# EU CRCF Online Workshop:
# **Temporary Carbon Storage Certification of Buildings**

24 September 2024

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European Commission, DG CLIMA, Unit C3

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European Commission

# Agenda

- 10:00 **Welcome and introduction, Sevim AKTAS**
- 10:05 **Panel discussion on existing regulations regarding carbon storage in the built environment**
- 11:00 **CRCF methodology deep dive: Quantification** Technical discussion
- 12:30 **Lunch break**
- 13:30 **CRCF methodology deep dive: Sustainability**
- 14:30 **Reflecting on certification methodologies from a practitioner's point of view**

# Objectives

**Status of work:**
This session is part of the methodology development process and is in a draft phase. Your technical feedback and insights are highly valuable to further shape the development of the methodology.

**Session focus:**
This session will be concentrating specifically on temporary carbon storage in buildings through the use of bio-based materials. We are also exploring how to account for both temporary and permanent carbon storage at the building level, e.g. carbon sequestration through biochar and mineralisation of concrete.

**Objective:**
The primary objective of this session is to gather expert input on the technical considerations for temporary carbon storage in buildings.

OVERVIEW

# Panel discussion on existing regulations regarding carbon storage in the built environment

1. **Presentation** by Sevim Aktas, DG CLIMA
2. **Panel discussion**
    - **Moderator:** Christian Holzleitner, DG CLIMA
    - Philippe Moseley, DG GROW
    - Bunthan Iea, DG ENER
    - Sevim Aktas, DG CLIMA
    - Mona Menadi, Built by Nature
3. **Q&A session**

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EU CRCF REGULATION

# Carbon storage in buildings certification methodology: Concept overview

# Agenda

1. Building regulation landscape
2. What does that mean for carbon removals
3. Carbon removal certification framework regulation
4. Certification methodology concept of carbon storage in buildings
5. Potential uses of certificates
6. Process so far & next steps

# Building regulation landscape

Energy Performance of Buildings Directive & Construction Product Regulation

## Buildings as carbon sinks

Carbon removals as mandatory indicator in the National Renovation Plans

Carbon removals as voluntary indicator in the EPCs

## New targets

All new buildings are zero-emission buildings starting from 2030

Roadmaps incl. limit values on life-cycle GWP of all new buildings & set targets for new buildings from 2030

## Move toward GWP indicator

The total lifetime GHG emissions of a building, **including embodied and operational emissions**, is calculated and disclosed in EPC

>> from 2028 for new buildings >1000m2
>> from 2030 for all new buildings

## Enhanced sustainability requirements

Mandatory declaration of GWP indicators for construction products from 2025 (standardised assessment and reporting and 3rd party review)

## Digitalisation

Digital building logbooks, incl. energy performance certificates & renovation passports by 2026 est.

Mandatory digital construction product passport from 2028

## Renovation Wave

Decarbonising the Union's building stock requires large-scale energy renovations: Nearly 75% of current buildings are inefficient, and 85-95% of today's buildings will still exist in 2050.

Context

# Carbon storage in the built environment

**Bio-based construction products like timber or agricultural crops offer significant potential for long-lasting storage of $CO_2$. By promoting sustainably sourced bio-based materials and advanced construction techniques, we can create energy-efficient buildings that serve as carbon sinks.**

- ## Reduces carbon footprint

  Lowers GHG emissions by storing carbon in construction materials.

- ## Supports climate goals

  Contributes towards EU climate neutrality targets.

- ## Promotes sustainability & cascading use

  Encourages use of sustainably sourced, renewable and circular materials.

- ## Improves air quality

  Enhances overall environmental quality and public health.

**Certification methodology as incentive for long-term use of (innovative) bio-based products & proof of carbon storage capacity of building.**

Context

# Bio-based materials go beyond wood

**bio-based insulation**

**cross-laminated timber (CLT)**

**hemp-based**

**miscanthus-based**

**eucalyptus wood**

**agro-waste**

rice husk ash, sugarcane bagasse ash, bamboo leaves ash, groundnut shell, sawdust, oil palm shell, cork waste ash, coconut shell

**sugarcrete**

**long-term bioplastics**

e.g. pipes

**mycelium**

root structure of fungi

**bamboo panels**

**flax-based**

**biochar**

CRCF Regulation

# Carbon removal certification framework Regulation

**Quantification & monitoring regulation** for carbon farming, **carbon storage in products**, permanent carbon removals

## EU certification methodology

**Commission establishes** certification methodology in consultation with **expert group**

**QUALITY** criteria: Quantification • Additionality • Liability • Sustainability

## Certification process

**Private and public certification schemes** recognised by the Commission

**Independent certification bodies** to issue audit reports & certificate of compliance

## Certification registries and Union-wide CRCF registry from 2028

**Publicly accessible information** on activities and operators audit reports & certificates of compliance

**Quantity and status of certified units, e.g.** carbon storage in products unit

CRCF Regulation

# Definition of carbon storage in products

## Carbon storage in products

**‘carbon storage in products’** means any practice or process that captures and stores atmospheric or biogenic carbon for at least 35 years in long-lasting products and which allows on-site monitoring of the carbon stored and certified throughout the monitoring period;

## Carbon storage in products units

**‘carbon storage in product units’** should be subject to an expiry date matching with the end of the relevant monitoring period, which should cover **at least 35 years for carbon storage in products**. Thereafter, the carbon captured and stored should be assumed to be released into the atmosphere, unless the operator or group of operators commits to prolonging the monitoring period.

CRCF methodology concept

# Certification of biogenic carbon storage in buildings

Long-lasting biogenic carbon storage in buildings
Timely limited certificates (min 35 years) with possibility to recertify

**Beneficiary:** Building owner as liability carrier

**Applicable to:** Renovation & new builds

**Scope:** Bio-based materials in structural building elements and insulation materials

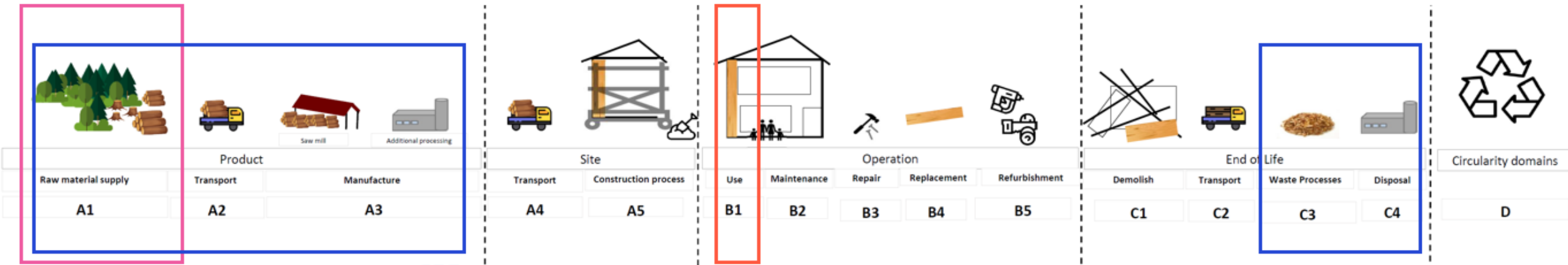
**Certification & verification processes integrated into existing building check-up routine**

**Voluntary certification** to declare carbon storage indicator in Energy Performance Certificate (EPBD)

**Certification as proof for sustainability reporting**

We are also exploring inclusion of term-term bio-based plastics and how to account for both temporary and permanent carbon storage at the building level, e.g. carbon sequestration through biochar and mineralisation of concrete.

# Related regulations




RED 3

Sustainability criteria for sustainable harvesting

CPR

GHG_fossil,GHG_biogenic, GHG_luluc per life cycle stage per product on DoPs

EPBD [+WLC]

Taxonomy

# Potential uses of the certificate

Non-prescriptive & non-exhaustive list

- **Public procurement**
- **Net-zero claims (within value chain) & climate neutrality claims**

  Corporate sustainability reporting regulation & green claims

  Demonstrate leadership in environmental stewardship: "net-zero/carbon-negative/climate-positive building stock"
- **Unlock financial incentives/ attract investments**

  As credible and transparent proof for green bonds, green mortgages or favourable loan or investment terms.
- **Increase property value**

  Advantages when selling real estate; access to new customer segments

  Sustainable buildings are more resilient to environmental risks, such as extreme weather - could lead to lower insurance premiums and increased property durability.
- **Help ensure compliance with specific sustainability standards, e.g. EU taxonomy**

# Process so far & next steps

**December 2023**

Review of certification methodologies for long-term biogenic carbon storage in buildings

**March 2024**

Provisional agreement between the European Parliament and the Council on CRCF Regulation

**March 2024**

Draft Technical Assessment Paper with technical recommendations for certification methodology

**April 2024**

4th Expert Group meeting

**September 2024**

2nd draft of Technical Assessment Paper

**September 2024**

Public workshop

**October 2024**

5th Expert Group meeting: Fist draft elements of methodology

PANEL DISCUSSION

# Existing regulations regarding carbon storage in the built environment

- **Christian Holzleitner,** DG CLIMA (moderator)
- **Philippe Moseley,** DG GROW
- **Bunthan lea,** DG ENER
- **Sevim Aktas,** DG CLIMA
- **Mona Menadi,** Built by Nature

# EPBD & Whole Life Carbon

Dr. BUNTHAN IEA, Policy Officer
DG ENER.B.3 - Buildings and Products

# Increased consideration of the whole-life-cycle performance of buildings & a circular economy

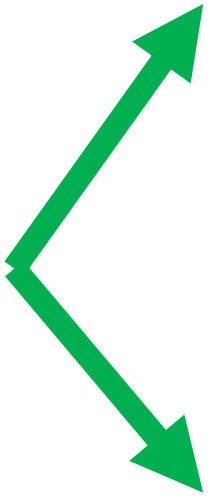
- Buildings are responsible for greenhouse gas emissions before, during & after their operational lifetime.
- The **whole-life-cycle emissions** of buildings should therefore progressively be taken into account, starting with new buildings.
- The **2050 vision** for a decarbonised building stock goes beyond the current focus on operational greenhouse gas emissions.
- Making good choices about **building design, practices, and materials** can significantly reduce both operational and embodied carbon emissions.

# Provisions of the recast EPBD for Life-cycle GWP

- **Calculation of LC GWP** from 1-01-2028 for large new buildings & from 01-01-2030 for all new buildings (Art 7.2)

  ✓Calculation in accordance with the **main principles of Annex III,** pending the adoption of a DA to set out a **Union framework for the national calculation of GWP** by 31 December 2025 (Art 7.3)

- By 01-01-2027, publication & notification of **national roadmaps** detailing introduction of limit values and set targets (Art 7.5)



# Timeline of the provisions for Life-cycle GWP

## May 2024

Publication of the EPBD in the OJ & entry into force
Directive - EU - 2024/1275 - EN - EUR-Lex (europa.eu)

## 31 December 2025

The Commission shall adopt a delegated act setting out a Union framework for the national calculation of life-cycle GWP.

Article 7(3)

## January 2027

Member States shall publish and notify to the Commission a roadmap on the introduction of limit values & targets

Article 7(5)

## January 2028

**> New buildings over 1000m2 useful floor area**

Member States shall ensure that life-cycle GWP is calculated in accordance with Annex III and disclosed in the energy performance certificate.

Article 7(2)

## January 2030

**> All new buildings**

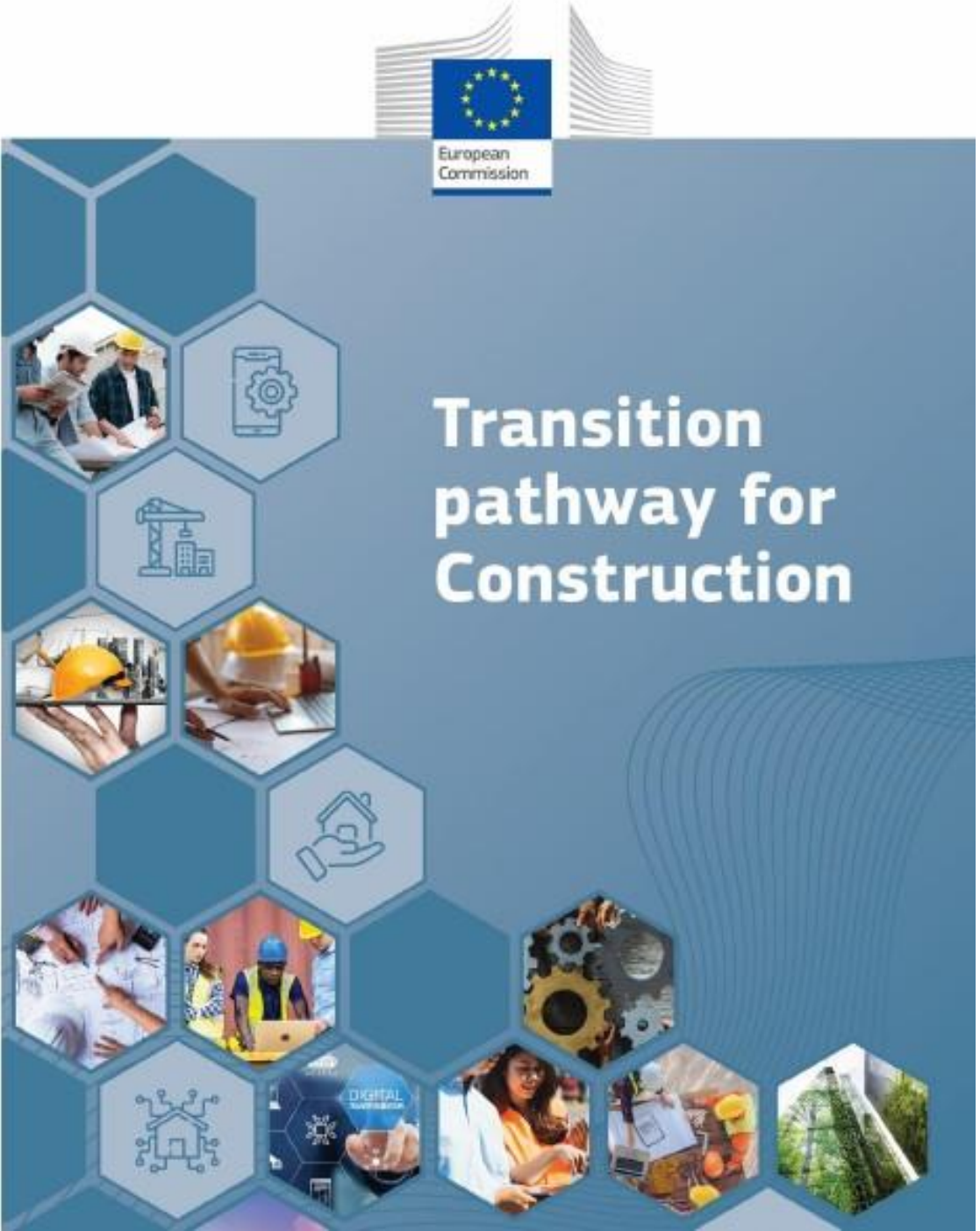
Member States shall ensure that life-cycle GWP is calculated in accordance with Annex III (and DA) and disclosed in the energy performance certificate

+ **Targets** for all new buildings from national roadmaps

Article 7(2) + Article 7(5)

# Construction Product Regulation

Philippe Moseley, DG GROW




**Transition Pathway** (March 2023): https://ec.europa.eu/docsroom/documents/53854

- Co-created with industry, Member States and other stakeholders
- A vision for the green and digital transition
- Recommendations of concrete action

Call for new commitments aligning with the Transition Pathway: https://ec.europa.eu/eusurvey/runner/TransitionPathwayConstruction_Commitments

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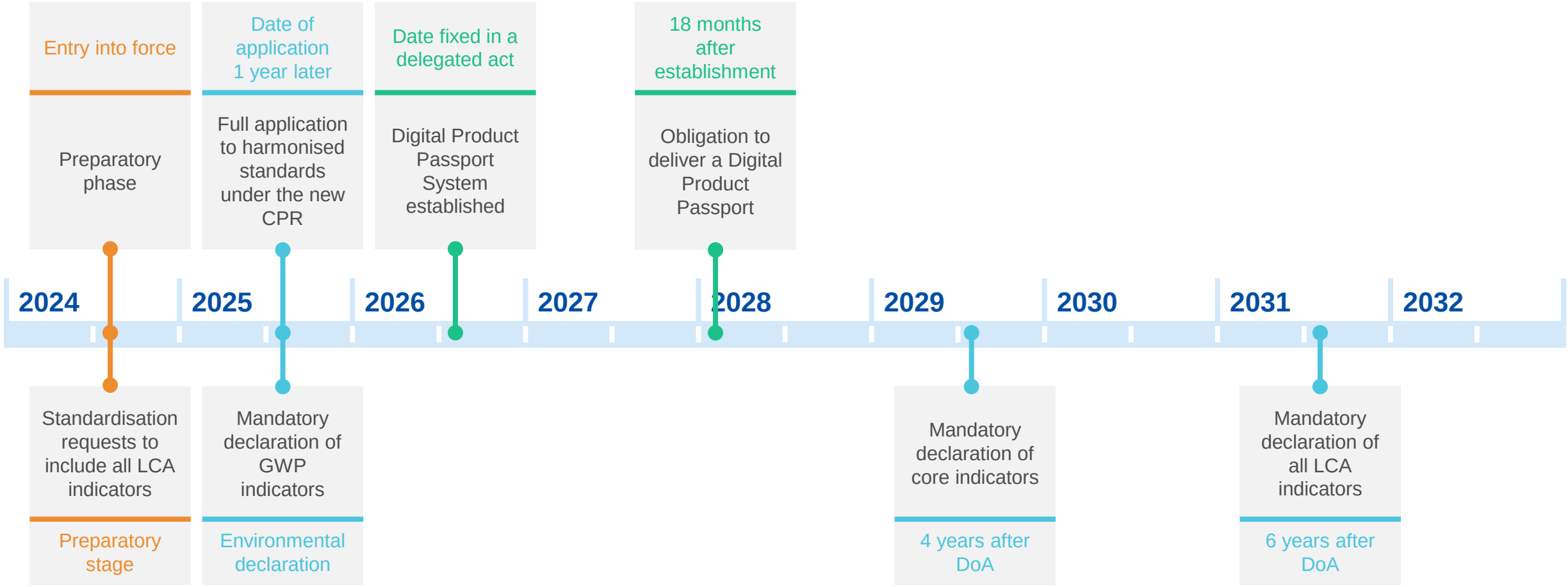
# Construction Products Regulation: timeline of new provisions

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CRCF METHODOLOGY DEEP DIVE

# Quantification

- **Draft elements of the EU certification methodology**, CRETA
- **“Analysis of Life-Cycle Greenhouse Gas emissions and removals of EU Buildings and Construction” – the modelling work**, Martin Röck, Ramboll

# Draft elements of quantification

Quantification of long-term biogenic carbon storage in buildings for EU certification methodology

*24-09-2024 | Jannes Nelissen and Sinéad O' Keeffe (CRETA)*

# Content

1. State of the draft methodology
2. Eligibility criteria
3. Overarching formula
4. $CR_{baseline}$
5. $CR_{total}$
6. $GHG_{associated}$

# Overview of the draft methodology

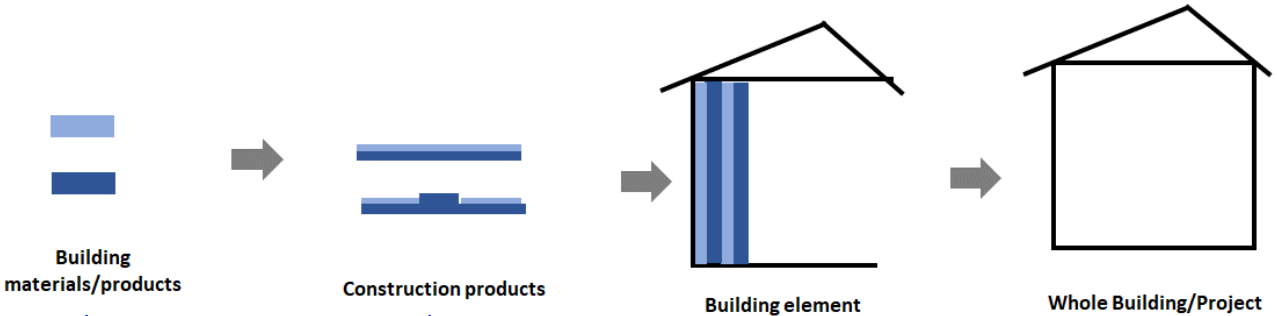
The methodology is in development, with a current focus on **quantification**.

