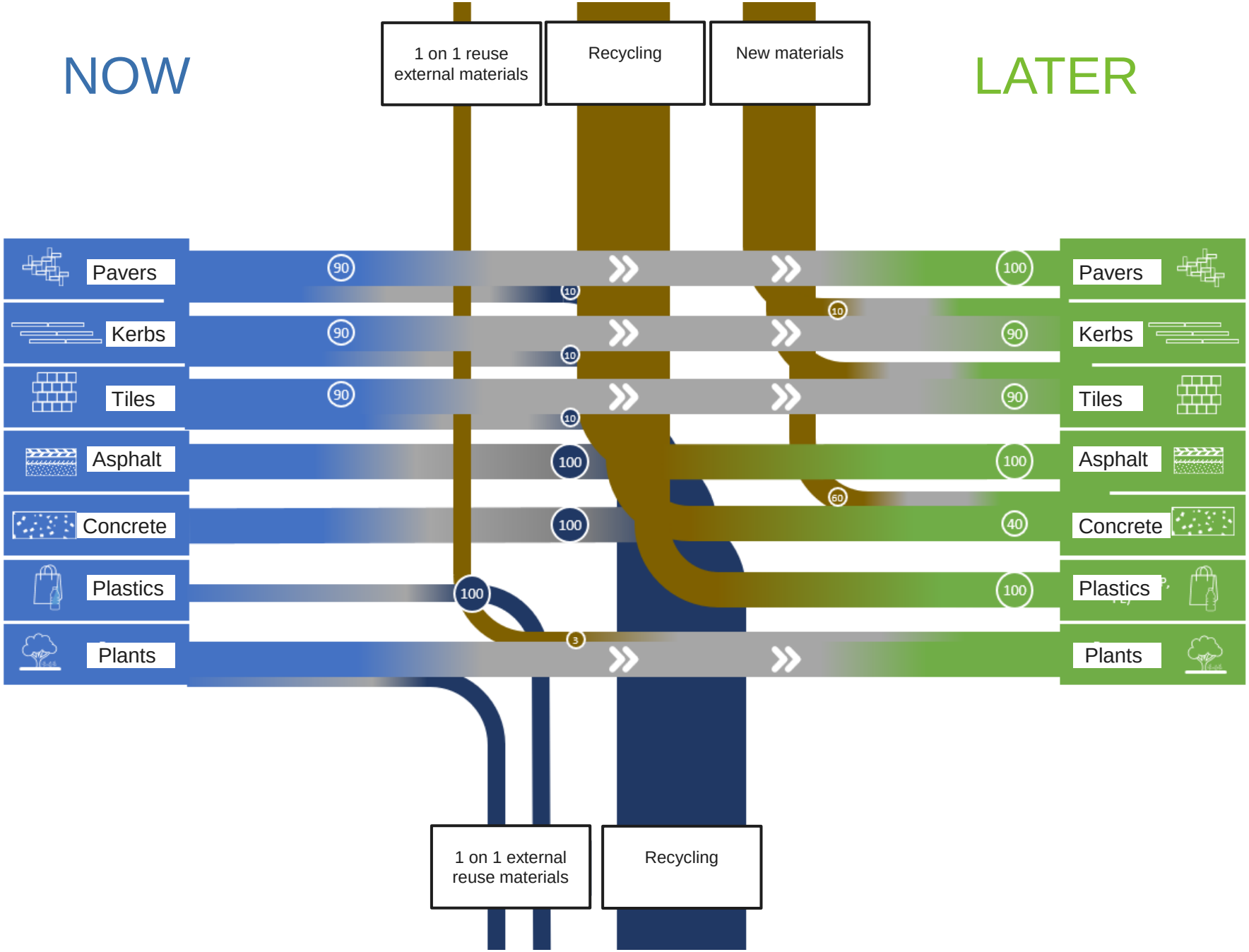
[1] Program / plan ahead

- Important questions:
  - What is there now and what does this mean or require for the future?
  - How is the context changing in the next 10-30-… yrs? (use, requirements, availability of materials etc.)
  - What does it mean for real estate portfolios and different types of infra-assets?
  - What does that mean for design and (in/outcoming) materials?
  - What does this require regarding partnerships, legal and financial arrangements, innovation?
- Program / plan ahead: development strategy, roadmaps, portfolio- and asset management



Material flow analyses

- Do you know what you have and going to get and going to need?
- Is your (asset management) system ready for this?



Example: sustainable procurement of concrete paving materials Amersfoort (NL)

- Biggest environmental impact outdoor material use in the city
- Traditional: challenge per project, outcoming materials to contractor
- Result: hotchpotch of products and environmental gains (not future proof)
- **New strategy:** long term contract with single supplier for reuse, recycling and new materials
  - All outcoming concrete paving materials first to be checked for reuse at product level, then to be recycled in new products
  - New products with >50% recycled materials and >50% better LCA
  - 1% higher product cost, but cheaper at project level (less surcharge costs)

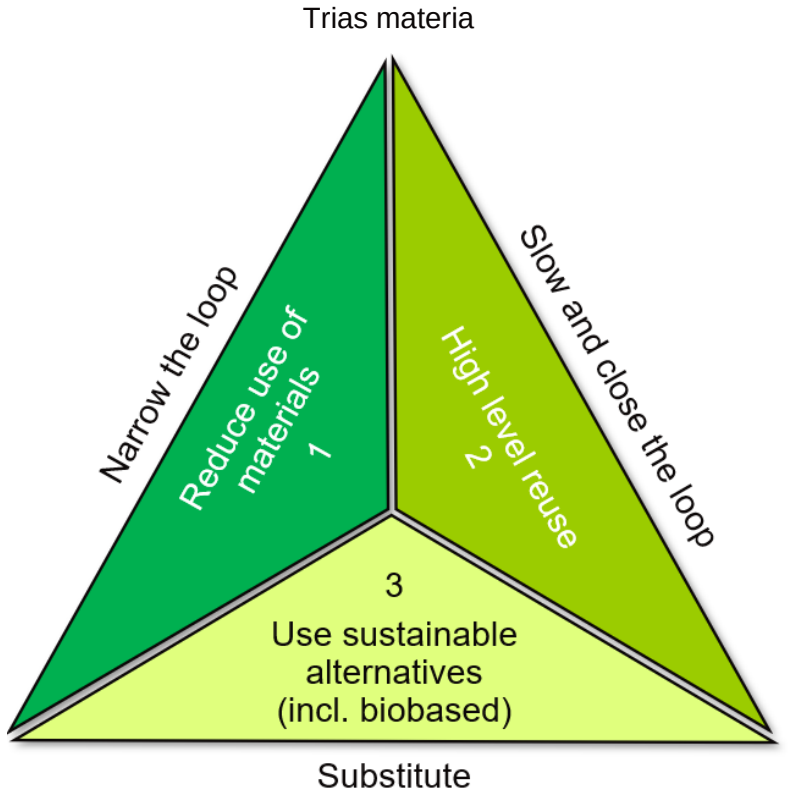
Example: new Kazernekwartier neighborhood development Venlo (NL)