- Quantification (Article 4):
  - Definition of variables in formula given in Article 4 of the provisional agreement.
  - Draft methodology in October.
- Sustainability (Article 7):
  - Analysis of relevant existing EU regulations and initiatives that can be used as foundation for sustainability criteria.
  - Results are recorded in technical assessment paper, discussed today and in October

Other parts have been explored and are in the TAP but will not be discussed today:

- Additionality (Article 5)
- Storage, monitoring and liability (Article 6)

# Terminology: materials, products, elements




Biobased and non-biobased materials:
plaster, timber, paper, wool

For example, timber beams and wallpaper.
EPDs are usually made on product level

For example, a wall that consists of timber beams, plaster and wallpaper.
EPDs can be on element level, if prefab elements are used.

The building contains N number of eligible construction elements *j*.
Which contain *n* number of biobased products *i*.

# Eligibility

Under the CRCF those products which can be proven to have life span of greater than 35 years can be included. To begin with two major biobased building elements are suggested.

- Load bearing structural elements
  - + Easiest to monitor and verify
  - - Just timber in practice

- Load bearing structural elements + insulation
  - + Incentivises more sources and use of larger part of trees
  - + Stimulates improvement of lifespan and availability of biobased insulation materials
  - - Requires additional monitoring and verification rules
  - High potential for storage, low potential for ‘Net carbon storage benefit’

# Formula Quantification

Temporary net carbon removal benefit = $CR_{baseline} - CR_{total} - GHG_{associated} > 0$

with

a. $CR_{baseline}$ is the carbon removed under the baseline;
b. $CR_{total}$ is the total carbon removals of the carbon storage in products activity;
c. $GHG_{associated}$ is the increase in direct and indirect greenhouse gas emissions, over the entire lifecycle of the activity which are due to its implementation [...].

Quantities for parameters (a) –(c) shall be designated with a negative sign (-) if they are net GHG removals and with a positive sign (+) if they are net GHG emissions. The parameters need to be expressed in tonnes $CO_2$ equivalent.

# Example

- Timber frame extension
- The Netherlands
- 50 $m^2$ useful floor area, over 2 floors
- Simplified BoM:

| Elements | Material | Amount |
|---|---|---|
| Wall frame | Spruce timber beams | 5 m3 |
| Floor joists | Spruce timber beams | 0,5 m3 |
| Roof rafters | Spruce timber beams & Douglas fir timber | 0,5 m3 |
| Wall panels | Pine plywood | 2,5 m3 |
| Ceiling and floors | OSB | 2 m3 |
| External cladding | Pine timber panels | 5 m3 |
| Insulation | Hemp fiber wool | 29m3 |
| Roof tiles | Clay | 1000 kg |
| Fasteners | Steel screws | 40 kg |

Image courtesy of Flitcraft Timber Frame

# $CR_{baseline}$

The five years average of carbon content in eligible construction elements in new build buildings, or renovation projects in a country.

$$CR_{baseline} = CR_{reference} \times A_{project} \times Cf_1$$

with

a. $CR_{reference}$ is the standardised baseline figure for carbon storage in stipulated building elements per square meter of useful floor area in a reference building. Expressed in kg $CO_2$ eq/$m^2$.
b. $A_{project}$ is the useful floor area of the building applying for certification, expressed in $m^2$.
c. $Cf_1$ is the conversion factor for kg to ton (1/1000)

- Useful floor area is used to align with the Taxonomy and Level(s)
- On a country level, due to varying building codes among Member states

# Example

$$CR_{baseline} = CR_{reference} \times A_{project} \times Cf_1$$

- $CR_{reference}$ for a renovation project on a single-family home in The Netherlands: -30 kg $CO_2$ eq/$m^2$
- $A_{project}$ is 50 $m^2$
- $Cf_1$ is 1/1000

- $CR_{baseline}$= -30*50*(1/1000)*1= -1,5 ton $CO_2$ eq.

Example: Dummy data

Image courtesy of Flitcraft Timber Frame

# $CR_{baseline}$ – determining baseline figures

- $CR_{reference}$ shall be specified per building typology and Member State
- Based on modelling done for DG GROW[1]
- Harmonised methodology for all Member States
- Based on data of EU's Building Stock Observatory (among others)
- Will be able to improve over time with the right reporting requirements


1: Analysis of Life-Cycle GHG emissions and removals of EU buildings and construction - Baseline Analysis Report
Ramboll, KU Leuven, BPIE, TU Graz, IIASA, Aalborg University, Politecnico di Milano. (2024).

# $CR_{total}$

Sum of the carbon content in all eligible construction products, according to EPDs adhering to EN15804+A2

$$CR_{element,j} = \sum_{i=1}^{N_j} C_{i,j} \times n_i \times Cf_1 \times Cf_2 \times (-1)$$

with:

a. $CR_{element,j}$ is the stored carbon in eligible construction element j in ton $CO_2$ eq
b. $C_{i,j}$ is the carbon content of biobased product *i* in eligible construction element j, expressed in kg carbon per unit product, as defined per EPD
c. $n_i$ is the number of units of eligible biobased product *i* in the building element *j*
d. $N_j$ is the number of different biobased products in the building element *j*
e. $Cf_1$ is the conversion factor for carbon to $CO_2$: (44/12)
f. $Cf_2$ is the conversion factor for kg to ton: (1/1000)
g. -1 is used to indicate that the CR is a removal

# $CR_{total}$

Sum of the carbon content in all eligible construction materials, according to EPDs adhering to EN15804+A2

$$CR_{total} = \sum_{j=1}^{N} CR_{element,j} \times 1$$

with:

a. $CR_{element,j}$ is the stored carbon in eligible construction element j in ton $CO_2$ eq
b. N is the total number of eligible construction elements in the building
c. 1 refers to the characterisation factor to convert $CO_2$ emissions to the global warming potential impact factor of $CO_2$ equivalence

# $CR_{total}$

- Report per eligible construction element for transparency in reporting and monitoring
  - And to align with the ‘life-cycle GWP’ approach from Level(s)
- EPD’s according to EN15804+A2 are the norm and will be mandatory under CPR
- Carbon content of biobased product (in kg carbon per unit product) are required according to clause 7.2.5 of EN15804+A2
  - This excludes the packaging materials, only the carbon content in the actual product
- Unit product from EPD can vary (e.g.  1 $m^3$ of insulation material, 1 meter of CLT beam)
- Unit products need to be verifiable through a bill of materials

# Example

For simplification we have assumed biobased load bearing structural elements and insulation are eligible.

$$CR_{element,j} = \sum_{i=1}^{N_j} C_{i,j} \times n_i \times Cf_1 \times Cf_2 \times (-1)$$

$$CR_{total} = \sum_{j=1}^{N} CR_{element,j} \times 1$$

| Element | Amount | Unit product in EPD | Unit products in element, $n_i$ | C (kg) |
|---|---|---|---|---|
| Wall frame | 5 m³ | Spruce timber beam, per 1 m³ | 5 | 205 |
| Floor joists | 0,5 m³ | Spruce timber beam, per 1 m³ | 0,5 | 205 |
| Roof rafters | 0,2 m³ | Spruce timber beam, per 1 m³ | 0,2 | 205 |
| Roof rafters | 0,3 m³ | Douglas fir timber beam, per 1 m³ | 0,3 | 225 |
| Insulation | 29 m³ | Hemp fiber insulation, per 1 m² panel | 290 | 1,8 |

- $CR_{wall\ frame}$ = 205 * 5 * 44/12 * 1/1000 *-1 = -3,75 ton $CO_2$ eq
- $CR_{floor\ joists}$ = 205 * 0,5 * 44/12 * 1/1000 *-1 = -0,38 ton $CO_2$ eq
- $CR_{roof\ rafters}$ = (205 * 0,2 + 225*0,3) * 44/12 * 1/1000 *-1 = -0,40 ton $CO_2$ eq
- $CR_{insulation}$ = 290 * 1,8 * 44/12 * 1/1000 *-1 = -1,9 ton $CO_2$ eq
- **$CR_{total}$ = -6,45 ton $CO_2$ eq**

# $GHG_{associated}$ : two options

*"$GHG_{associated}$ is the increase in direct and indirect greenhouse gas emissions, over the entire lifecycle of the activity which are due to its implementation [...]."*

1. "The building is the implementation": Use sum of GHG emissions for all stipulated elements, regardless of whether they store carbon.
   - \- High $GHG_{associated}$. No new building activity will be able to be certified
   - \+ Renovation projects are possible, if mostly biobased materials are used. This stimulates reuse of existing building stock
   - \+ Account for actual emissions

2. "The carbon storing construction elements are the implementation": Use a representative conventional building as a reference which is subtracted in the calculation.
   - \+ $GHG_{associated}$ is lower, biobased building is stimulated. Higher potential for temporary carbon storage and reductions relative to conventional building
   - \- Absolute associated emissions will be higher than temporary carbon storage

# $GHG_{associated}$ – formula, option 1

Sum of the associated emissions in all stipulated construction elements, according to EPDs adhering to EN15804+A2

$$GHG_{element,p} = \sum_{k=1}^{N_p} GWP_{fossil,kp} \times n_k \times Cf_1$$

$$GHG_{associated} = \sum_{p=1}^{N} GHG_{element,p}$$

with:

a. $GHG_{element,p}$ is the increase in greenhouse gas emissions associated with the stipulated construction element *p*
b. $GWP_{fossil,kp}$ is the sum of all $GWP_{fossil}$ values in the A-phases of construction product *k* in stipulated construction element, expressed in kg $CO_2$ eq per unit product, as defined per EPD.
c. $n_k$ is the number of units of construction product *k* in building element *p*
d. $N_p$ is the number of different construction products in building element *p*
e. $Cf_1$ is the conversion factor for kg to ton (1/1000)
f. N is the total number of stipulated construction element in the building.

# $GHG_{associated}$ – option 1

- Stipulated construction elements ≠ eligible construction elements
  - Eligible construction elements contain biogenic carbon and have a minimal lifespan of 35 years.
  - Stipulated construction elements are the same type of elements, but do not need to contain biogenic carbon.
  - If carbon storing load bearing structural elements are eligible,
    all load bearing structural elements are stipulated, including steel beams for instance.

Image courtesy of Vision Development

# Example – option 1

- All eligible construction elements are stipulated construction elements.
- These elements contain more than just biobased products.
- For simplification assume that all elements contain 10 kg of fasteners each.

| Element | Amount | Unit product in EPD | Unit products in element, $n_i$ | $GWP_{fossil}$ (kg $CO_2$ eq) |
|---|---|---|---|---|
| Wall frame | 2 $m^3$ | Spruce timber beam, per 1 $m^3$ | 5 | 75 |
| Wall frame | 10 kg | Screws, per kg | 10 | 4 |
| Floor joists | 0,5 $m^3$ | Spruce timber beam, per 1 $m^3$ | 0,5 | 75 |
| Floor joists | 10 kg | Screws, per kg | 10 | 4 |
| Roof rafters | 0,2 $m^3$ | Spruce timber beam, per 1 $m^3$ | 0,2 | 75 |
| Roof rafters | 0,3 $m^3$ | Douglas fir timber beam, per 1 $m^3$ | 0,3 | 120 |
| Roof rafters | 10 kg | Screws, per kg | 10 | 4 |
| Insulation | 29 $m^3$ | Hemp fiber insulation, per 1 $m^2$ panel | 290 | 1,5 |
| Insulation | 10 kg | Screws, per kg | 10 | 4 |

# Example – option 1

Example:
Dummy data

$$GHG_{element,p} = \sum_{k=1}^{N_p} GWP_{fossil,kp} \times n_k \times Cf_1$$

$$GHG_{associated} = \sum_{p=1}^{N} GHG_{element,p}$$

- $GHG_{Wall\ frame}$ = (75*5+4*10) * 1/1000 = 0,42 ton $CO_2$ eq
- $GHG_{Floor\ joists}$ = (75*0,5+4*10) * 1/1000 = 0,08 ton $CO_2$ eq
- $GHG_{Roof\ rafters}$ = (75*0,2+120*0,3+4*10) * 1/1000 = 0,09 ton $CO_2$ eq
- $GHG_{Insulation}$ = (1,5*290+4*10) * 1/1000 = 0,48 ton $CO_2$ eq
- $GHG_{associated}$ = 1,06 ton $CO_2$ eq

**Temporary net carbon removal benefit** = $CR_{baseline} - CR_{total} - GHG_{associated}$ = -1,5 + 6,45 – 1,06 = 3,89 ton $CO_2$ eq

# Example – option 1

**What if the timber frame needs a concrete foundation?**

- For 25m$^2$, 5m$^3$ concrete is assumed, with density 2500 kg/m$^3$ = 12,5 ton of concrete
- From EPD: $GWP_{fossil}$ = 840 kg $CO_2$ eq/ton product
- $GHG_{foundation}$ = 840 * 12,5 *1/1000 = 10,5 ton $CO_2$ eq
- $GHG_{associated}$ = 11,6 ton $CO_2$ eq

**Temporary net carbon removal benefit** = $CR_{baseline} - CR_{total} - GHG_{associated}$ = -1,5 + 6,45 – 11,06 = **-6,11 ton $CO_2$ eq.**

# $GHG_{associated}$ – formula, option 2

The total additional GHG emissions during the lifecycle of the building, additional to a conventional building.

$$GHG_{associated} = (GWP_{project} - GHG_{reference}) \times A_{project} \times Cf_1$$

With

a. $GWP_{project}$ is the life-cycle GWP value per square meter of useful floor area of the building in kg $CO_2$ eq/$m^2$ in accordance with Annex III of the EPBD (EU/2024/1275).
b. $GHG_{reference}$ is the standardised reference value for embodied emissions per square meter of useful floor area in a reference building. Expressed in kg $CO_2$ eq/$m^2$.
c. $A_{project}$ is the useful floor area of the building applying for certification, expressed in $m^2$
d. $Cf_1$ is the conversion factor for kg to ton (1/1000)

# Example – option 2

$$GHG_{associated} = (GWP_{project} - GHG_{reference}) \times A_{project} \times Cf_1$$

Example: Dummy data

- First for the renovation project without concrete foundation.
- In $GWP_{project}$ all elements, including roof tiles and non-eligible biobased materials are included
- $GWP_{project}$ = 51 kg $CO_2$ eq/$m^2$ (based on estimated total 2,6 ton $CO_2$ eq)
- $GHG_{reference}$ for a renovation project on a single-family home in The Netherlands: 167 kg $CO_2$ eq/$m^2$ *

- $GHG_{associated}$ = (51-167)*50*1/1000 = -5,78 ton $CO_2$ eq. → $GHG_{associated}$ = 0 ton $CO_2$ eq.
- **Temporary net carbon removal benefit** = $CR_{baseline} - CR_{total} - GHG_{associated}$ = 4,95 ton $CO_2$ eq.

* Reference value based on study by Dutch Green Building Council.

# Example – option 2


$$GHG_{associated} = (GWP_{project} - GHG_{reference}) \times A_{project} \times Cf_1$$

- And for the renovation project <u>including</u> concrete foundation:

- $GWP_{project}$ = 261 kg $CO_2$ eq/$m^2$ (based on estimated total 13,1 ton $CO_2$ eq)
- $GHG_{reference}$ for a renovation project on a single-family home in The Netherlands: 167 kg $CO_2$ eq/$m^2$ *

- $GHG_{associated}$ = (261-167)*50*1/1000 = 4,7 ton $CO_2$ eq.
- **Temporary net carbon removal benefit** = $CR_{baseline} - CR_{total} - GHG_{associated}$ = 0,23 ton $CO_2$ eq.

- For new builds the $GHG_{reference}$ is 286 kg $CO_2$/$m^{2*}$
- This makes $GHG_{associated} < 0$ → 0
- Temporary net carbon removal benefit = 4,95 ton $CO_2$ eq.

* Reference values based on study by Dutch Green Building council.

# We would like your input on:

- Which construction elements should be eligible for certification?
  - Load bearing structural elements, with a lifespan > 35 years
  - Load bearing structural elements + insulation with a lifespan > 35 years
  - All biobased construction elements with a lifespan > 35 years
- How should $GHG_{associated}$ be interpreted?
  - "The building is the implementation" → $GHG_{associated}$ option 1
  - "The carbon storing construction elements are the implementation": → $GHG_{associated}$ option 2

- And you're a free to leave all other comments.

# **EU CRCF**: Carbon storage certification of buildings workshop

**Dr Martin Röck**
KU Leuven, RISE

24/09/2024

RAMBØLL Bright ideas. Sustainable change.