- **Strategy 1:** reuse all old buildings former military base (history/identity)
- **Strategy 2:** best (circular etc.) living conditions for the future by getting more with less due to combination of:
  - Robust high quality very energy efficient compact housing
  - Community development with sharing economy: from ownership to flexible facilities and services, including shared mobility solutions (Mobility as a Service)

➢ Requires new ways of cooperation with new types of legal and financial agreements

[2] Standardise, automate

- Common language, conceptual framework, (set of) indicators and requirements:
  - what is it?
  - when is it good/bad for what type of question?
  - how do you weigh the indicators/requirements?
- Translate into standard documents and policies for organisations and at project level (f.e. procurement)
- Use software for support (BIM + management systems + material passports/logbooks etc.)

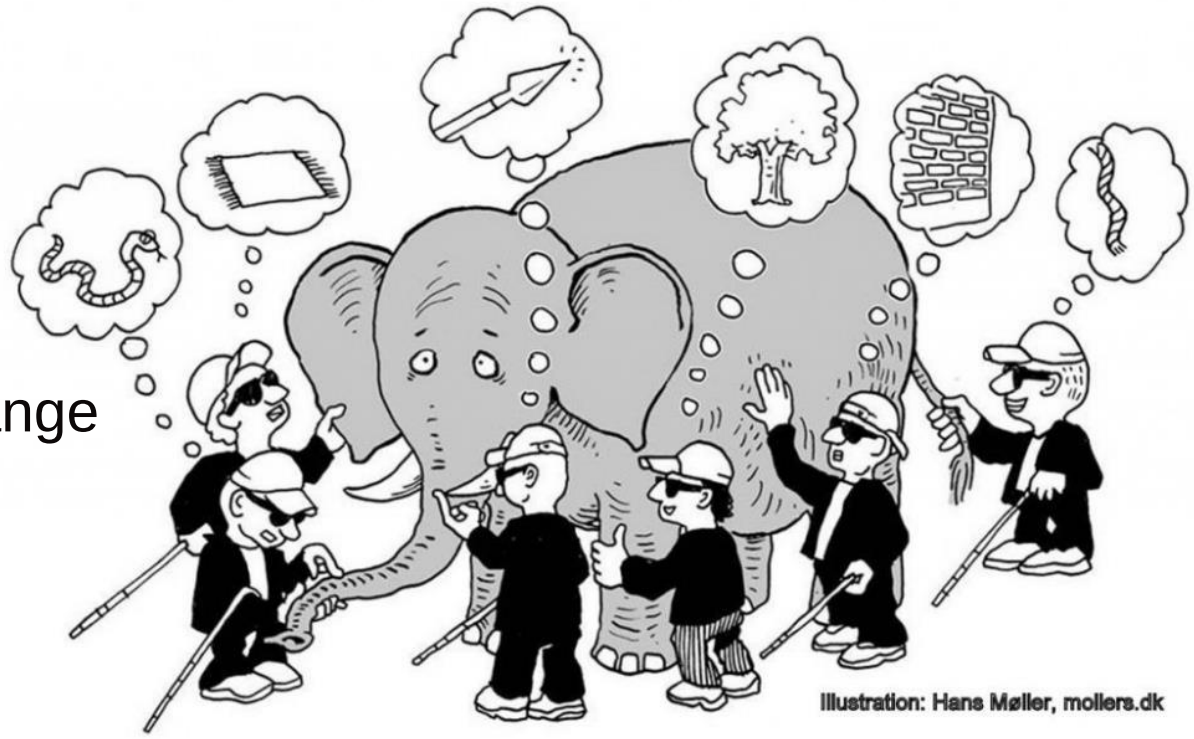


Future proof / future value:
- (opportunities for) value proof future reuse
- (opportunities for) increased life span, useability

Added value

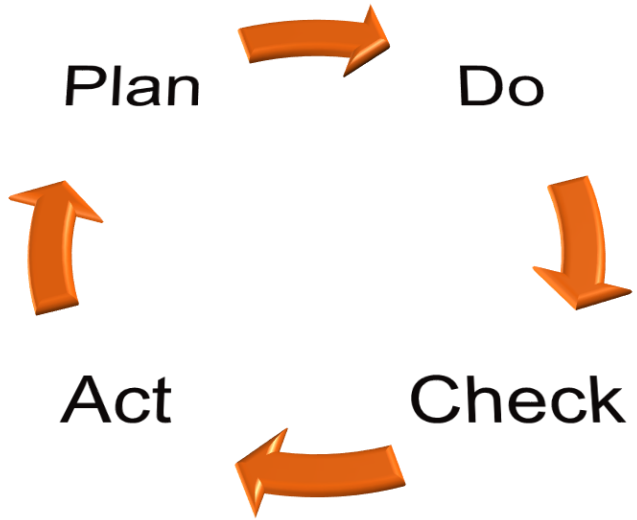
[3] Structured cooperation and sufficient capacity in organisation

- All relevant parties identified and connected
- Clear responsibilities and (design)processes
- Managing relations and dependencies (short and long term)
- Right capacities: (shared) knowledge and experience
- Clear data protocol (how to collect and exchange what data)



[4] Learn and improve by doing and monitoring

- Evaluate process
- Evaluate results
  - Number of procurements with which requirements regarding circularity achieved what?
  - How much materials was reused at projects (direct, indirect and at what level: object, raw material)?
  - New expected life span, TCO, added value?
- Adjust processes, guidelines, policies etc. where necessary