RAMBØLL BPIE KU LEUVEN TU Graz AALBORG UNIVERSITY International Institute for Applied Systems Analysis IIASA www.iiasa.ac.at POLITECNICO MILANO 1863

# Outline

1. **Introduction**
   Overview of the study and tasks

2. **Methodology**
   Modelling and stakeholder engagement

3. **Results**
   Building-level GWP results incl. $GWP_{bio}$

4. **Outlook**
   Data outcomes, modelling future scenarios

5. **Q&A**

# Introduction

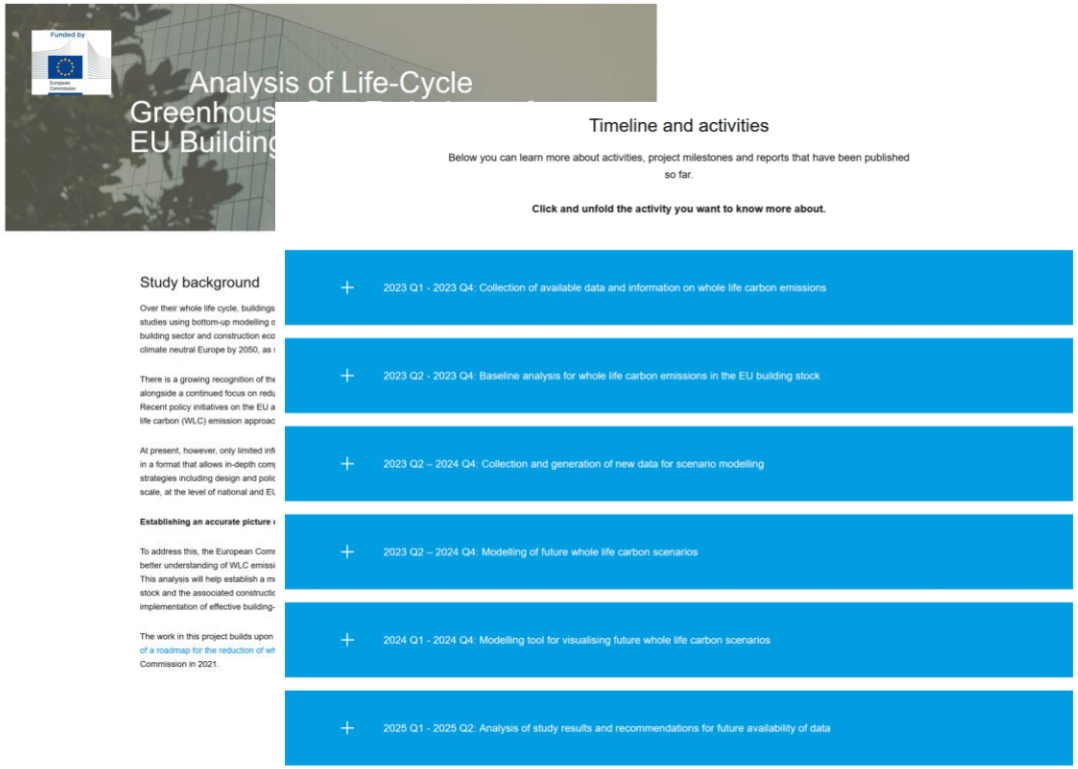
# Analysis of Life-Cycle Greenhouse Gas Emissions and Removal of EU Buildings and Construction

- **Contract**
  GROW/2022/OP/0005

- **Contact**
  Philippe Mosley, EC DG GROW
  philippe.moseley@ec.europa.eu

- **Information**
  Website
  https://c.ramboll.com/life-cycle-emissions-of-eu-building-and-construction

- **Outcomes**
  Reports, Data, Scenario tool



# The study aims at developing a better understanding of whole life carbon reduction of buildings in the EU

**Strategies for life cycle GHG emissions reduction and removal**, for reaching climate neutrality in 2050, considering different national contexts.

**Quantified impact of the EU building stock and scenario tool** for whole life GHG emissions and removals at national and EU level

**Improved availability of data for buildings and construction** to analyse whole life GHG emissions reduction and carbon removals

# Project team and tasks

**Consortium**

RAMBØLL

KU LEUVEN

BPIE

TU Graz

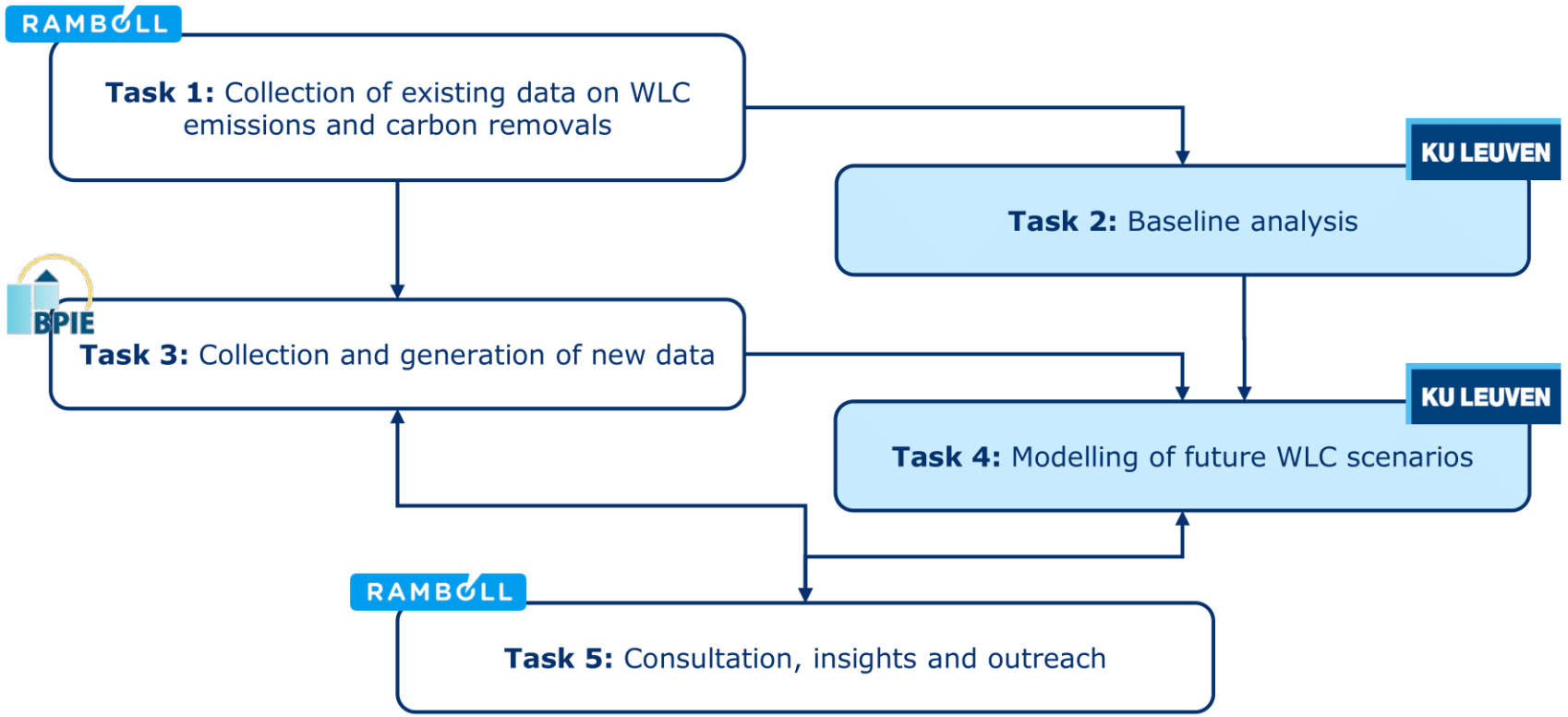
POLITECNICO MILANO 1863

AALBORG UNIVERSITY

International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

**Workstream 1:**
Analysis of existing WLC data across MS, current capacity and next steps for WLC data collection and analysis

**Workstream 2:**
Analysis of life-cycle GHG emissions and carbon removals of EU buildings and construction



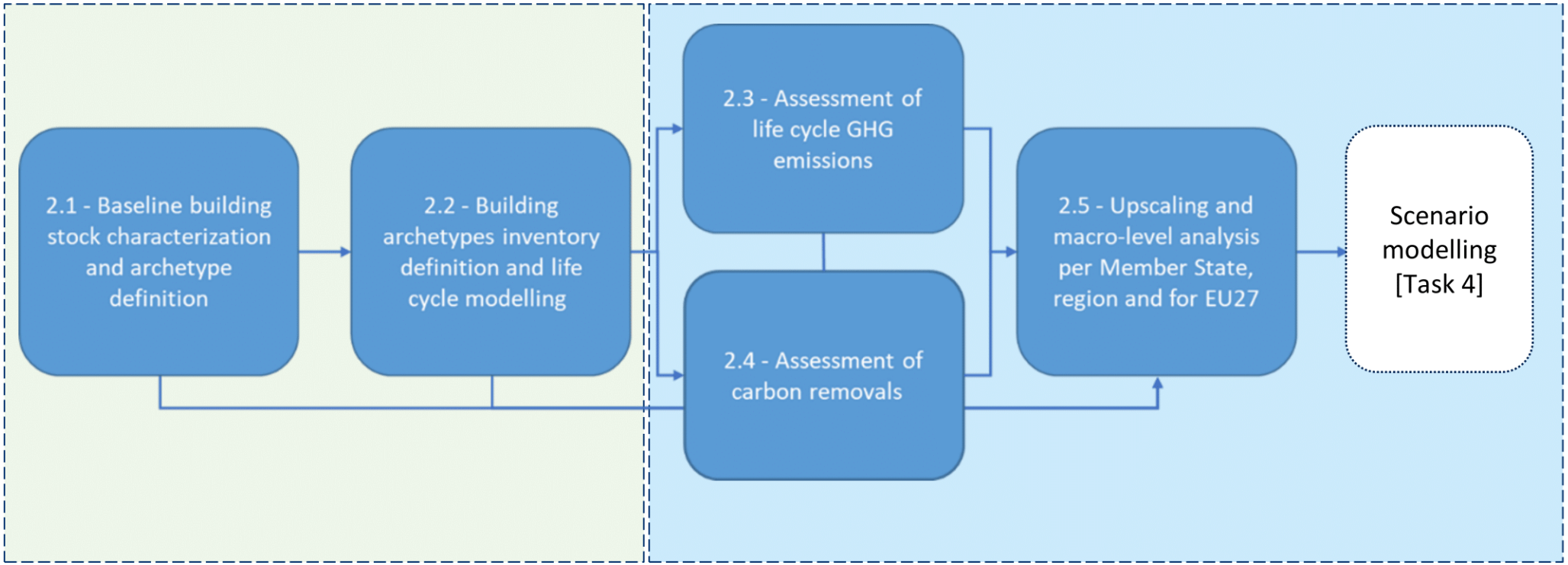
# Methodology

# Stakeholder engagement

| Objective | Activities | When |
|---|---|---|
| **Outreach** | | |
| **Informing and awareness-raising** | • Website<br>• Social media engagement | • Throughout study |
| **Ensuring that the needs of the EU, MS and the industry are met** | • Data collection activities<br>• Ad-hoc presentations (e.g., HLCF, Concerted Action EPBD, industry events) | • Throughout study |
| **Ensuring buy-in and continuation** | • Workshops to distribute findings and deliverables, discuss continuation of data collection and modelling based on tool | • Q1-Q2 2025 |
| **Stakeholder consultation** | | |
| **Collection of new information and data** | • Survey with national competent authorities<br>• Interviews (e.g., industry associations and NGOs)<br>• Expert consultations on building archetypes definitions and modelling | • Q3 2023<br>• Q2-Q4 2023<br>• Q4 2023-Q2 2024 |
| **Verifying / Validating results** | • Workshop with relevant ecosystem actors on validation of scenarios and assumptions for modelling removal and reduction strategies)<br>• Academic sounding board | • Q4 2024<br>• Q2 2024-Q2 2025 |
| **Key stakeholders and decision-makers** | | |
| • EU Institutions<br>• National Authorities<br>• Green Building Councils<br>• BuiltHub<br>• Building Stock Observatory<br>• Industry associations | | • Other networks, NGOs and industry actors |

# Building stock analysis via building archetypes

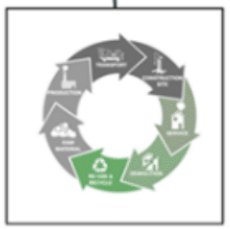
**Characterization of baseline building stocks and new construction activities, definition of representative building archetypes, upscaling and analysis of future scenarios for building and building stock development**



# Building archetypes: Representing building stock

## Building stock data

- EU Countries (27+2)
- Clustered by region (EPBD)
- Economy-wide scenarios
- Projections (2015 – 2050)

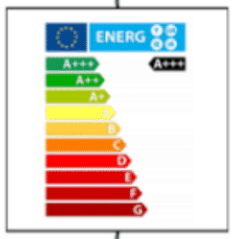


## Activities

- Existing building operation
- Energy retrofit
- Deconstruction, demolition
- New building construction

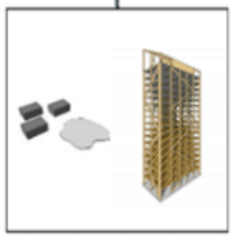
## Building types

- Single Family Houses (SFH)
- Multi-Family Houses (MFH)
- Office buildings (OFF)



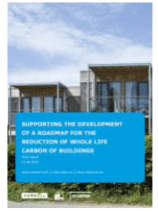

## Energy performance

- Per region & building type
  - Existing average
  - Energy retrofit depths (2)
  - New building levels (2)



## Elements / Materials

- Per region & building type
  - Existing average
  - New buildings
- Low-carbon solutions (scenarios)

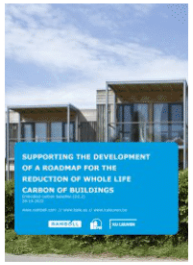


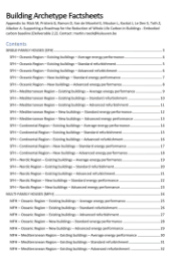
European Commission, Directorate-General for Environment, Ramboll, BPIE, KU Leuven, Le Den, X., Steinmann, J., Kovacs, A., Kockat, J., Toth, Z., Röck, M., Allacker, K. Supporting the development of a roadmap for the reduction of whole life carbon of buildings – Final technical report , Publications Office of the European Union, 2024, https://doi.org/10.2779/634412

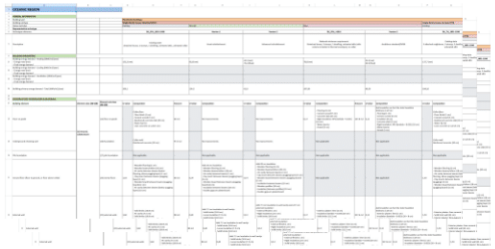
# Building archetypes per region and per Member State

## Available

- DG ENV and DG GROW Task 2: Regional archetypes
  - Representative archetypes per region via statistical analysis, total floor area, energy and material info
  - Link with TABULA-EPISCOPE (limited to envelope, energy system), basis inventory modelling
  - Complete inventory via additional data sources, expert judgement and stakeholder verification
  - **Results**
    - Report: D2.2 Embodied carbon baseline (DOC)
    - Report: D2.2+A2 Archetype factsheets (DOC)
    - **Dataset**: Archetype inventory overview (XLS)

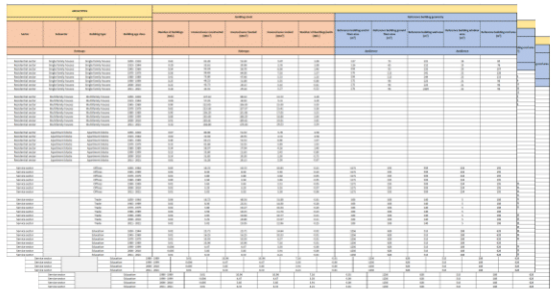


## Forthcoming

- DG GROW Task 4: Defining new archetypes per MS
  - Building stock characterization combining key data sources to generate a new, harmonized dataset
    - Main: Hotmaps; Ambience; Cost-effectiveness studies; Building Stock Observatory
  - Defining representative archetypes per country (Member State) for the EU27
  - **Results:**
    - Methodology: Guideline + MS application (DOC)
    - Dataset: Attributes per MS, type, period (XLS)

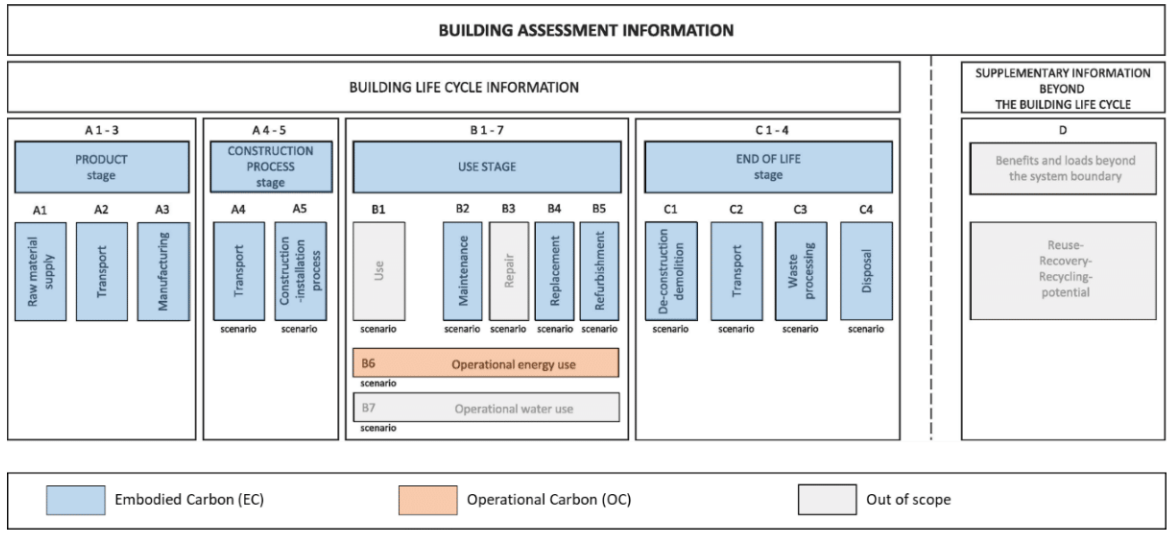


# Building archetype inventory modeling scope

- Building parts

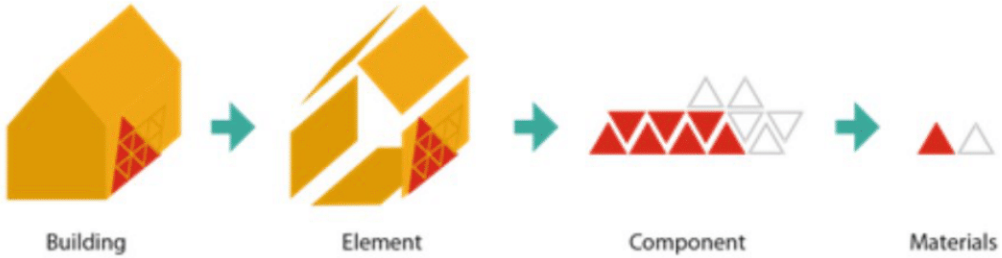
  - Floors on grade [(13) floor on grade]
  - Foundations [(16) foundation, (17) pile foundation]
  - External walls [(21) external walls, (28) load-bearing structures]
  - Internal walls [(22.1) load bearing and (22.3) not-load bearing internal walls]
  - Common walls [(22.8) party walls]
  - Storey floors [(23) storey floors]
  - Stairs [(24) stairs]
  - Roofs [(27.1) flat and (27.2) pitched roofs]
  - External openings [(31) windows]
  - Internal openings [(32) internal doors]
  - Technical systems [(53) water supply and (52) water disposal, (56) space heating and (53.3) DHW, (57) ventilation]
  - Electrical systems [(6) services, mainly electrical]

- Life cycle stages



# Building archetype inventory modelling approach

## MMG-SLiCE logic

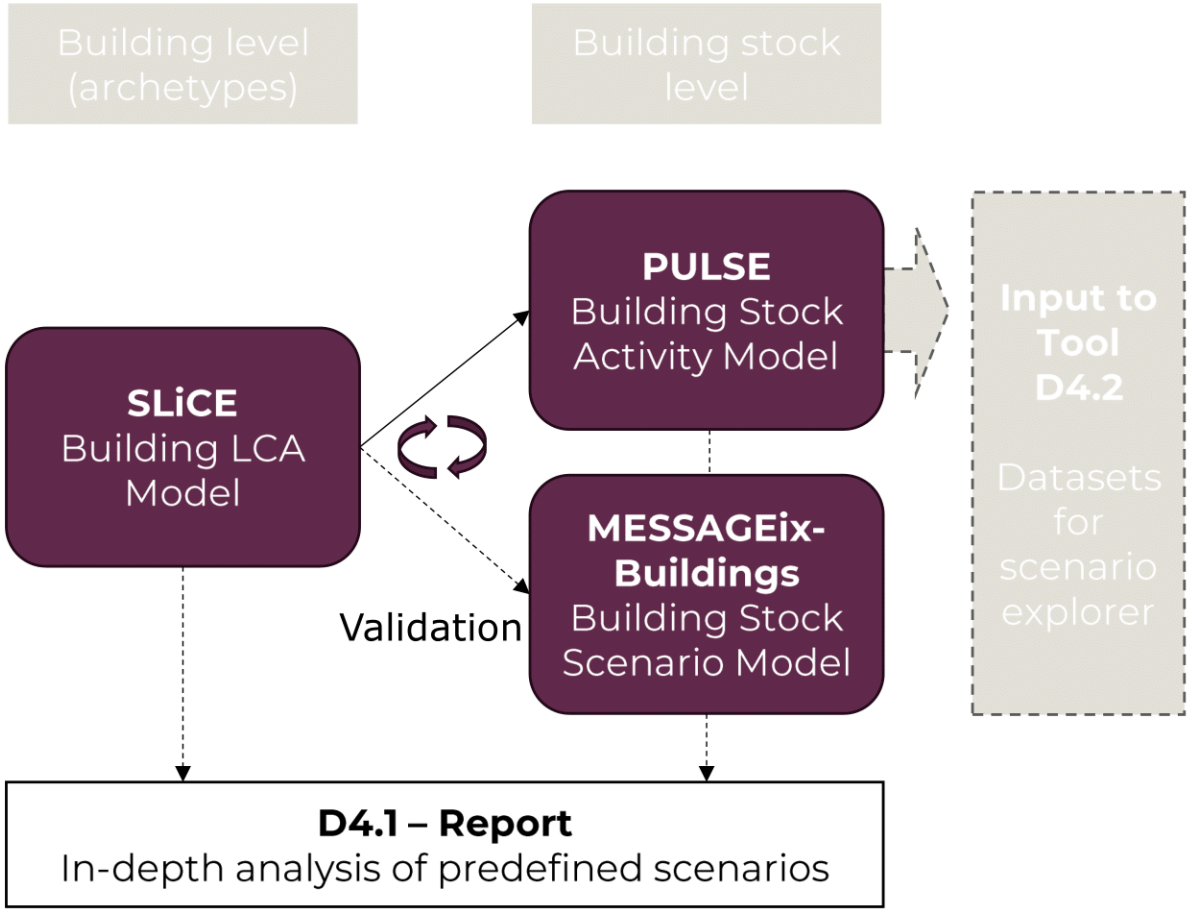



| Spatial attributes (keys)<br>Hierarchical building information modelling (element-method) | | | | | |
|---|---|---|---|---|---|
| [...] | Building | Element | Worksection | Construction material/product | [...] |
| - | Bldg A | Elem A | Wsec A | MatC A | - |
| - | Bldg A | Elem A | Wsec A | MatC B | - |
| - | Bldg A | Elem A | Wsec B | MatC A | - |
| - | Bldg A | Elem A | Wsec B | MatC C | - |
| - | Bldg A | Elem B | Wsec C | MatC D | - |
| - | Bldg A | Elem B | Wsec C | MatC E | - |
| - | Bldg A | Elem B | Wsec A | MatC A | - |
| - | Bldg A | Elem B | Wsec A | MatC B | - |
| - | [...] | [...] | [...] | [...] | - |

Röck, Martin, Alexander Passer, and Karen Allacker. "SLiCE: An Open Building Data Model for Scalable High-Definition Life Cycle Engineering, Environmental Hotspot Analysis and Dynamic Impact Assessment." *Sustainable Production and Consumption*, 2024. https://doi.org/10.1016/j.spc.2024.01.005.
Figure adapted from Trigaux (2020)

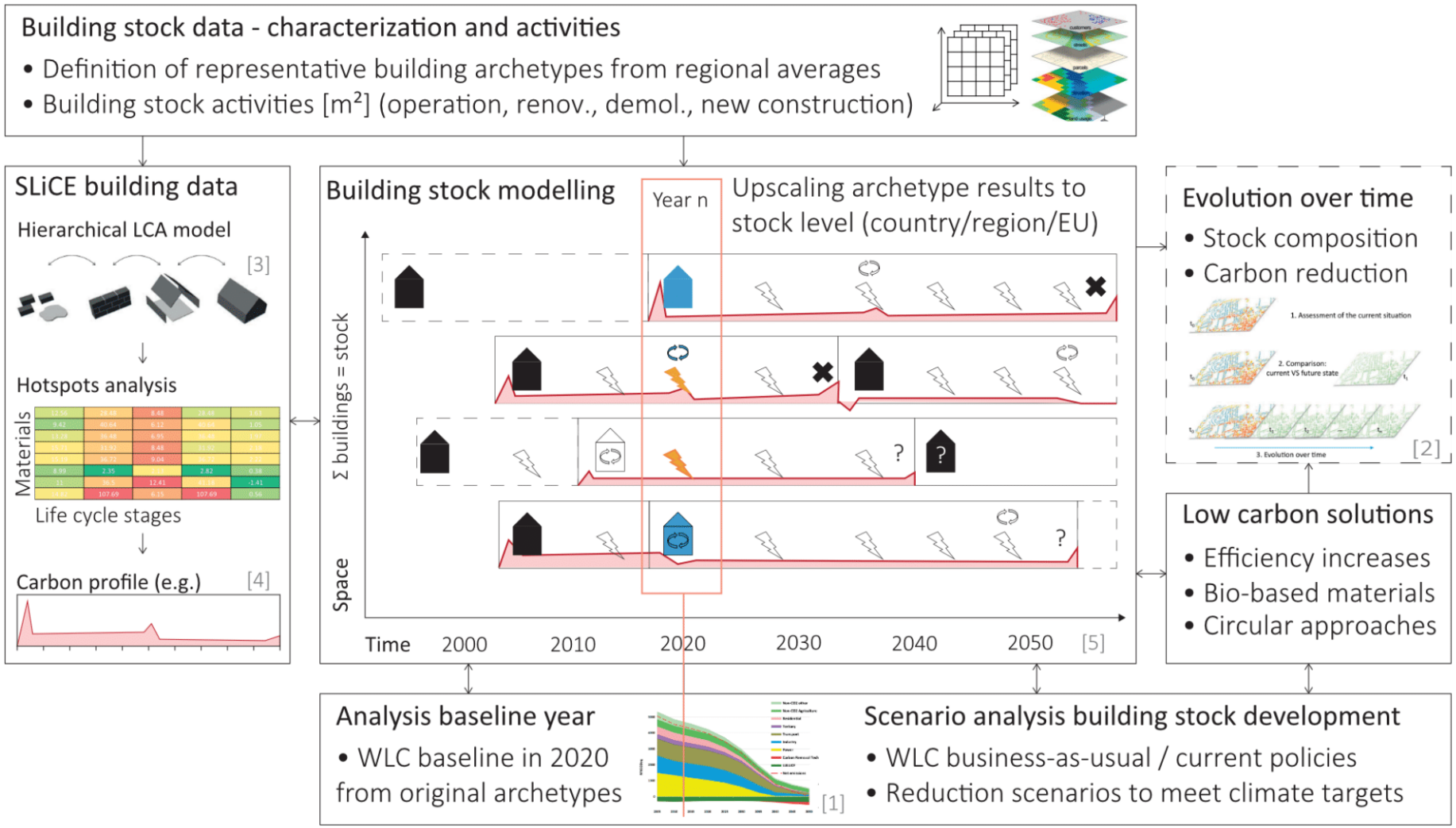
# Building archetypes for building stock scenario modelling

## T4.1: In-depth analysis of predefined scenarios




- **SLiCE: Building archetype LCA [KU Leuven]**
  - Comprehensive building LCA of archetypes
  - High-definition LCA results including
    - Life cycle inventory data (materials, energy)
    - Life cycle impact assessment (GWP total/bio/fos, …)
- **PULSE: Building stock activity model [TUG]**
  - Building stock composition and activity rates
  - Maps SLiCE building LCA results to stock activities
    - New construction (Std, Adv); Existing building use; Renovation (Std, Adv); Demolitions
- **MESSAGEix-Buildings: Validation [IIASA]**
  - Buildings sector model linked to IAM
  - Validation of archetypes and stock-level results

# Building archetypes for building stock scenario modelling



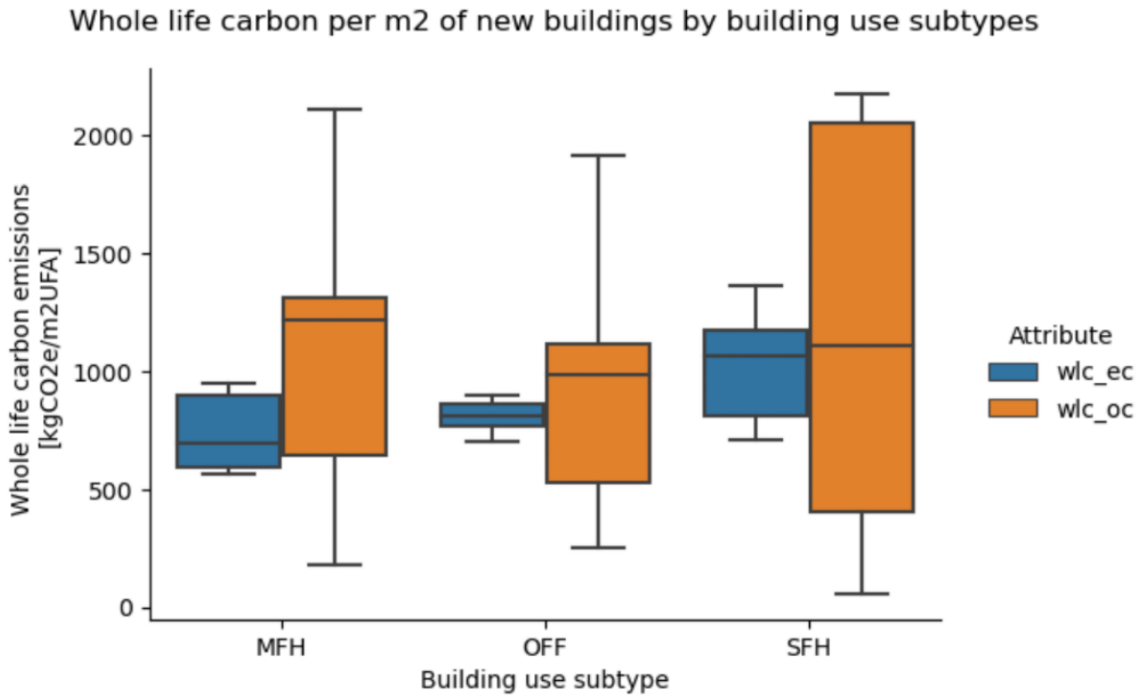


- Röck, M, Balouktsi M, and Ruschi Mendes Saade M. "Embodied Carbon Emissions of Buildings and How to Tame Them." One Earth 6, no. 11 (November 17, 2023): 1458–64. https://doi.org/10.1016/j.oneear.2023.10.018.
- Röck M, Passer A, and Allacker K. "SLiCE: An Open Building Data Model for Scalable High-Definition Life Cycle Engineering, Environmental Hotspot Analysis and Dynamic Impact Assessment." Sustainable Production and Consumption, January 19, 2024. https://doi.org/10.1016/j.spc.2024.01.005.

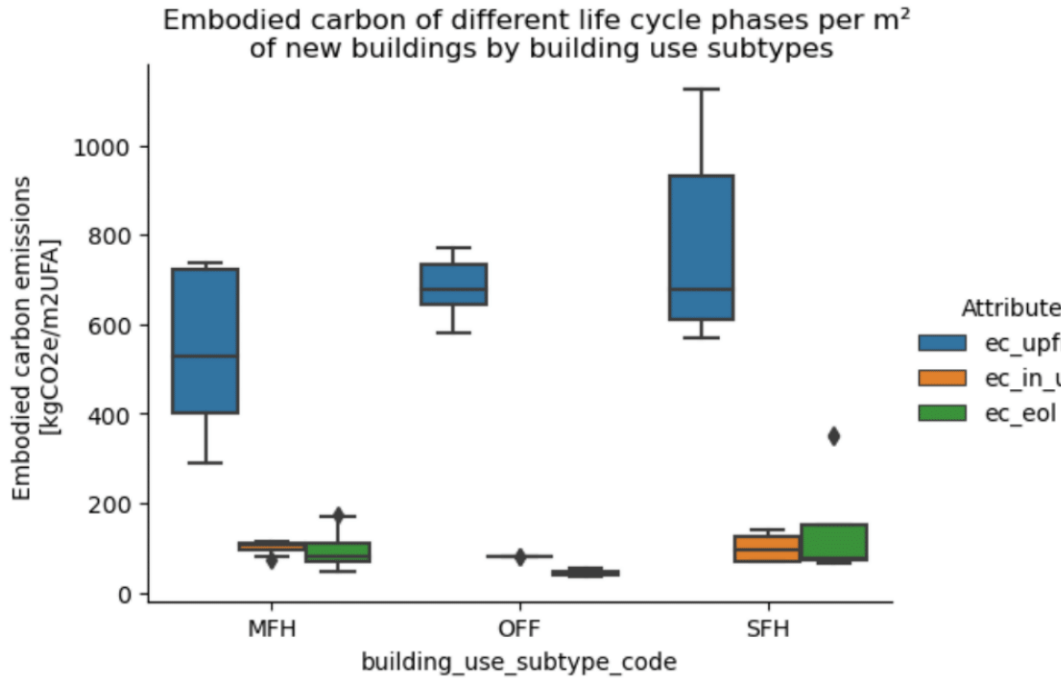
# Results

# Building archetype results: $GWP_{total}$

**Whole life carbon emissions ($GWP_{total}$, A-C)**
- New construction building archetypes




**Embodied carbon emissions ($GWP_{total}$)**
- New construction building archetypes



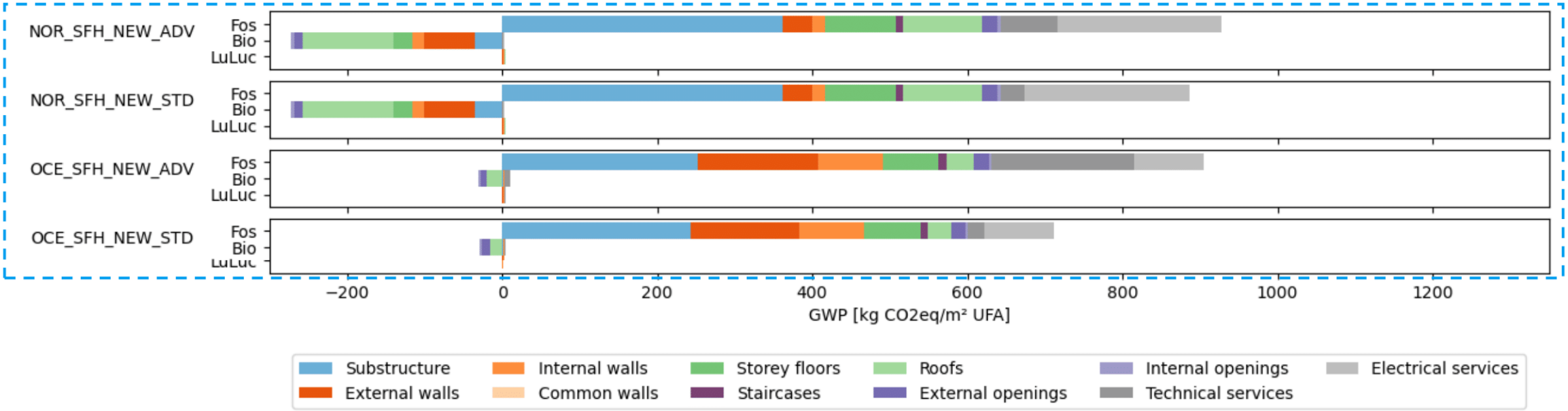

Röck, Martin, Delphine Ramon, Judit Kockat, Alessio Mastrucci, Xiaoyang Zhong, Dominik Maierhofer, Tajda Obrecht, et al. "Analysis of Life-Cycle Greenhouse Gas Emissions of EU Buildings and Construction - Report with Quantitative Baseline Figures for Whole Life Carbon and Carbon Removals," 2023. https://ec.europa.eu/docsroom/documents/58196.