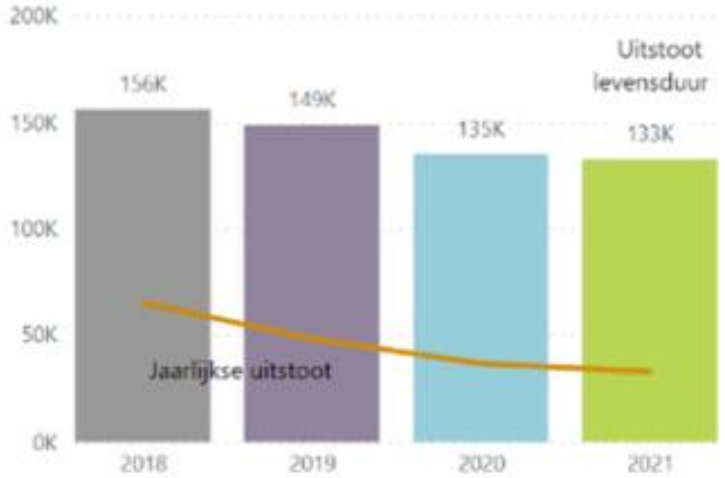


Dashboard Monitoring Infra

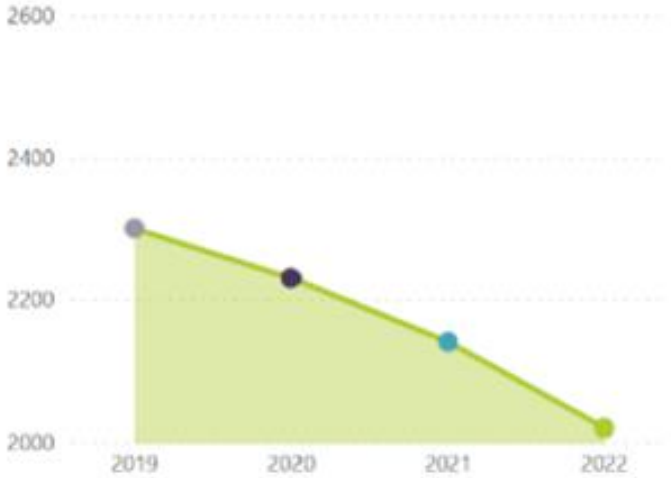
Duurzaam GWW

kennisplatform CROW

CO2 emissions

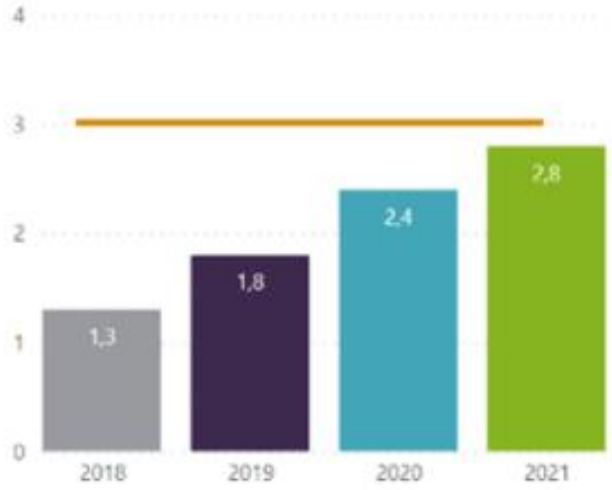


NOx emissions

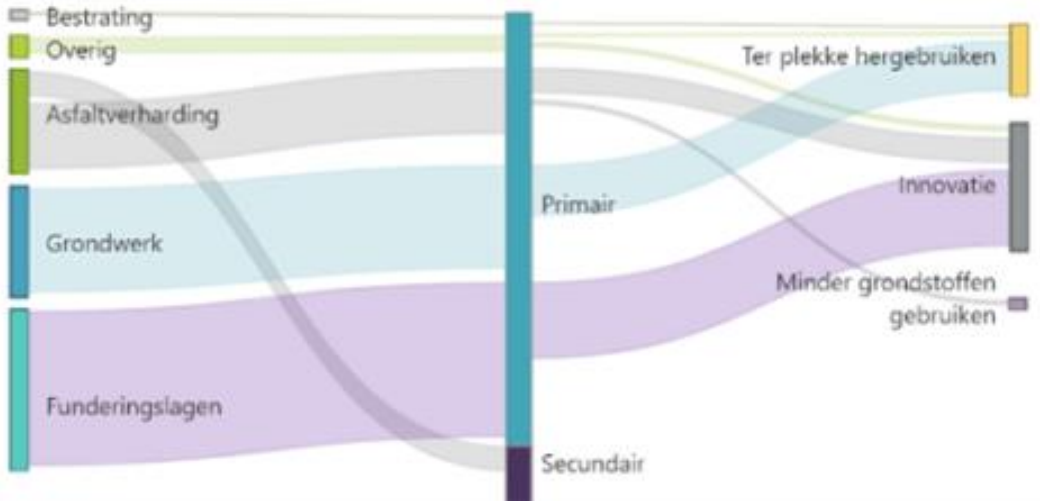


Energy use

Biodiversity ambition



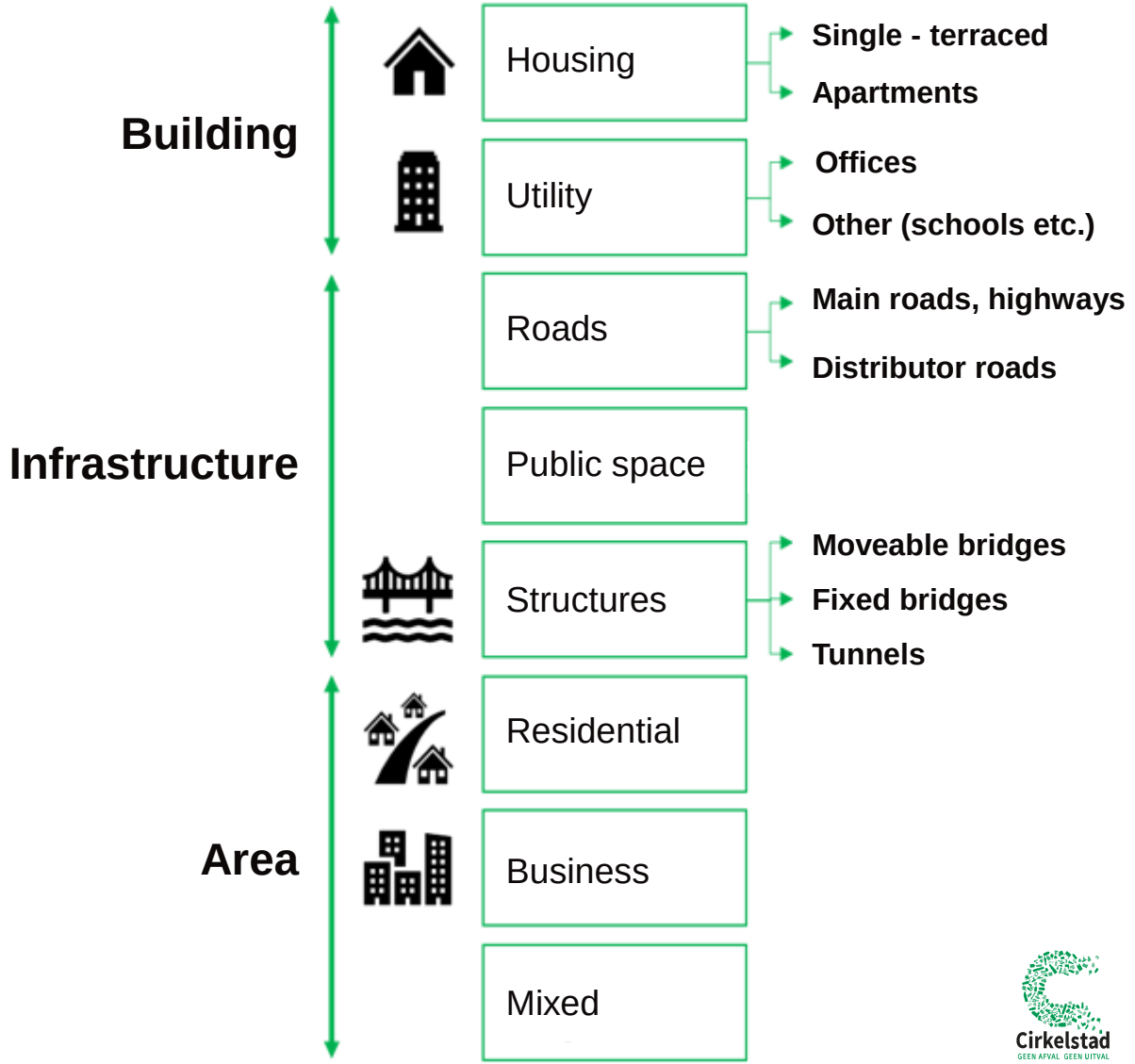
Material use



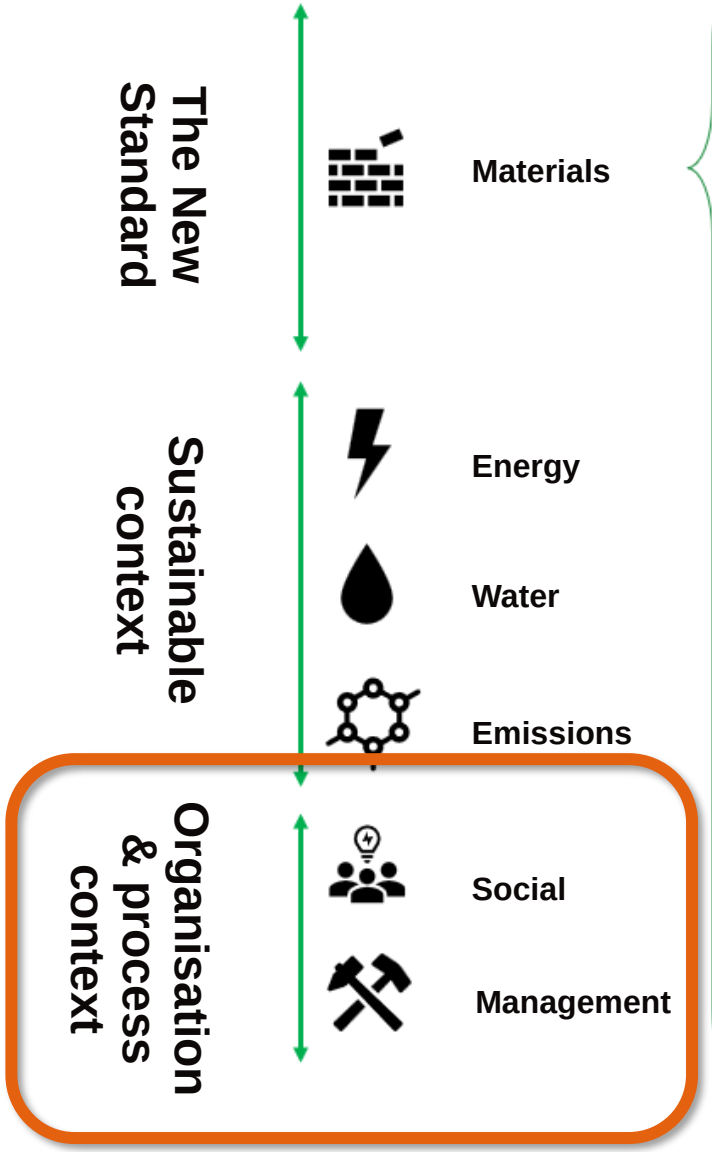
ECI - score

Example: the New Standard

Common framework and language regarding circularity **including processes** in the Netherlands [under construction]