# Building archetype results: $GWP_{bio}$, $GWP_{foss}$, $GWP_{luluc}$

**Upfront carbon (A1-3, A4, A5)**

- New construction, archetypes per region

Example

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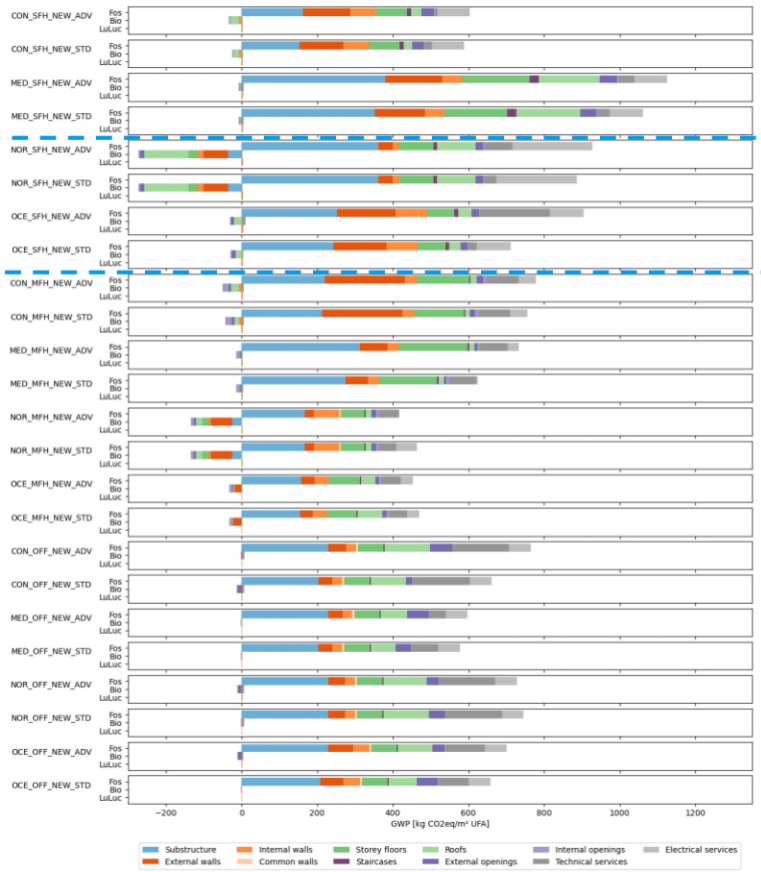
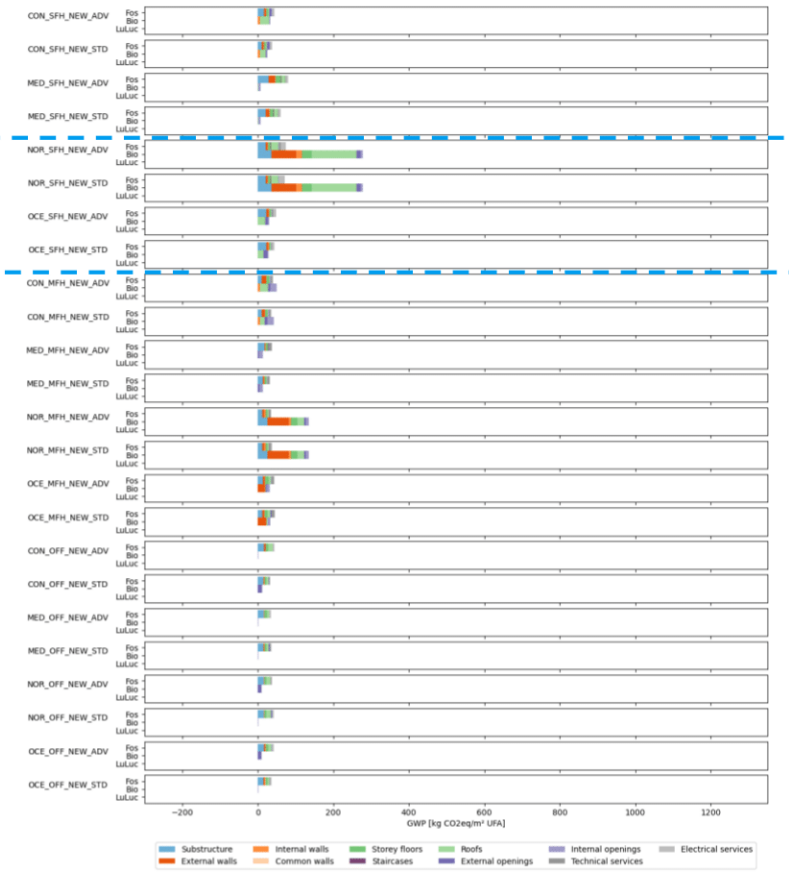
# Building archetype results: $GWP_{bio}$, $GWP_{foss}$, $GWP_{luluc}$

**Upfront carbon (A1-3, A4, A5)**
- Biogenic carbon uptake




**End-of-life (C)**
- Release of biogenic carbon



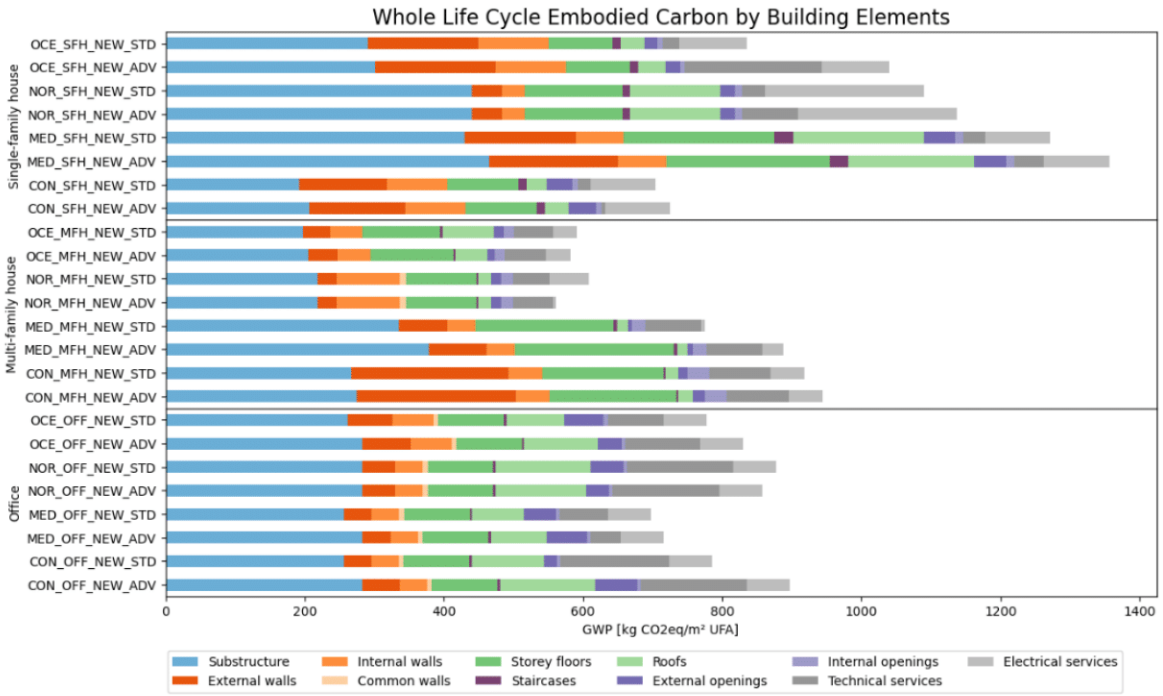

**Whole life cycle (A,B,C)**
- Uptake and release even out (-1/+1)

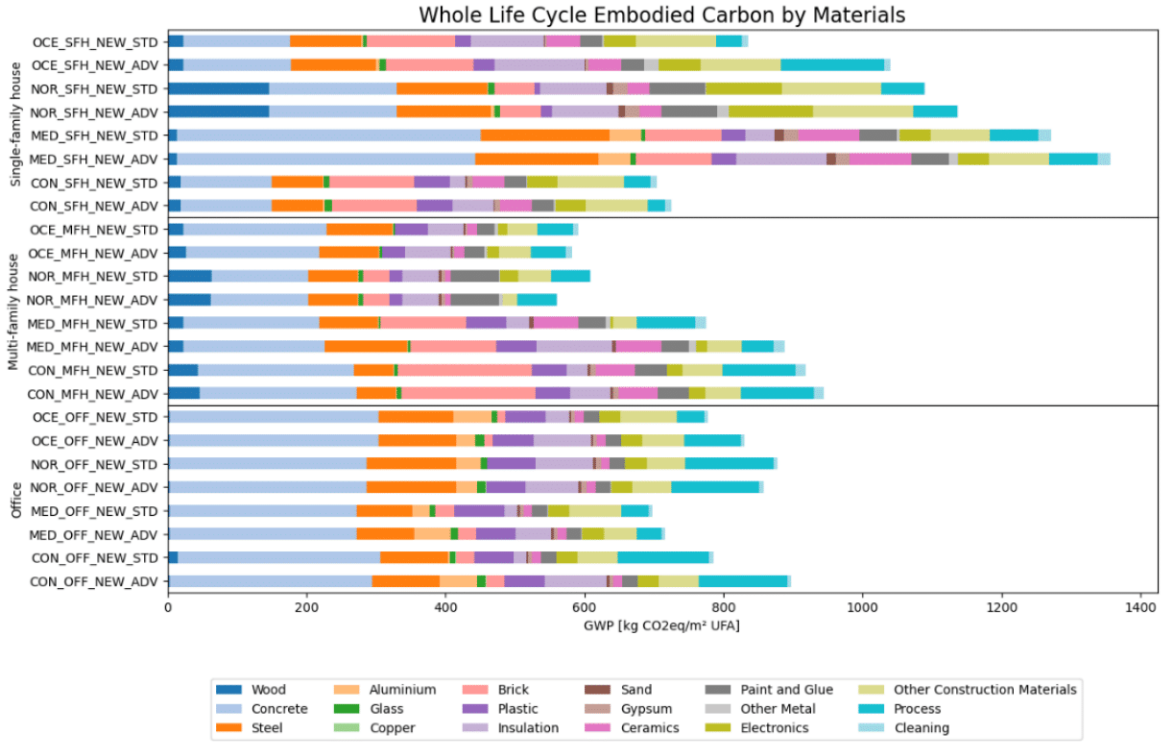

https://ec.europa.eu/docsroom/documents/58196.

# Hotspots: Contribution of building elements, materials

**Whole life carbon emissions ($GWP_{total}$, A-C)**

- New construction building archetypes




https://ec.europa.eu/docsroom/documents/58196.

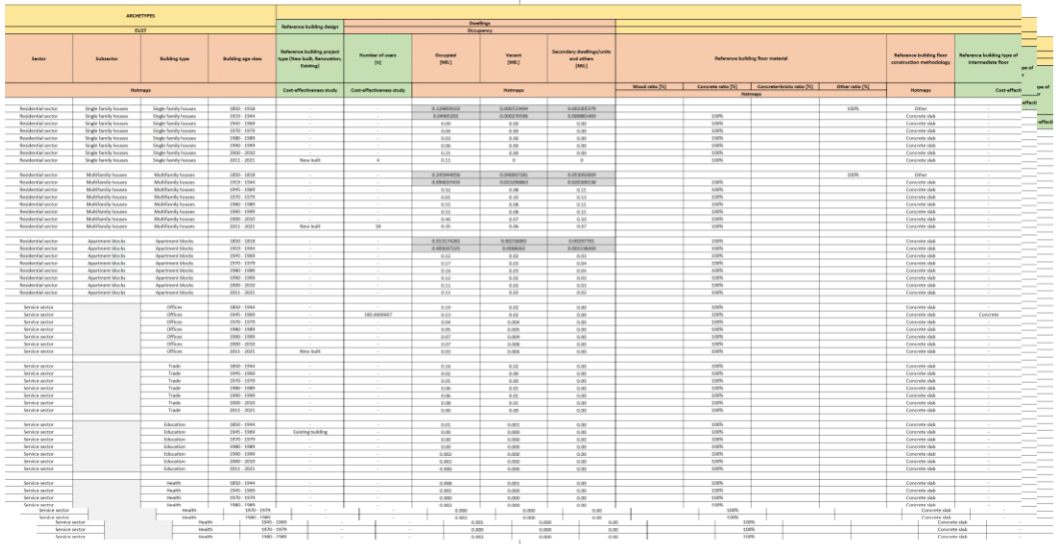
# Outlook

# Outlook: New building archetypes per Member State

## Forthcoming

- **DG GROW Task 4: Building archetypes per MS**
  - Combination of best available data
    - Hotmaps, Ambience, Cost-effectiveness studies, …
    - National data sources, expert inputs to close gaps
  - **New building types**
    - Single family houses;
    - Multifamily houses;
    - Apartment blocks;
    - Offices;
    - Trade;
    - Education;
    - Health;
    - Hotels and Restaurants;
    - Other service buildings

- New building stock characterization dataset
  - Number of buildings in the stock
  - Building archetype characteristics
  - **Work in progress - Collaborative effort**
    - KU Leuven, TU Graz, PoliMi, BUILD AAU, IIASA



Member States
x
Building typologies
x
Construction periods
X
Variants
(materials, energy)
=
**~10.000 Archetypes**

# Important considerations

*Note:*
*Individual archetypes should not be used for benchmarking, not representative as stand-alone.*
*They become representative only when weighted, combined, and scaled up to stock/portfolio!*

**Using these building archetypes for establishing a carbon storage baseline requires**

- **Must**
  - Details of national level (bio-based) material use in current construction practice per MS
  - Use to generate weighted average from MS archetypes for representative CR baseline
- **Should**
  - Advancing diversity of typologies, geometry (e.g. SFH detached, row-houses, etc)
  - Can happen centralized, via EC contract, or on country level through national studies/research
  - Web-platform to enable user-friendly access of building archetype data, benchmarking, comparison

# Recommendations

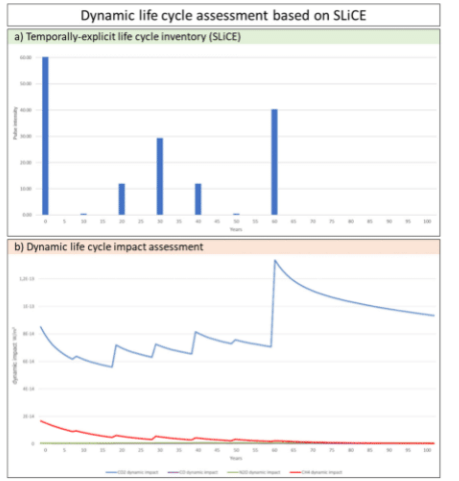
**Ensure data updates and consistency – 3 Paths**

1. **Modelling:** Building life cycle inventory modelling by research institutions, e.g.,
   - EU level studies updated every 5 years (EC)
   - MS level data collection, modelling (eg INDICATE)
2. **Industry**: Data on production and consumption, main sectors (concrete, steel, brick, glass, wood)
   - Ensure LCI disclosure via EPDs in CPR
3. **Practice**: Reporting on resource use and WLC from real world building practice (EPBD, Level(s))
   - Bill of materials (specifications and quantity!)
   - Detailed reporting of whole life carbon results ($GWP_{total}$ and sub-indicators (bio, foss, luluc))
   - By building element/worksection

**Disclosure of detailed life cycle inventory**

Important to understand carbon uptake and release, i.e., material (and energy) **in/out flows**

- Needs temporary explicit life cycle inventory in building LCA documentation, reporting (EPBD)
- Monitoring, reporting of end-of-life, demolition

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# Q&A

Thank you!

Dr Martin Röck
martin.roeck@kuleuven.be

CRCF METHODOLOGY DEEP DIVE

# Sustainability

- **Status of the EU certification methodology,** CRETA
- **RED3 biomass sustainability criteria**, Zinovia Tsitrouli, DG ENER
- **Level(s),** Estelle Elizagoien, DG ENV
- **Circular Economy Delegated Act** of the taxonomy on construction and new builds, Piotr Kowalczyk, DG ENV

# Sustainabilty Requirements

Sustainability requirements of long term biogenic carbon storage in buildings for EU certification methodology

*24-09-2024 | Sinéad O' Keeffe and Jannes Nelissen (CRETA)*

# Minimum Sustainability requirements

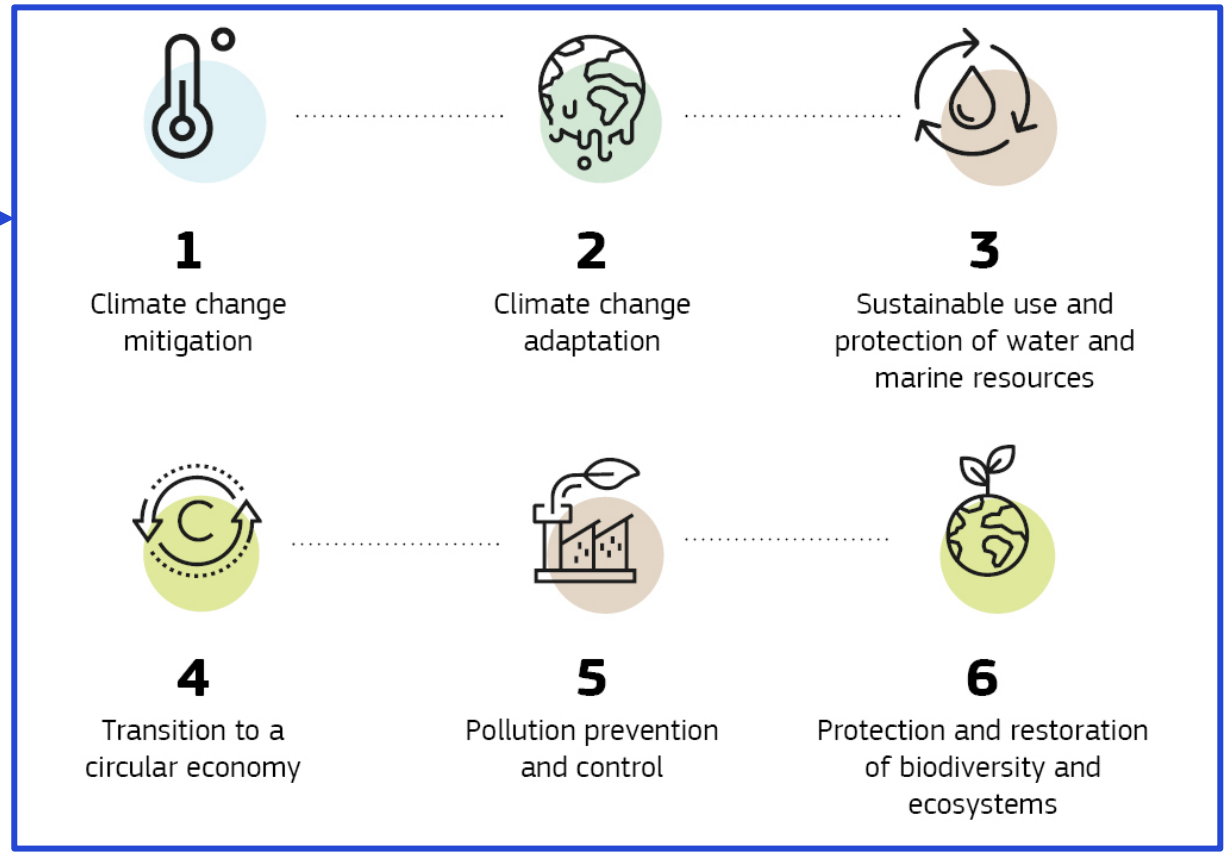
*Article 7*

**Sustainability**

1. *"An activity shall not significantly harm and may generate co-benefits for one or more of, the following sustainability objectives:"*

2. "Those minimum sustainability requirements shall, where appropriate, be consistent with the technical screening criteria for the 'do no significant harm' principle. The minimum sustainability requirements shall promote the sustainability of forest and agriculture biomass raw material in accordance with the sustainability and GHG saving criteria for biofuels, bioliquids and biomass fuels laid down in Article 29 of Directive (EU) 2018/2001" (RENEWBLE ENERGY DIRECTIVE III)

3. Where an operator or group of operators report co-benefits that contribute to the sustainability objectives referred to in paragraph 1 beyond the minimum sustainability requirements referred to in paragraph 2, they shall comply with the certification methodologies set out in delegated acts referred to in Article 8. The certification methodologies shall incentivise as much as possible the generation of co-benefits going beyond the minimum sustainability requirements, in particular for the objective referred to in paragraph 1, point (f).