The New Standard | 0.4



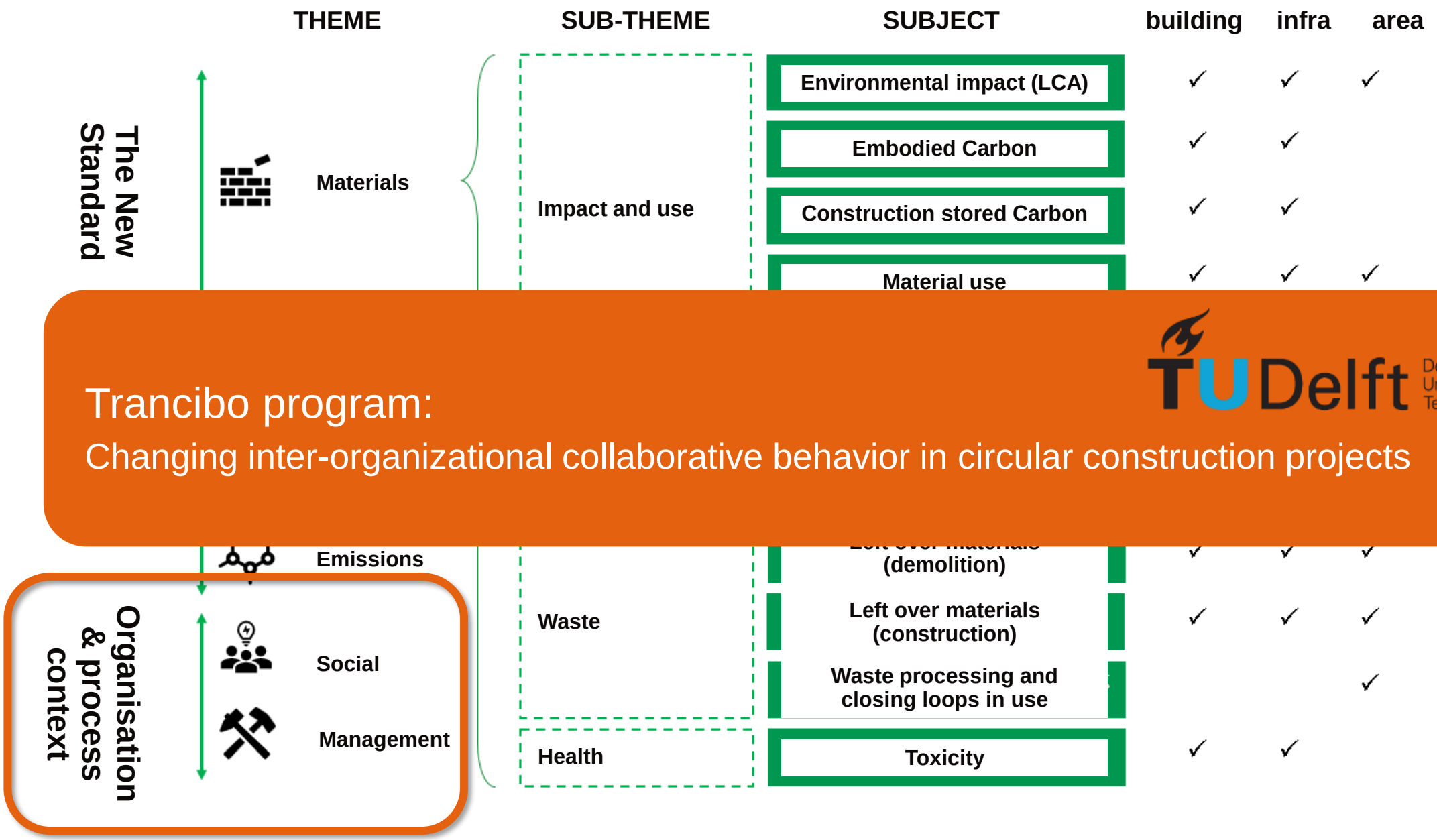
THEME	SUB-THEME	SUBJECT	building	infra	area
Materials	Impact and use	Environmental impact (LCA)	✓	✓	✓
		Embodied Carbon	✓	✓	
		Construction stored Carbon	✓	✓	
		Material use	✓	✓	✓
		Reuse potential	✓	✓	✓
Energy	Flexibility	Adaptive potential	✓	✓	
Water		Detachability	✓	✓	
Emissions	Waste	Left over materials (demolition)	✓	✓	✓
		Left over materials (construction)	✓	✓	✓
		Waste processing and closing loops in use			✓
Social	Health	Toxicity	✓	✓	
Management					

Cirkelstad
GEEN AFVAL GEEN UITVAL

Questions organisation / process context

- **Participation:**
  - To what level are (future) users involved?
- **Procurement:**
  - Is it clear what the performance should be (short and long term)?
  - How open is the task specified?
  - Is it clear what circular indicators and requirements are relevant and why?
  - Is TCO part of the specifications?
- **Contract:**
  - Are costs/benefits and risks of circular building been identified and dealt with, with the project team as a whole?
  - Is residual value been taken into account?
- **Cooperation and process:**
  - Are all necessary circularity partners identified and part of the process?
  - What kind and what amount of cooperation is there within the project team and with external partners outside the project team (suppliers etc.)?
  - Are all roles and responsibilities clear within the project team?
  - Are all consequences regarding circular building during the whole process (from design to in use) been identified and organised?
- **Internal organisation:**
  - Are all roles and responsibilities clear within the organisation regarding the project?
  - Is knowledge shared and monitoring and evaluation part of the process?
  - Is data collected and shared for maintenance, asset management and other future purposes?

The New Standard | 0.4



Creating sustainable perspectives

starting tomorrows sustainability today

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European Engineering Consultancies
ARCADIS

Arcadis.

Improving quality of life.

Indicators at organisational level

ORGANISATIONAL LEVEL

- Refurbishment/transformation rate of buildings/infrastructure portfolio
- Predicted service life of buildings/infrastructure portfolio
- Average reused and recycled content in new buildings/infrastructure (circular inputs)
- Reused and secondary content input
- Non hazardous waste arisings
- Hazardous waste
- Waste management routes
- Requirements set for specification of circular economy approaches including recycled + reused products and materials
- Requirements set for pre-demolition audits and subsequent implementation

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Event code
FSYSSH

We will now hear one presentation on the application of circular approaches at urban level

Yannick D’Otreppe

Be Circular: Reuse in circular building sites

By Yannick D’Otreppe (Project manager - Facilitator Sustainable buildings trainings, Brussels Environment)

FORMATION BÂTIMENT DURABLE

BE CIRCULAR

Reuse in circular building sites

Yannick d'Otreppe
Project manager - Facilitator
Sustainable buildings trainings, Brussels Environment

bruxelles environnement leefmilieu brussel .brussels

3 CONTEXT

Project calls « Be Circular – Be Brussels »

- PREC
- Building sector
- For construction companies
- Subsidy (now 30,000€ max/project) + follow-up + communication

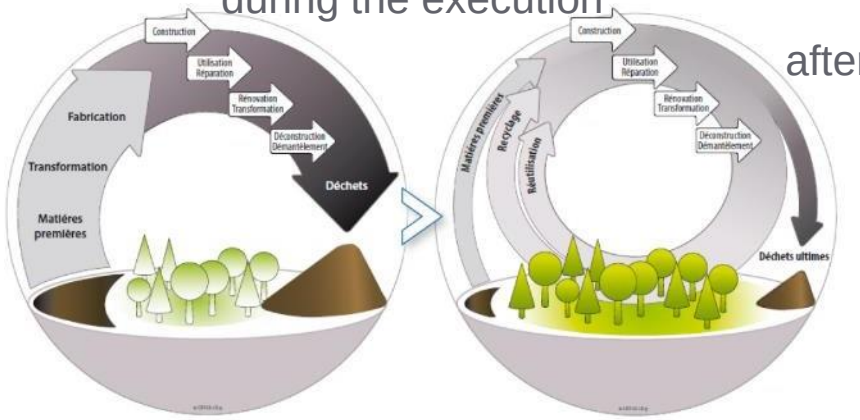
Building sites optimizing management

- Of material resources
- Of human resources

Before the execution

during the execution

after the execution



4 CONTEXT

Laureates

N36 projects between 2016 & 2020

9 projects in 2016

6 projects in 2017

CONTEXTE

Laureates

N36 projects between 2016 & 2020

6 projects in 2018

7 projects in 2019

8 projects in 2020

6 CONTEXT

CASA BLANCO

VLA | ARCHITECTURE et Sophie Boone

Florian Girault

mun com a

Jamar ENTREPRISE GÉNÉRALE

Ilinye Iliya

Max Stockmans

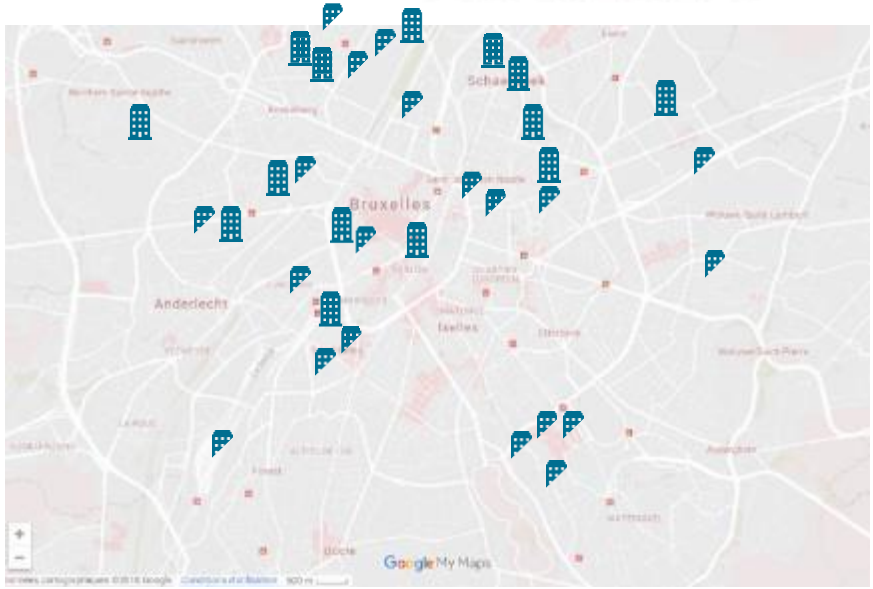
AUTREMENT

BESIX

La ferme NOS PILIFS

LES ENTREPRISES LOUIS DE WAELE Brique Rabot Dutilleul

INCLUSIO



D'leteren Immo

BPC

Eco Construct Groupe

DEMOCO THE VALUE BUILDERS

DECO SEGE ROM sprl

hé!

EIFFAGE VALENS

BOIS & STRUCTURE

Jacques Delens

STEGERS & Co

mundo LAB

Global Art Concept

TRAVIE

BC MATERIALS

GILLION CONSTRUCT

R!noo SCRL

DRTB

8 THEMATICS

Management of human resources

Management of material resources

demountability

Training of the workforce

Reversible building design

Local workforce

adaptability

subsequent

on site

Recycled, biobased materials

Reuse

incoming

off site

Synergies between companies & building sites

bouwteam

Intergated team management

Lean

Companies of socio-professional integration

Waste prevention & management

BIM

Maintenance of existing buildings

TABLE OF CONTENTS

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WARLAND 238 [GLOBALART CONCEPT]

Renovation of a townhouse

Reuse:

- Exterior joineries
- Bricks
- Radiators
- Kitchen furniture
- …

Almost 6 tons of reused materials matériaux (on site of incoming)

Crédit: Lionel Billiet

WARLAND 238 [GLOBALART CONCEPT]

Reused marbel in the bathrooms

Crédit: Lionel Billiet

12

CLOS DUPONT [ECO CONSTRUCT GROUPE]

Extension of a townhouse

Reused bircks

Extension with reuse in the whole project:

- Frames
- Windowsills
- Sanitation
- Radiators
- Clinkers
- …

+ 6 tons of reuse materials (on site and incoming flow)

Crédit: Bernard Boccara

Crédit: VLA-architecture – Sophie Boone

Crédit: Laurent Brandajs

DEBATTY [GILLION CONSTRUCT]

Renovation of social housing – Public contract

Reuse of parquet

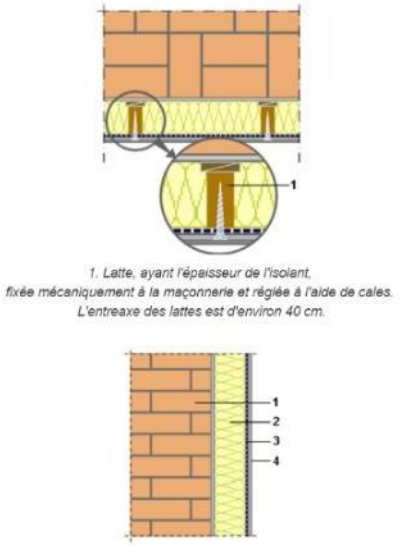
- 1.500 m² of reused parquet

Crédit photos: Bruxelles Environnement

DEBATTY [GILLION CONSTRUCT]

Preparation for reuse

- Internal insulation
- 1.700 m² dismountable



Crédit photos: Bruxelles Environnement

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HORTA ONSS [ENTREPRISES LOUIS DE WAELE]

Refurbishment of an office building

Reuse integrated in the specification of the public contract

- Reuse of partition walls
- Reuse of HVAC
- 486 m² of insulation reused off site
- 610 m³ of materials reused on site

Crédit photos: Bruxelles Environnement

16 TIVOLI [BPC]

Renovation of a Belgacom building in housing

Reuse on site:

- 130 m² of floor tiles
- Yellow bricks
- …

Crédit: Bruxelles Environnement

Crédit: Bruxelles Environnement

Crédit: Rotor

Crédit: Rotor

17

TIVOLI [BPC]

Reuse off site:

- Doors
- Wall tiles
- Sanitation
- …

Crédit: Rotor

Inventory realised before execution:

A. Seront récupérés **avec certitude** :

Dans cette catégorie sont mentionnés les quantités de matériaux que Rotor prévoit de démonter, sous réserve que l'opération se déroule dans les conditions prévues par la convention. Le commanditaire peut intégrer le fait que ces éléments auront quitté le bâtiment après le passage de Rotor.