*Linked to the EU Taxonomy – "Technical Screening Criteria"*
*For Renovations and for New builds across all six requirements*

# Minimum Sustainability Requirements

## Level(s) Framework

Macro Objectives (MO)

MO5:Adaptation and resilience to climate change

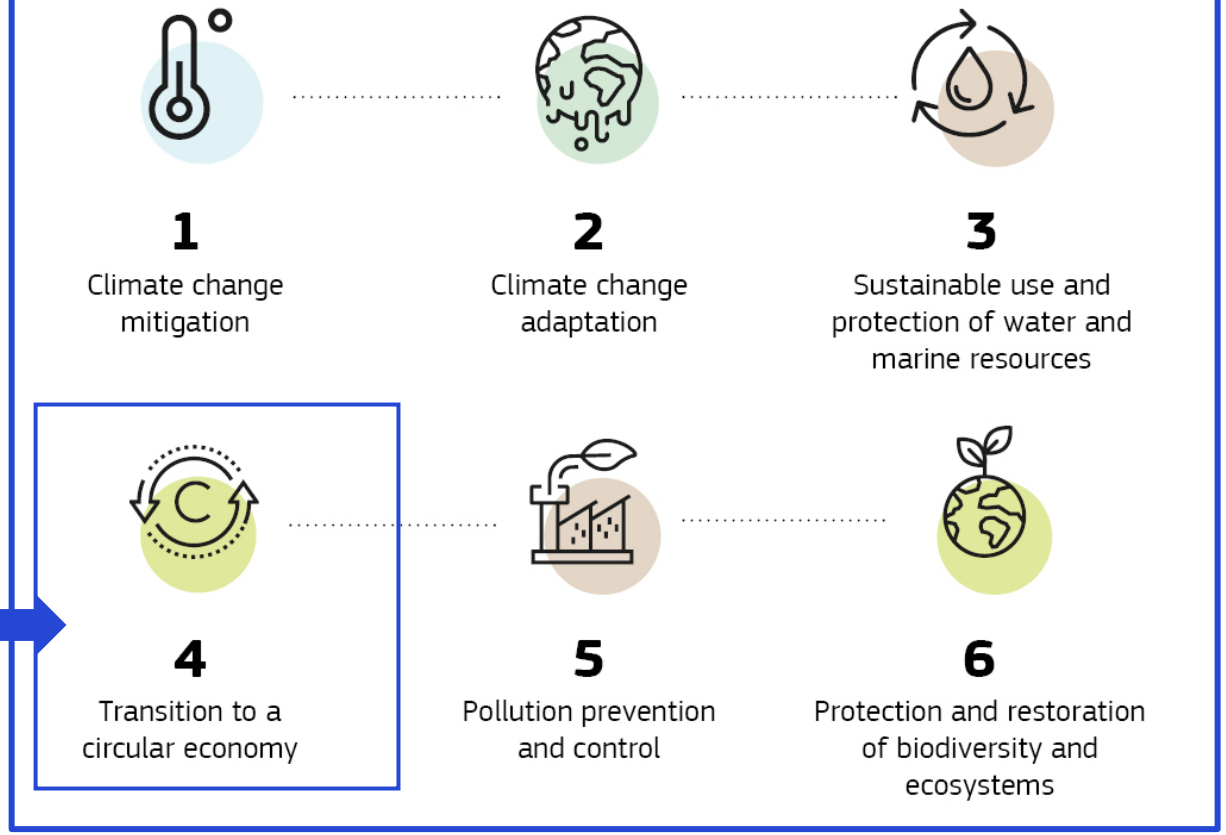
MO6:Optimised life cycle cost and value

MO3:Efficient use of water resources

MO4:Healthy and comfortable spaces


MO1: GHG and air pollution along building life cycle

MO2: Resource Efficient and Circular material life cycles



# The sustainability criteria in the Renewable Energy Directive

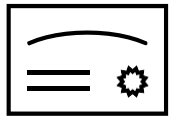
Carbon Removal Certification Framework (CRCF) online workshop:
Carbon storage certification of buildings

*Zinovia Tsitrouli*
*DG ENER, Unit C.2. Decarbonisation and Sustainability of energy sources*

# Biomass in the Renewable Energy Directive

Sustainability Criteria

Greenhouse gas emissions savings criteria



Certification Voluntary schemes

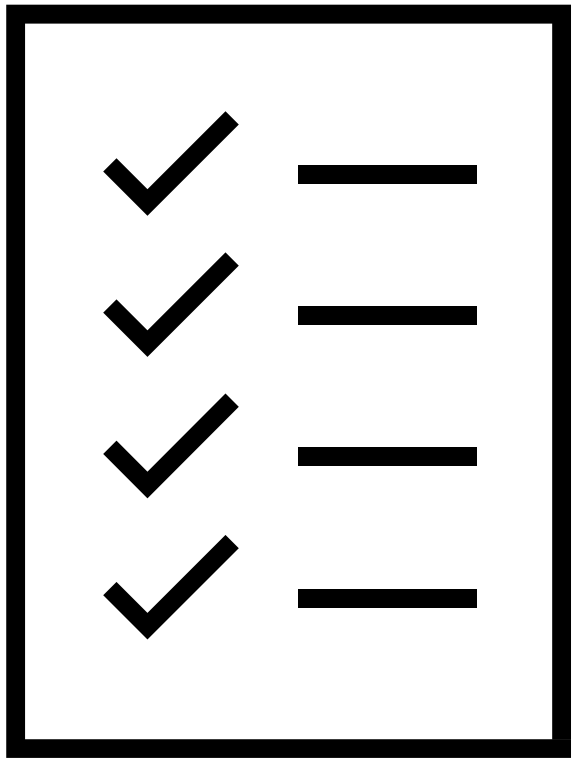
The cascading principle

European Commission

# Sustainability and Greenhouse gas emissions savings

| 2009 Renewable Energy Directive – 'RED I' | 2018 recast Renewable Energy Directive – 'RED II' | 2023 revised Renewable Energy Directive – 'RED III' |
|---|---|---|
| **Sustainability criteria:**<br>- for biofuels and bioliquids<br>- Focus on agricultural biomass | **Sustainability criteria:**<br>- extension to biomass fuels<br>- extension to forest biomass | **Sustainability criteria:**<br>- Targeted strengthening<br>- New rules for forest biomass |
| Greenhouse gas (GHG) emissions savings criteria | **Extension of GHG criteria:**<br>In new electricity, heating and cooling installations: above 20MW for solid biomass fuels and 2MW for gaseous biomass fuels | **Extension of GHG criteria:**<br>New threshold - 7.5 MW for solid biomass fuels<br>Gradually in existing electricity, heating and cooling installations |
| Verification of compliance– voluntary schemes | Verification of compliance – voluntary schemes<br>+ New Implementing rules | Verification of compliance – voluntary schemes |

# Verification of compliance – The role of Voluntary schemes



- Economic operators must submit **reliable and third-party audited information** that the criteria have been fulfilled
- **Mass balance system** – not ‘book and claim’
- Member States **may** set up national schemes
- Economic operators **may** use voluntary schemes
- The Commission can recognise these schemes at EU level via **implementing decisions**

Voluntary schemes (europa.eu)

# Cascading principle

- New Article 3 (3): Member States are asked to apply **the cascading principle** to the use of biomass.

- Support schemes for bioenergy should be designed to avoid incentivizing unsustainable pathways and distorting competition with the material sectors

- Priorities for woody biomass:

(a) wood-based products
(b) extending the service life of wood-based products
(c) re-use
(d) recycling
(e) bioenergy and
(f) disposal

# Thank you





European Commission

# Introducing Level(s) for building professionals

**Estelle Elizagoïen**

Circular Economy Policy Officer

European Commission (DG ENV)

European Commission

# Level(s) as a common language

Based on **best practice** industry standards

Indicators developed with and tested by the sector

## Methodology to assess and report on sustainability

- Residential and Offices
- New Built and Renovation

## Entry-level tool for mainstream market

- Level(s) provides the methodology to **assess and report** on sustainability

# Common language for full life cycle

**Whole life carbon**

**Resource efficient material flows**

**Efficient use of water**

**Health and comfort**

**Adaptation and resilience to climate change**

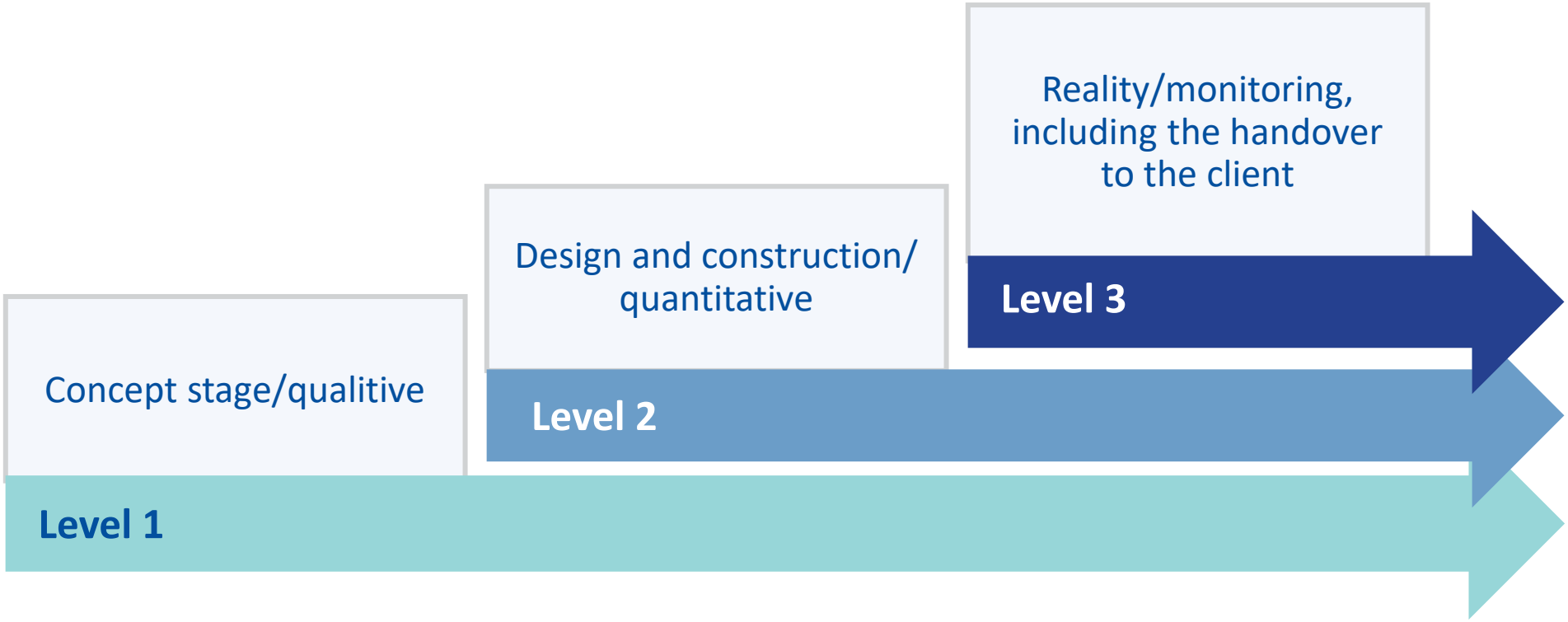
**Life cycle cost and value**

European Commission

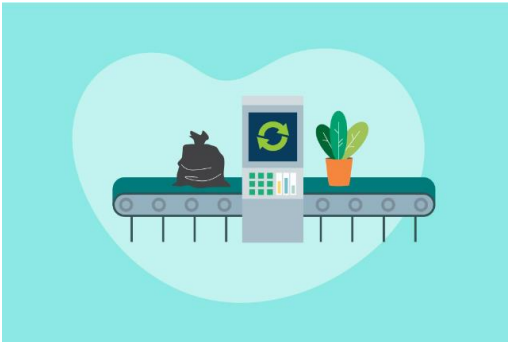
# Let's meet Level(s)

| Thematic areas | Macro-objectives | Indicators | | | |
|---|---|---|---|---|---|
| Resource use and environmental performance | 1. Greenhouse gas emissions along a building's life cycle | 1.1 Use stage energy performance (kWh/m2/year) | 1.2 Life cycle Global warming potential (CO2 eq./m2/year) | | |
| | 2. Resource efficient and circular material life cycles | 2.1 Bill of quantities, materials and lifespans | 2.2 Construction and demolition waste | 2.3 Design for adaptability and renovation | 2.4 Design for deconstruction |
| | 3. Efficient use of water resources | 3.1 Use stage water consumption (m3/occupant/year) | | | |
| Health and comfort | 4. Healthy and comfortable spaces | 4.1 Indoor air quality | 4.2 Time out of thermal comfort range | 4.3 Lighting | 4.4 Acoustics |
| Cost, value and risk | 5. Adaption and resilience to climate change | 5.1 Protection of occupier health and thermal comfort | 5.2 Increased risk of extreme weather | 5.3 Sustainable drainage | |
| | 6. Optimised life cycle cost and value | 6.1 Life cycle costs (€/m²/year) | 6.2 Value creation and risk factors | | |

# Use Level(s) at three different levels



# 2.1 Bill of quantities, materials and lifespans



**Level 1. Qualitative assessments and reporting on the concepts**

- Be aware of six highly relevant aspects for optimising the consumption of construction materials and products.
- Describe how these aspects were considered (or not) during discussions and decision-making at the concept design stage.

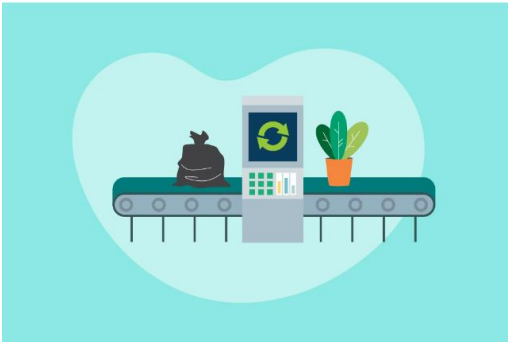
**Level 2.An intermediate level, quantitative assessment**

- Make an estimate of Bill of Quantities during the design stage that ensures that budgetary limits are respected.
- Use an inventory template to insert and manage the Bill of Quantities data. By entering optional cost data and lifespans, the template can generate outputs that are useful for other Level(s) indicators.

**Level 3. Monitoring and surveying of activity**

- Register and log Bill of Quantities data as materials and products are procured and delivered to the site based on actual quotations and purchases.
- Use an inventory template to centralize record of purchases to track spending in line with project budgets and schedules.
- Compare with estimates during design stage.

# 2.2 Construction & Demolition waste and materials



**Level 1. Qualitative assessments and reporting on the concepts**

- Be aware of highly relevant aspects for reducing construction and demolition waste and optimising its management.
- Describe how these aspects were considered (or not) during discussions and decision-making at the concept design stage.

**Level 2.An intermediate level, quantitative assessment**

- Report on and to make reliable quantitative estimates of construction and demolition waste.
- Use (an) inventory template(s) for estimation.

- **Level 3. Monitoring and surveying of activity**
- Measure the quantities of construction and demolition waste in their project, using the Level(s) excel templates for reporting to collate data.
- Compare estimates with actual data.

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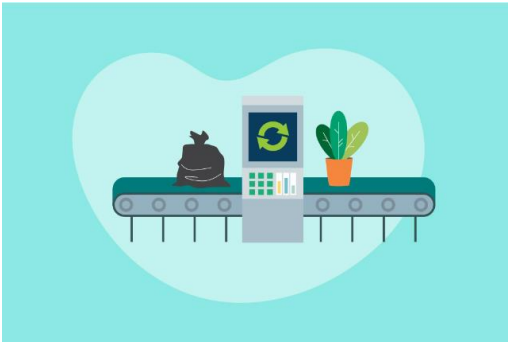
# 2.3 Design for adaptability and renovation



**Level 1. Qualitative assessments and reporting on the concepts**

- Understand how the design of a building could facilitate future adaptation to changing occupier needs and market conditions.
- How these design aspects could extend the service life of the building as a whole, either by facilitating continuation of the intended use or through possible future changes in use.

**Level 2.An intermediate level, quantitative assessment**

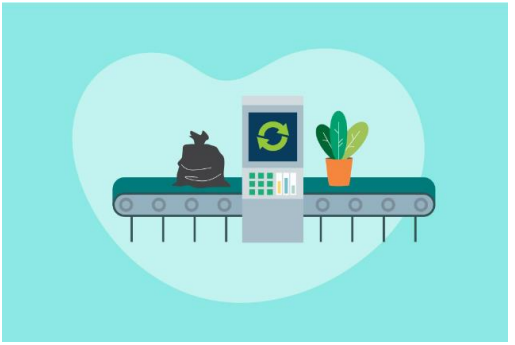
- When at the stage of setting design targets or making design decisions, compare design options for their relative adaptability.

**Level 3. Monitoring and surveying of activity**

- Compare the final as-built design with the earlier detailed designs. It can also form the starting point for a long-term monitoring of the building and how it performs in the local property market.

European Commission

# 2.4 Design for deconstruction, reuse and recycling



**Level 1. Qualitative assessments and reporting on the concepts**

- Understand how the design of a building could facilitate ease of future deconstruction in order to access, disassemble and dismantle parts and materials.
- Consider the extent to which these building parts may be recovered for either reuse and/or for recycling.

**Level 2.An intermediate level, quantitative assessment**

- When at the stage of setting design targets or making design decisions, compare design options for their deconstruction potential.

**Level 3. Monitoring and surveying of activity**

- Compare the final as-built design with the earlier detailed designs. It can also form the starting point for preparing the technical content of a building passport or building material bank record.