		Type d'élément	*Quantité à récupérer*	*Masse (éval.)*
V		Carrelage céramique 10x10 cm, damier rouge / beige moucheté	200 m² (>400 m² en tout dans le bâtiment, ~50 % de perte au démontage)	5600 kg
V		Carrelage mural émaillé jaune	140 m² (~190 m² en tout dans le bâtiment)	3100 kg
V		Tablettes de fenêtre en marbre, épaisseur 2 cm	Min. 60 m courants (tout)	850 kg
V		Manteaux de cheminées en marbre	4 pc	500 kg
	TOTAL			**10,05 tonnes**

C. Éléments **non-réutilisables** :

Dans cette catégorie sont mentionnés des éléments dont le potentiel a été examiné, mais qui se sont avérés non-réutilisables

		Type d'élément	*Raison pour laquelle le matériaux n'est pas réutilisable*
X		Châssis de fenêtre	Trop abîmés, plus aux normes, pas de valeur esthétique ou patrimoniale particulière
X		Radiateurs en fonte	Fêlés par le gel
X		Sols en carrelage de la cave : dalles 20 x 20 cm rouges et beiges, 380m2	Trop difficiles à démonter sans dommages.
X		Carrelage rouge 5x5 cm, ~33 m²	Carreaux trop petits : nettoyages des joints trop coûteux en temps

Crédit: Rotor

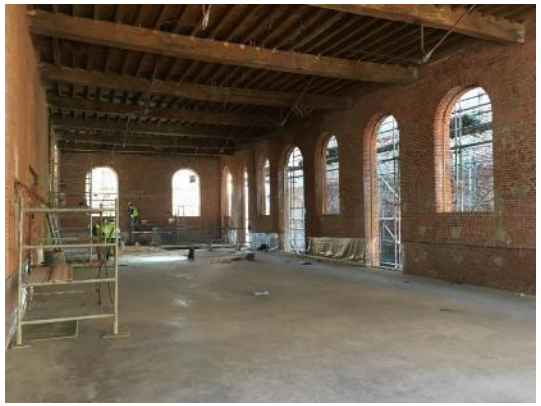
19

TOUR À PLOMB [ENTREPRISES JACQUES DELENS]

Renovation of an old foundry to a theater, gymnasium, library, … public contract

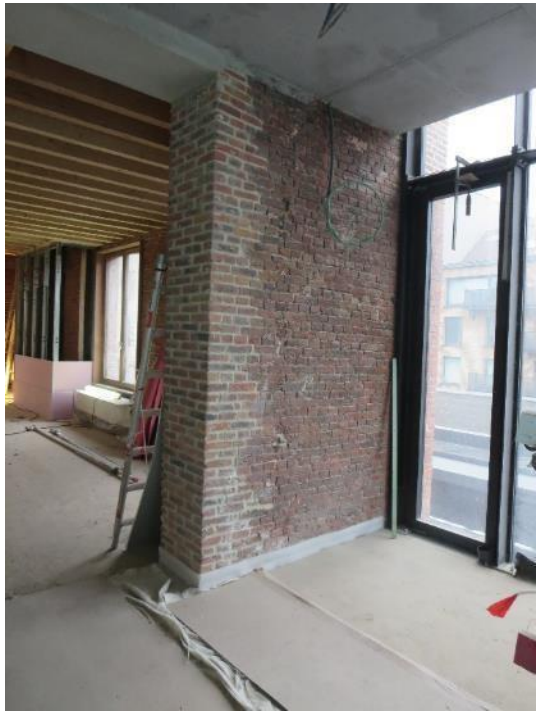
Reuse on site

- 60 m³ of bricks
- 9,5 t of wood beams (oak)
- 67,5 t of blue stones
- 0,5 t of formwork battens



Crédit: Bernard Van Damme - Source: Opalis

Crédit: Bernard Van Damme
Source: Opalis



Crédit: Bruxelles Environnement

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CHANTIER VANDERGOTEN [ENTREPRISES VALENS]

Demolition of a warehouse and construction of an appartement building

- Reuse of +/- 40.000 bricks on site
- Demoliton by: De Meuter / cleaning and storage: Travie
- 614 m² of bricks reused on site + 1.700 m² of bricks from other building sites
- Tests (resistance and frostiness) on reused bricks

Crédit photos: Bruxelles Environnement

CHANTIER VANDERGOTEN [ENTREPRISES VALENS]

Demolition of a warehouse and construction of an appartement building

Crédit photos: Bruxelles Environnement

22

INCLUSIO 2

Refurbishment of an office building into affordable rental housing

Crédit : Inlcusio

Reuse offsite

- Retrival :
  - Doors
  - Carpet
  - Glass partitions
  - Pictograms
  - Lighting
  - Sanitary equipment
  - Raised floors

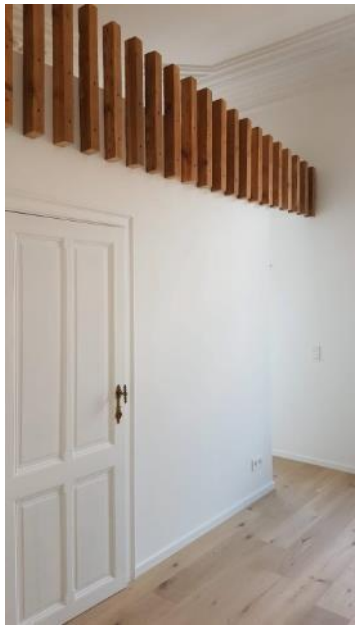
Crédit : Bruxelles Environnement

23 CHANTIER RUE DE L'EST [ENTREPRISE DECO SEGE ROM]

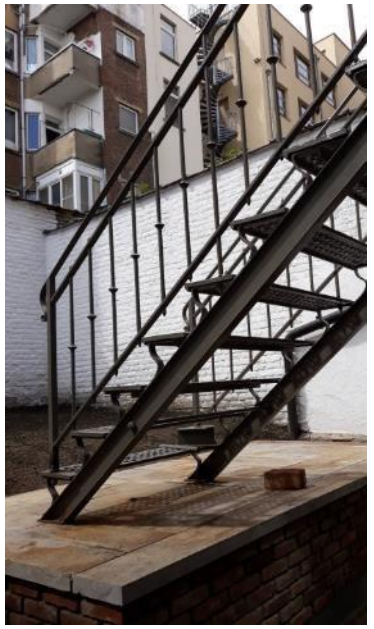
Renovation of a classical townhouse in 3 housing units

Reuse on site:

- 35 m² of cement tiles
- Exterior stairs
- Fireplace mantels -> Bathroom shelves
- Bluestones -> Outdoor facilities
- Interior doors
- Lumber







Source: S. Van Butsele

24 CHANTIER RUE DE L'EST [ENTREPRISE DECO SEGE ROM]

Reuse off site:

- 77m² wooden floor
- Stairs

Source: S. Van Butsele

25 CHANTIER RUE DE L'EST [ENTREPRISE DECO SEGE ROM]

Incoming reuse:

- 4 m³ of bricks
- Ironsmith
- Wall coverings

Source: S. Van Butsele

Source: Bruxelles Environnement

28 MUNDO-LAB

Refurbishment of an office building

Reuse on site, offsite and incoming

- Reuse inventory
- On site reuse: external glazing (internal partitions), removable partitioning, decorative panels, lighting fittings, mineral wool insulation (15 tons)
- Incoming reuse: doors, furniture, wood (tables), column covers (16.5 tons)
- Off-site reuse: floor carpet tiles, glass partitions (25 tons)