European Commission

# Website - Get to know Level(s)

**Let's meet Level(s)**

A common language creating a shared understanding of sustainability performance in buildings.

Introduction

**eLearning and tools**

Our eLearning course and calculator tool will prepare and support you to use Level(s) successfully.

Online tools

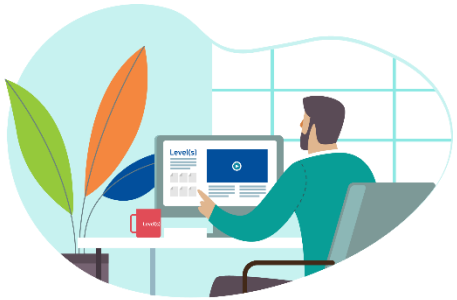
**Start using Level(s)**

Once you know the basics it is time to download the Level(s) user manuals and start using it in your working environment.

User manuals (backbone)

European Commission

# Website - eLearning and tools



## eLearning Material

The modules in this course **explain the principles and concepts** of Level(s)

## Calculation and Assessment Tool (CAT)

For those who are ready to use Level(s), or are already using the framework, CAT makes it **easier to complete** your sustainability performance **assessments**

Once you know the basics it is time to download the Level(s) user manuals and start using it in your working environment!

European Commission

# Level(s) in EU legislation

- **EU Green Taxonomy**
  - The Taxonomy includes **13 activities directly related to construction**
  - Part of the technical screening criteria are based on **Level(s)' indicators 1.2** « Global Warming Potential », **2.3** «Design for adaptability and renovation » and **2.4** « Design for deconstruction, reuse and recycling ».

- **Energy Performance of Buildings Directives**
  - Building professionals will need to disclose the **global warming potential (GWP)** of new buildings on energy performance certificates using a calculation measure drawn from **Level(s)' indicator 1.2.**
  - From **2028** for **new buildings** with a **useful floor area larger than 1000 m$^2$**. From **2030, for all new buildings**.

- **Green Public Procurement Criteria for office buildings**

European Commission

# Thank you


For questions: **Helpdesk**

Visit the Level(s) website:

**ec.europa.eu/environment/levels**

Join the Level(s) LinkedIn Group:

**linkedin.com/groups/12501037/**

European Commission

# Construction activities in the EU Taxonomy

Presentation at the Carbon Removal Certification Framework (CRCF) online workshop

*24 September 2024*

*Piotr Kowalczyk*

*ENV.E.1 Green finance and investments*

# The EU Taxonomy is a cornerstone of the EU sustainable finance framework

## EU Taxonomy

- Climate Delegated Act
- Environmental Delegated Act
- Disclosures Delegated Act

## Disclosures

- Corporate Sustainability Reporting Directive (CSRD)
- Sustainable Finance Disclosure Regulation (SFDR)
- Sustainability preferences

## Tools

- Climate Benchmarks
- European Green Bond Standard (EUGBS)

# The EU Taxonomy defines how economic activities can be environmentally sustainable

- Classification system for environmentally sustainable economic activities
- Measures the degree of sustainability of an investment and proportion of green activities of a company
- Helps investors and companies plan and report on their transition

- Mandatory list to invest in
- Rating of the “greenness” of companies
- Judgement on financial performance of an investment
- What’s not included is not necessarily unsustainable

**Make a substantial contribution**

to at least one of 6 environmental objectives

+

**Do no significant harm**

To any of the other 5 environmental objectives

+

**Meet minimum safeguards**

comply with international minimum safeguards

# The EU Taxonomy includes at least 13 activities directly relevant to buildings

- Acquisition and ownership of buildings
- Construction of new buildings
- **Renovation of existing buildings**
- Demolition and wrecking of buildings and other structures
- Installation, maintenance and repair of energy efficiency equipment
- Installation and operation of electric heat pumps
- Installation, maintenance and repair of renewable energy technologies
- Installation, maintenance and repair of instruments and devices for measuring (...) energy performance of buildings
- Installation, maintenance and repair of charging stations for electric vehicles in buildings
- District heating/cooling distribution
- Marketplace for the trade of second-hand goods for reuse
- Product-as-a-service and other circular use and result-oriented service models
- Preparation for re-use of end-of-life products and product components

# The renovation of existing buildings activities has a wide scope

**Construction** and **civil engineering** works or preparation thereof.

The economic activities in this category could be associated with several NACE codes, in particular **F41** and **F43** in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006.

 *F41 = construction of buildings; F43 = specialised construction activities*

# Focus on SC[1] to circular economy and DNSH[2] to water

| | CCM | CCA | CE | PPC | Water | Biodiversity |
|---|---|---|---|---|---|---|
| SC[1] | ✓ | ✓ | ✓ *Focus of slides 7-10* | | | |
| DNSH[2] | ✓ | ✓ | ✓ | ✓ | ✓ *Focus of slide 11* | ✓ |



1. SC = Substantial Contribution; 2. DNSH = Do No Significant Harm

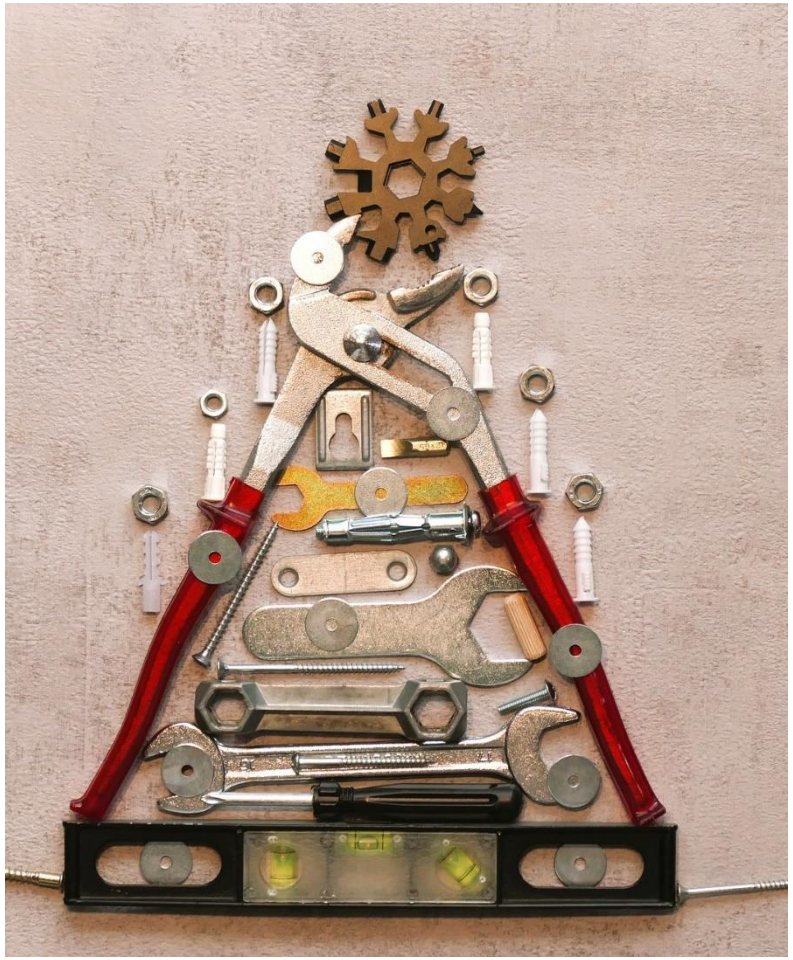
# Retain 50% of the original building

SC


1. Calculated based on the gross external floor area retained
2. Use the applicable national or regional measurement methodology
3. Alternatively, use the definition of ‘IPMS 1’ of the International Property Measurement Standard

# Calculate the GWP, incorporate circular design and store building information

SC



1. The GWP is calculated for each stage of the life cycle and disclosed to investors and clients on demand

2. Incorporate concepts for design for adaptability and deconstruction as outlined in Level(s) indicators 2.3 and 2.4

3. Store building information describing the characteristics of a building in a digital format using electronic tools

# Prepare for re-use or recycle 70% of CDW

SC

**70%**

Of non-hazardous waste prepared for re-use or recycled

1. Treated in accordance with waste legislation and the full checklist of the EU CDW Management Protocol
2. Backfilling and naturally occurring materials in category 17 05 04 are excluded
3. Reported using Level(s) indicator 2.2 and Level 2 reporting format



*CDW = construction and demolition waste*

# Minimise the use of primary raw materials

SC

| Material categories | Maximum primary raw materials content |
|---|---|
| Concrete, natural or agglomerated stone | **85%** |
| Brick, tile, ceramic | **85%** |
| Bio-based materials | **90%** |
| Glass, mineral insulation | **85%** |
| Non-biobased plastic | **75%** |
| Metals | **65%** |
| Gypsum | **83%** |

Apply to the **three heaviest** materials categories, by mass in kg

| | | | | | |
|---|---|---|---|---|---|
| Reused product: | 0% primary raw material | Information not available: | 100% primary raw material | Information available: | (100 – recycled content %) % |



*Source: European Environment Agency (2022), Modelling the Renovation of Buildings in Europe from a Circular Economy and Climate Perspective*

# Overview of the DNSH criteria for water

DNSH

**1** (...) the specified water use for the following water appliances are attested by product datasheets, a building certification or an existing product label in the Union, in accordance with the technical specifications laid down in Appendix E to this Annex:

- **a** wash hand basin taps and kitchen taps have a maximum water flow of **6 litres/min;**
- **b** showers have a maximum water flow of **8 litres/min**
- **c** WCs, including suites, bowls and flushing cisterns, have a full flush volume of a maximum of 6 litres and a maximum **average flush volume of 3,5 litres**
- **d** urinals use a maximum of **2 litres/bowl/hour**. Flushing urinals have a maximum full flush volume of **1 litre.**

**2** Comply with the generic DNSH criteria set out in Appendix B

# Construction activities in the EU Taxonomy

Presentation at the Carbon Removal Certification Framework (CRCF) online workshop

*24 September 2024*

*Piotr Kowalczyk*

*ENV.E.1 Green finance and investments*

PANEL DISCUSSION

# Reflecting on certification methodologies from a practitioner's point of view

- **Laurence Desmazieres,** ICAWOOD
- **Sacha Brons,** Climate Cleanup
- **Embla Winge,** LFM30

# A new Low Carbone Label method:
# « Development of long-term carbon storage in bio based material »

ASSOCIATION BÂTIMENT BBCA BAS CARBONE

I4CE INSTITUTE FOR CLIMATE ECONOMICS

carbone 4

ICAMAP

WO2

FIBOIS ÎLE-DE-FRANCE

FREY

Société Forestière

REI HABITAT

nexity

ICADE

Woodeum

# EXAMPLE

**1/ Prerequisite: BBCA** Gross floor area: 21 500 m²

**2/ Calculation of the building's CO2 stock** CO2 storage of the project: **224 kgCO2e/m²** or 4 800 tCO2e for the entire building

**3/ Calculation of the reference scenario (given in the method)**
Year of completion: 2023
CO2 stock ref (2023) = 38 kgCO2e/m² - Or 830 tCO2e for the entire building

**4/ Additional project CO2stock** = 4 800 tCO2e – 830 tCO2e = 3 970 tCO2e

**5/ Calculation of the service life coefficient** – Taking into acount the service life of materials

**6/ Calculation of the « reduction in emissions » valued by the Low Carbon Label**
Additional project stock x Service life coefficient x Discount for risk of non-permanence *(fire, prematurated destruction …)*
➔ 3 970 x 0,9476 x (1-**10%**) = 3 400 tCO2e, or **156 kgCO2e/m²**

# ARBORETUM

125 000 m² - Nanterre La Défense

**19 500 tCO2e of carbon credits**

ICAWOOD

# BREIZH

35 000 m² - Saint-Denis

**3 100 tCO2e labelled**

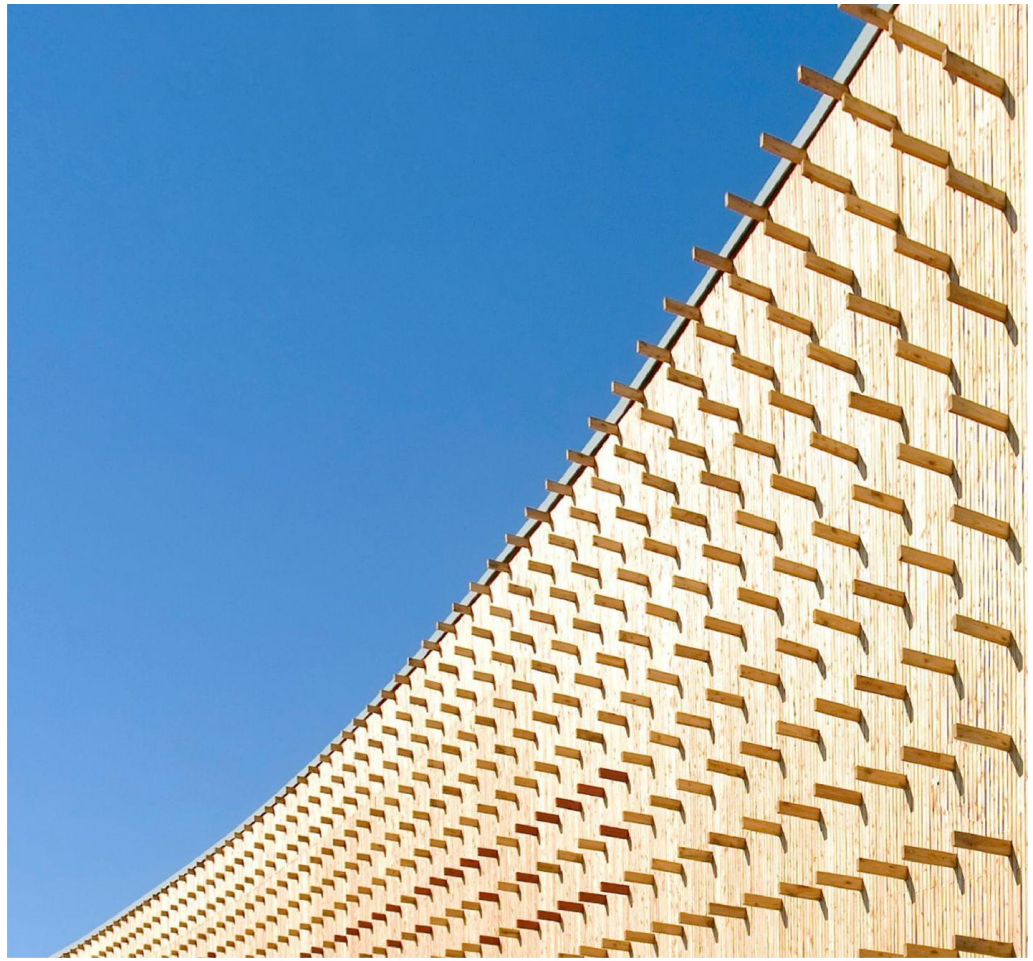
ICAWOOD

Copyright: Photo François Poche

climate cleanup

# Carbon Storage Certification of Buildings: Practical Experiences

Sacha Brons | Climate Cleanup Foundation



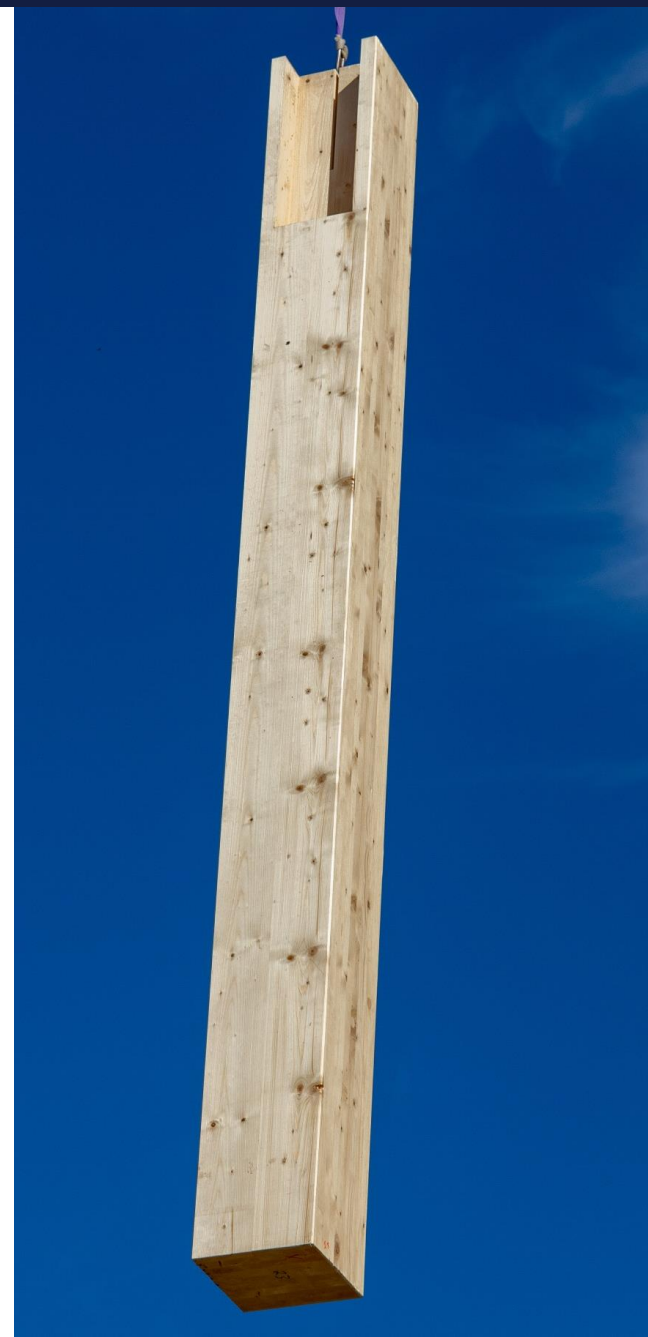
# Climate Cleanup Foundation

People Reversing Climate Change

2021 | Pioneered '**Construction Stored Carbon**' in a report with ASN Bank & Gideon Tribes

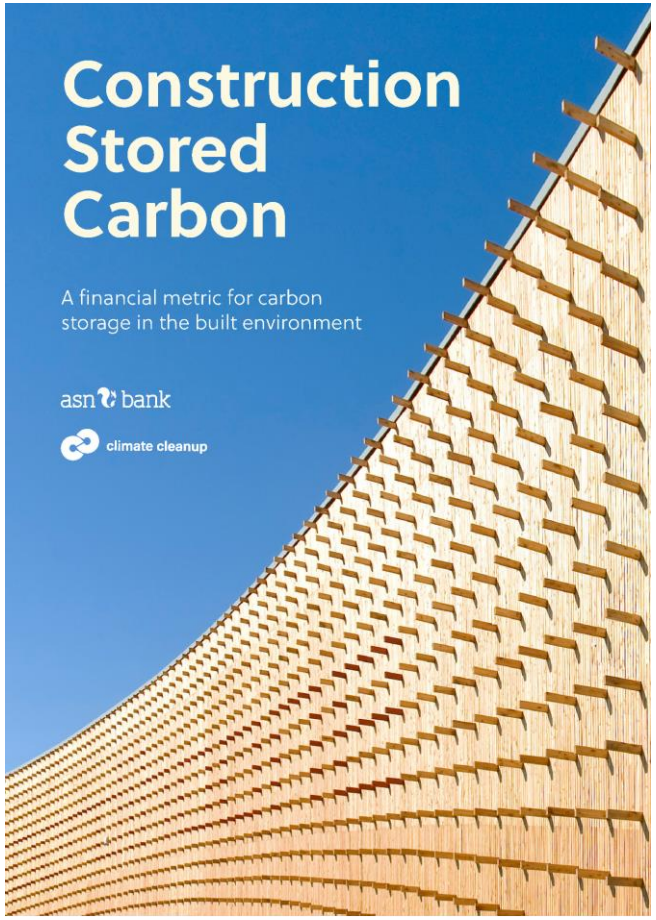
2022 | Launched **Oncra**: **Open Natural Carbon Removal Accounting**, to facilitate certification of small-scale nature-based carbon removal activities

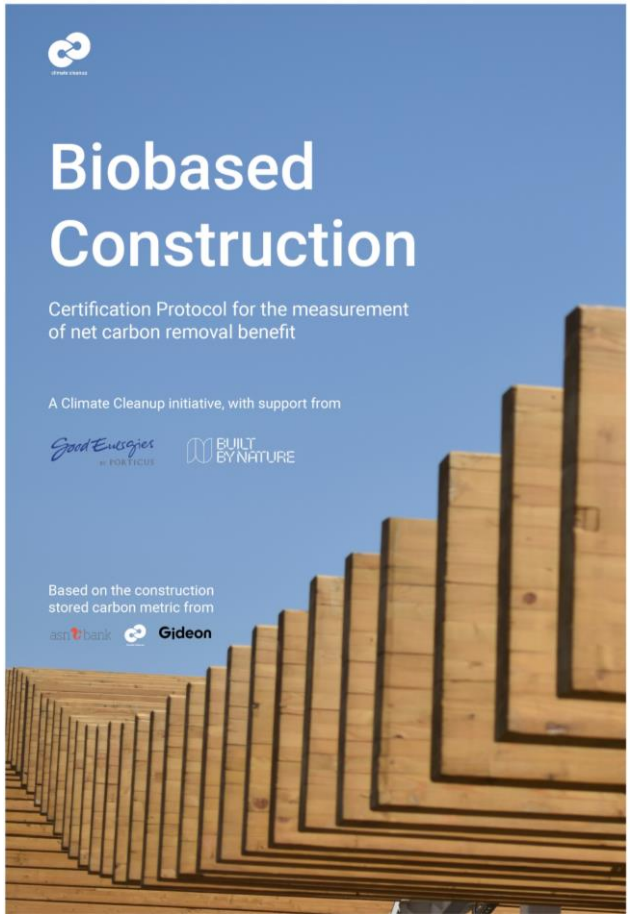
2024 | Developed a building-level certification methodology **'Biobased Construction'** complete with pilot projects, calculation tool and starter's guide
*Funded by Built by Nature & Good Energies*

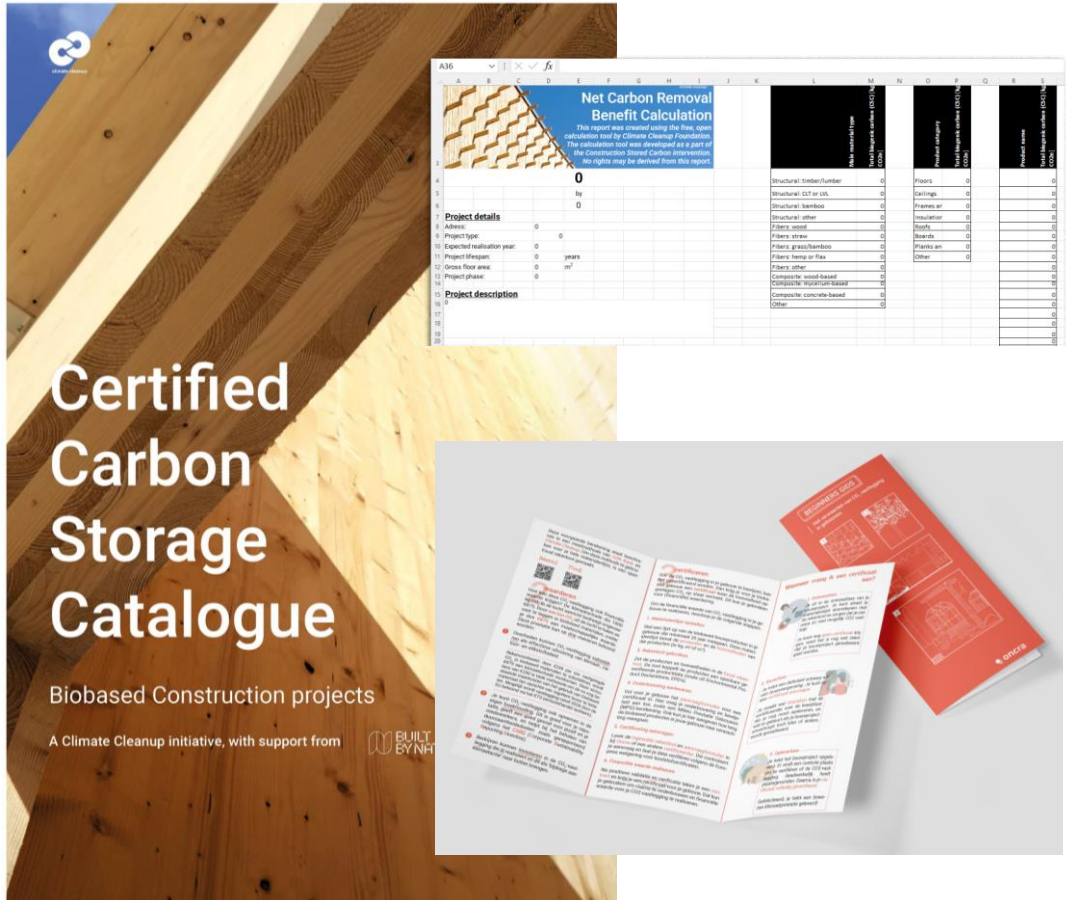


# Our CSC Knowledge Base

*Available at constructionstoredcarbon.org*



# The CubeHouse

Operators: a.s.r. real estate, G&S&.

Location: Amsterdam, NL

**Utility, office building**

Construction Stored Carbon: **2828** $tCO_2$

Net Carbon Removal Benefit: **2662** $tCO_2$

NCRB / $m^2$ GFO: **0,160** $tCO_2$ / $m^2$

# SAWA Rotterdam

Operators: SAWA v.o.f., Nice Developers, mei architects, ERA Contours.

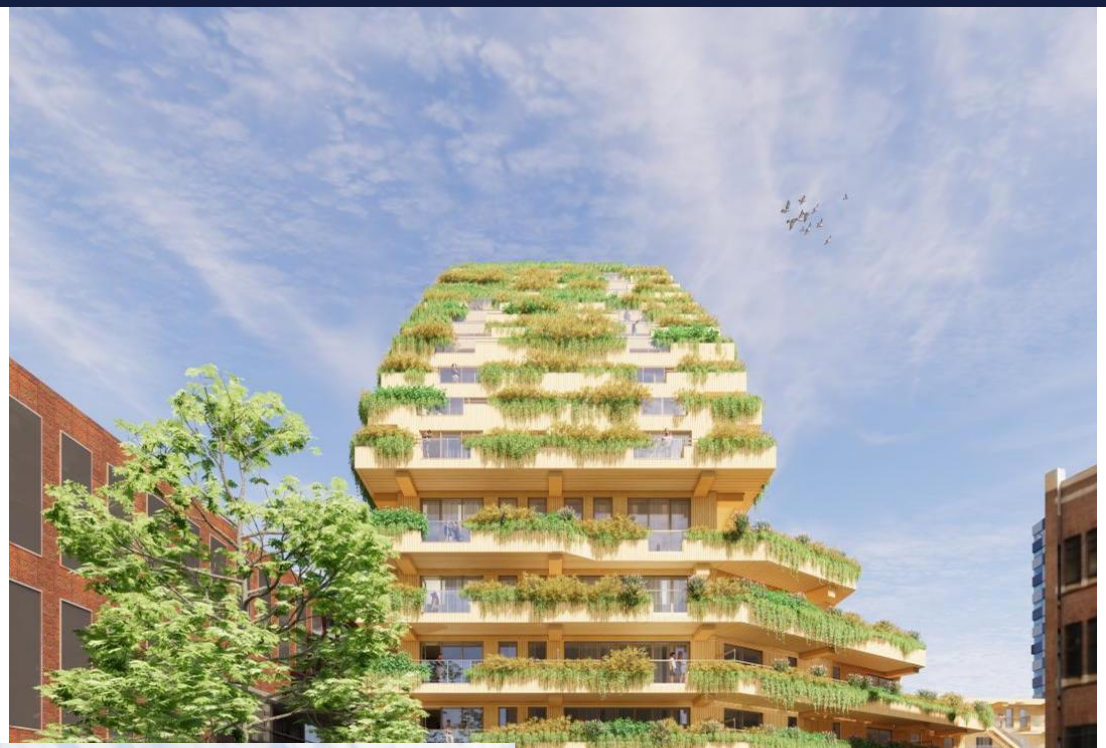
Location: Rotterdam, NL

**Residential, multi-storey**

Construction Stored Carbon: **2811** $tCO_2$

Net Carbon Removal Benefit: **2550** $tCO_2$

NCRB / $m^2$ GFO: **0,204** $tCO_2$ / $m^2$



# Koelmalaan

Operators: WoonWaard, Finch Buildings

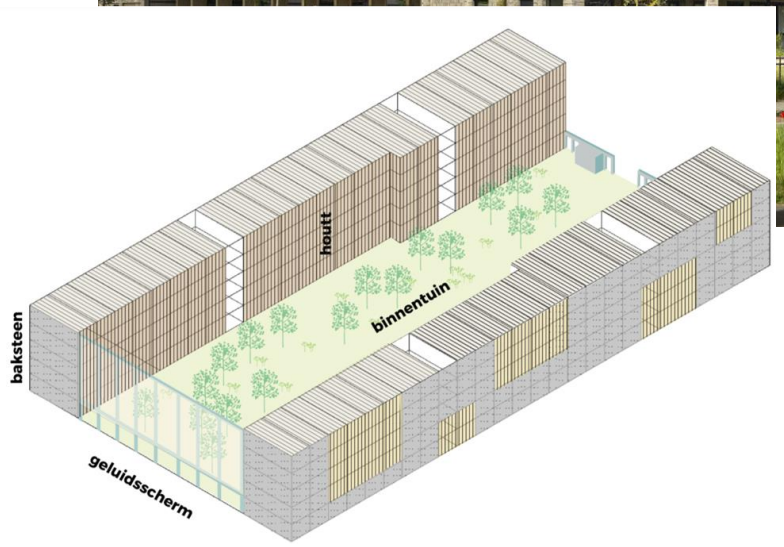
Location: Alkmaar, NL

**Modular social housing**

Construction Stored Carbon: **2506** $tCO_2$

Net Carbon Removal Benefit: **2419** $tCO_2$

NCRB / $m^2$ GFO: **0,279** $tCO_2$ / $m^2$



# Houtlab

Operators: Woody Builders, Hercuton.

Location: Nieuwkuijk, NL

**Utility, office building & factory**

Construction Stored Carbon: **416** $tCO_2$

Net Carbon Removal Benefit: **391** $tCO_2$

NCRB / $m^2$ GFO: **0,154** $tCO_2$ / $m^2$


climate cleanup

# CARBON REMOVAL CERTIFICATE

**PROJECT NAME**

Houtlab

**CARBON REMOVAL UNITS**

**391** tonnes $CO_2$

**REMOVER**

Woody Builders/Hercuton B.V.

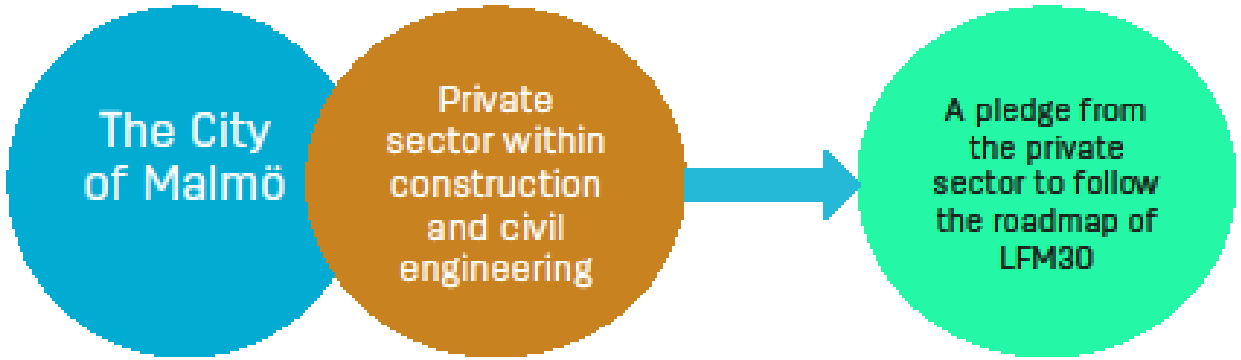
oncra

**PROJECT CODE**

WOODY-C-001

ONCRA VERIFIED CARBON ACCOUNTING
www.oncra.org/

**Speaker: Embla Winge – Peab AB / LFM30**




LFM30

## 200 AFFILLIATED COMPANIES

40 AFFILIATED PROPERTY DEVELOPERS

## *LFM30:s Method – a balanced climate budget*

4. Payback plan
(from the year of 2025)

3. Goal targets for mitigation

2. Focus on climate migitation

1. Measure and calculate

5. Continual control

Carbon Dioxide Removals

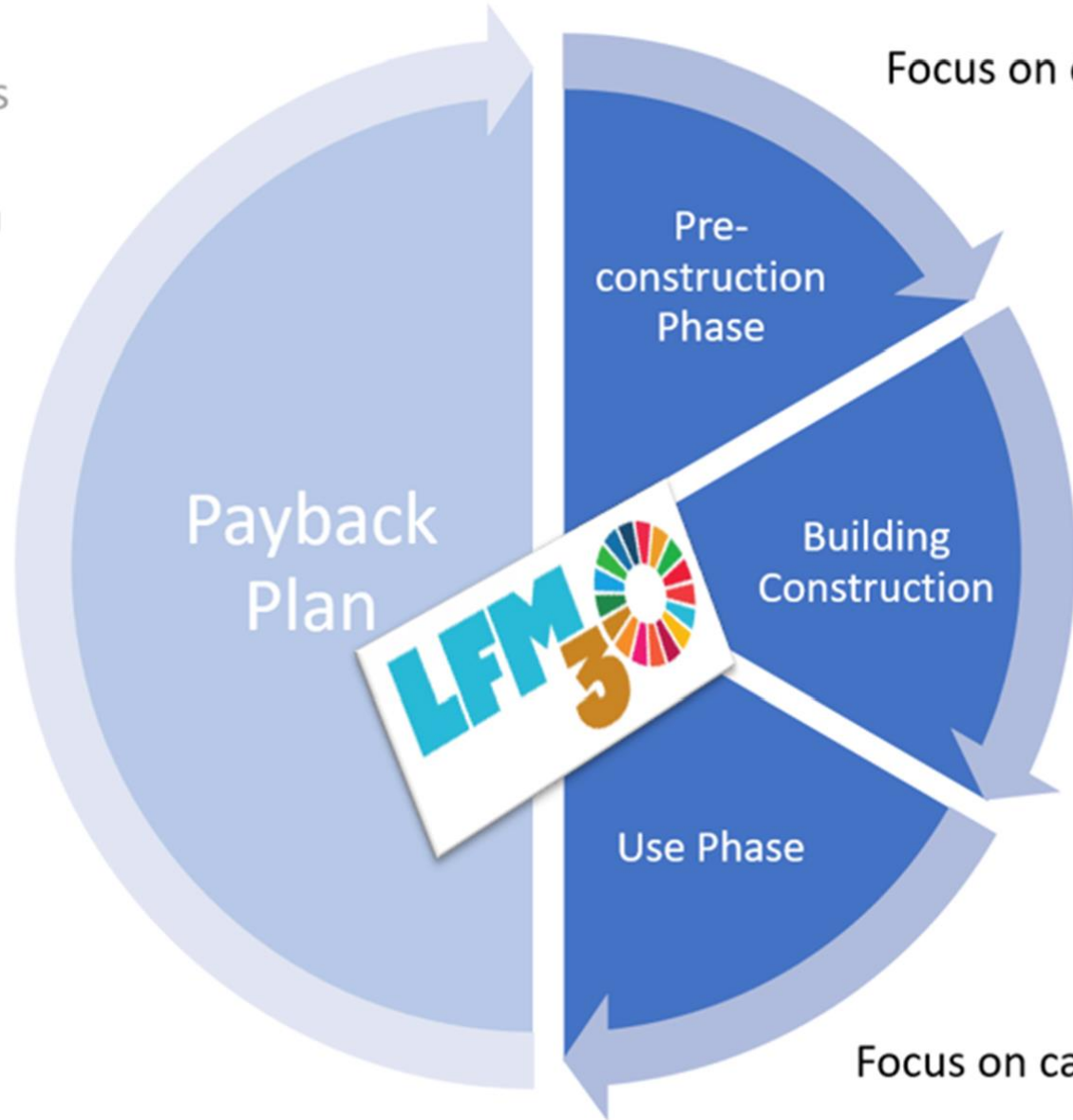
Beyond Value Chain Mitigation

Increased solid biogenic mass on site / real estate

Biochar on site

*Biogenic construction*

Renewable energy surplus




Focus on carbon mitigation

Focus on carbon mitigation

Focus on carbon mitigation

In LFM30:

# Payback plan our version year 2024

| 50 % of the total of balancing measures | | | | | | | 50% |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| At the building | | Next to the building | | External purchase | | | Energy |
| Building material (Long-lasting wood products) | Carbonization in concrete | Biochar, in own property or geographically close. | Net added vegetation above ground | External purchase biological carbon sink | External purchase artificial carbon sink (ex bio-ccs) | External purchase - afforestation / reforestation *Not allowed* | Renewable energy surplus |





*Calculation methods, in next version, will be aligned with CRCF*