Crédit : Bruxelles Environnement

OPPORTUNITIES AND THREATS

Opportunities and threats

- **Sensibiliy** of the company / of the site manager to reuse
- **Uncertainty**
  - at the amount of materials effectively reusable (fixations,…)
  - → Impact on the **planning** of the building site (deconstruction, reconstruction)
- Organize dismounting tests ahead of the execution
  - → informations on techniques and tools to dismount
  - → anticipation for handling
  - → evaluation of the time needed to dismount/remount
- Need of **storage** spaces for materials
  - Possibility to work on **just-in-time** basis

OPPORTUNITIES AND THREATS

Opportunities and threats

- **Workforce** needed to extract, to prepare and to remount the elements
  → cost of workforce vs cost of new elements

  Development of the profession of **« reclaimer »**
- **Guarantees** on the reused materials

  Possibility to use materials to other purpose

  Development of a **materials passports**
- …

OPPORTUNITIES AND THREATS

Opportunities and threats before the execution

- **Sensibility** of the client and the design team to reuse
- Existence / making of a **pre-demolition inventory** and a **reuse plan** on the basis of the inventory

  Who make the inventory?
- Knowing of **reuse channels**
  - resellers: existence of stable channels of supply (bricks, parquet,…)
  - contacts with other building sites/companies

  How to activate contacts, build a network?
- **Harvest** (and storage) of materials **in amount**

  → development of the project and price offers more accurate

  researchs take a lot of time

  architectural constraints linked to reuse

OPPORTUNITIES AND THREATS

Opportunities and threats before the execution

- Requirements linked to **regulations** (security, energy,…)
- Identical **taxes** on reused materials to new materials
- Put **variants** in new materials in specifications
- **Reserved budget** linked to reused materials
- …

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34 CONCLUSIONS

Reuse in Brussels is alredy happening on big and little building sites → projects and reference players exist

Feedbacks show threats but also a lot of opportunities to reuse, on site and before, in design phase

Numerous initiatives and tools exist or still under development to promote reuse

→ Transition is in its way…

… but for the offer (in materials, in the companies,…) to increase, the demand needs to increase aswell

→ Important part to play for public owners and designers.

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?

THANK YOU

Indicators at urban level

URBAN LEVEL

- Demolition waste generated
- Recycling/recovery rate of construction and demolition waste
- Refurbishment and transformation rate relative to new construction
- Demolition rate
- Average age at demolition

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Event code
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Scope and goal of the workshop

Interim results

Product/ material focus

Buildings/ infrastructure focus

Coffee break

Urban level & organisation level focus

Panel discussion

We will have four experts at today's panel discussion

Evert Schut

- Senior advisor
- *Dutch Ministry of Infrastructure and Water management*

Kaie Small-Warner

- Senior Consultant
- *CIRCuIT*

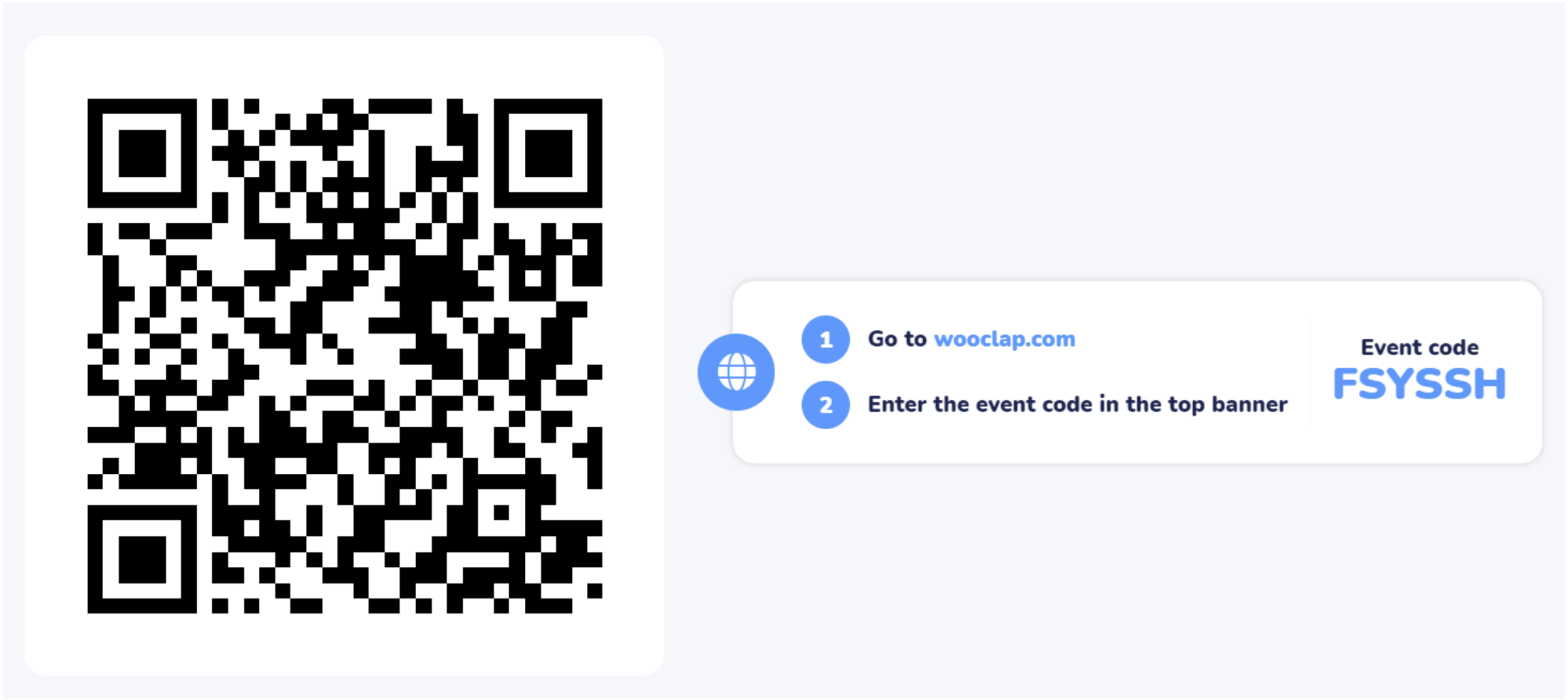
Christophe Sykes

- Director General
- *Construction Products Europe*

Sue Arundale

- Director General
- *EFCA*

Ask questions to our panellists and vote for them on wooclap!



Support our work in replying to our short, targeted survey!

Thank you.

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