5th Meeting of the Carbon Removals Expert Group

21 - 23 October 2024

Christian HOLZLEITNER, Head of Unit,
European Commission, DG CLIMA, Unit C3

Objectives

DAY 1

Permanent removals

- Update on policy developments
- DACCS and BioCCS
- Biochar

DAY 2

Carbon farming

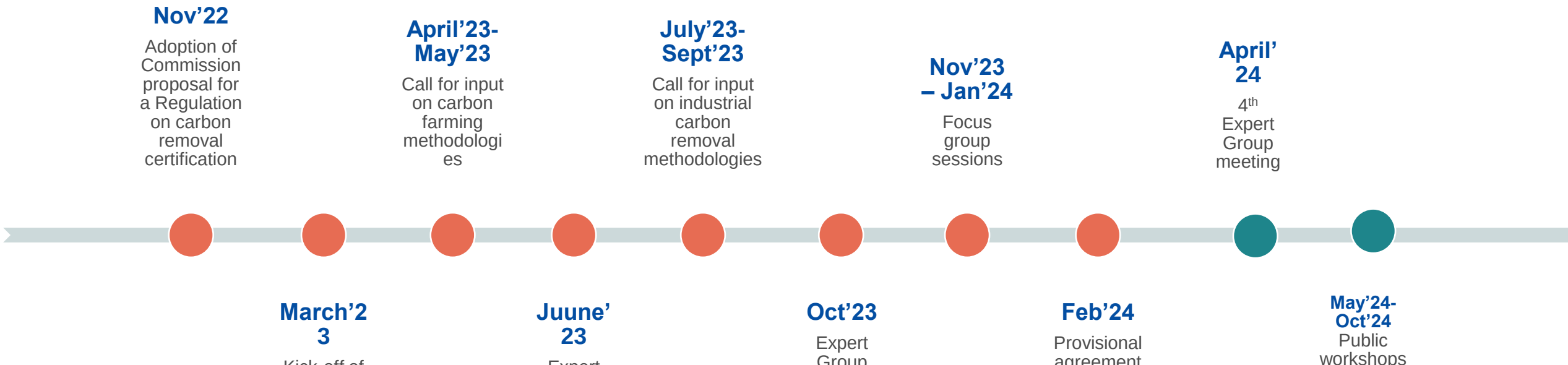
- Update on policy developments
- Agriculture
- Peatlands
- Forestry

DAY 3

Carbon storge in buildings & verification rules

- Update on policy developments
- Long-lasting biogenic carbon storage in buildings
- Rules on third-party verification and certification schemes

What’s the state of play?

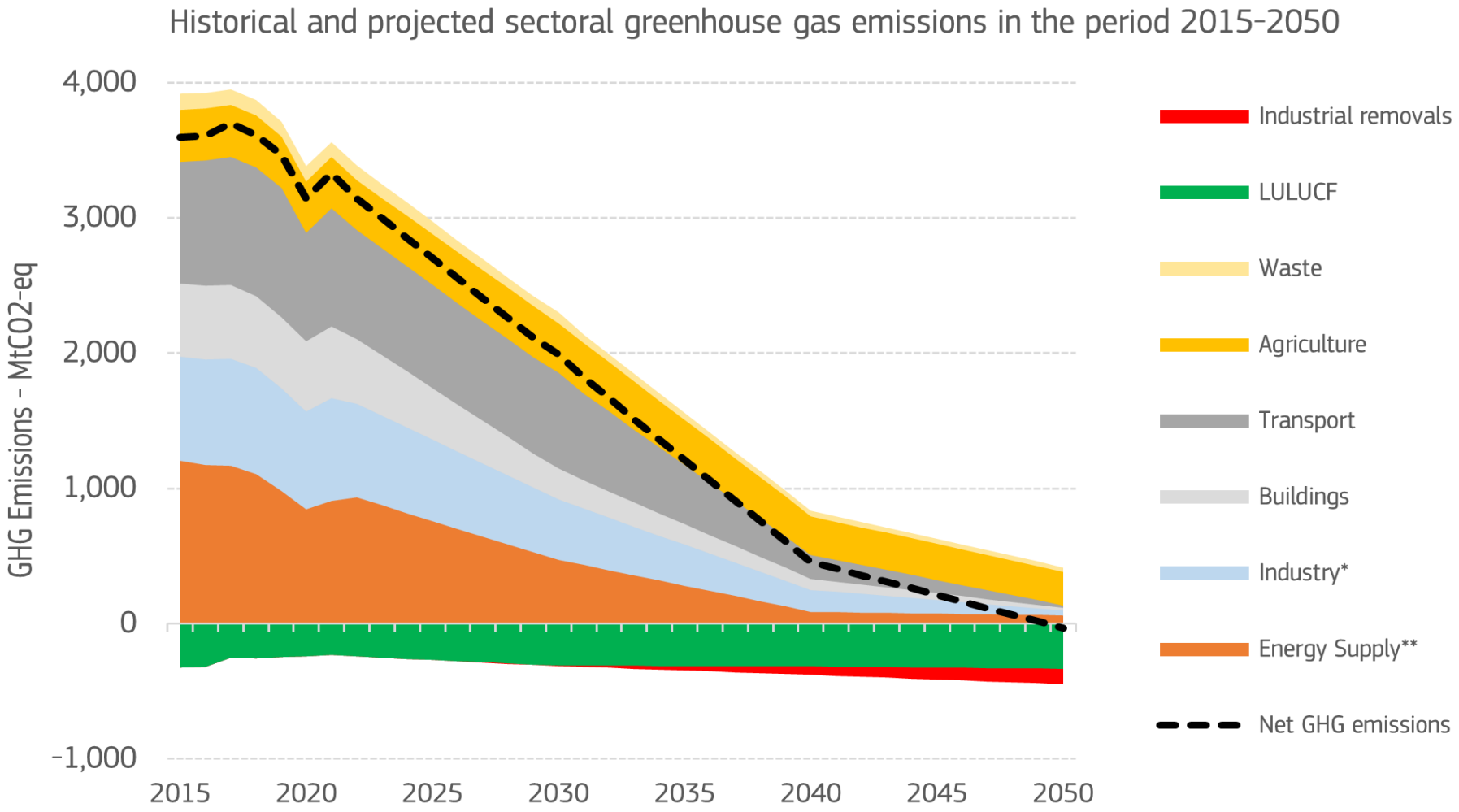


European Commission

Carbon Storage in Buildings

23 October 2024

Pathway to climate neutrality



*Excluding non-BECCS industrial removals
**Including bioenergy with carbon capture and storage (BECCS)

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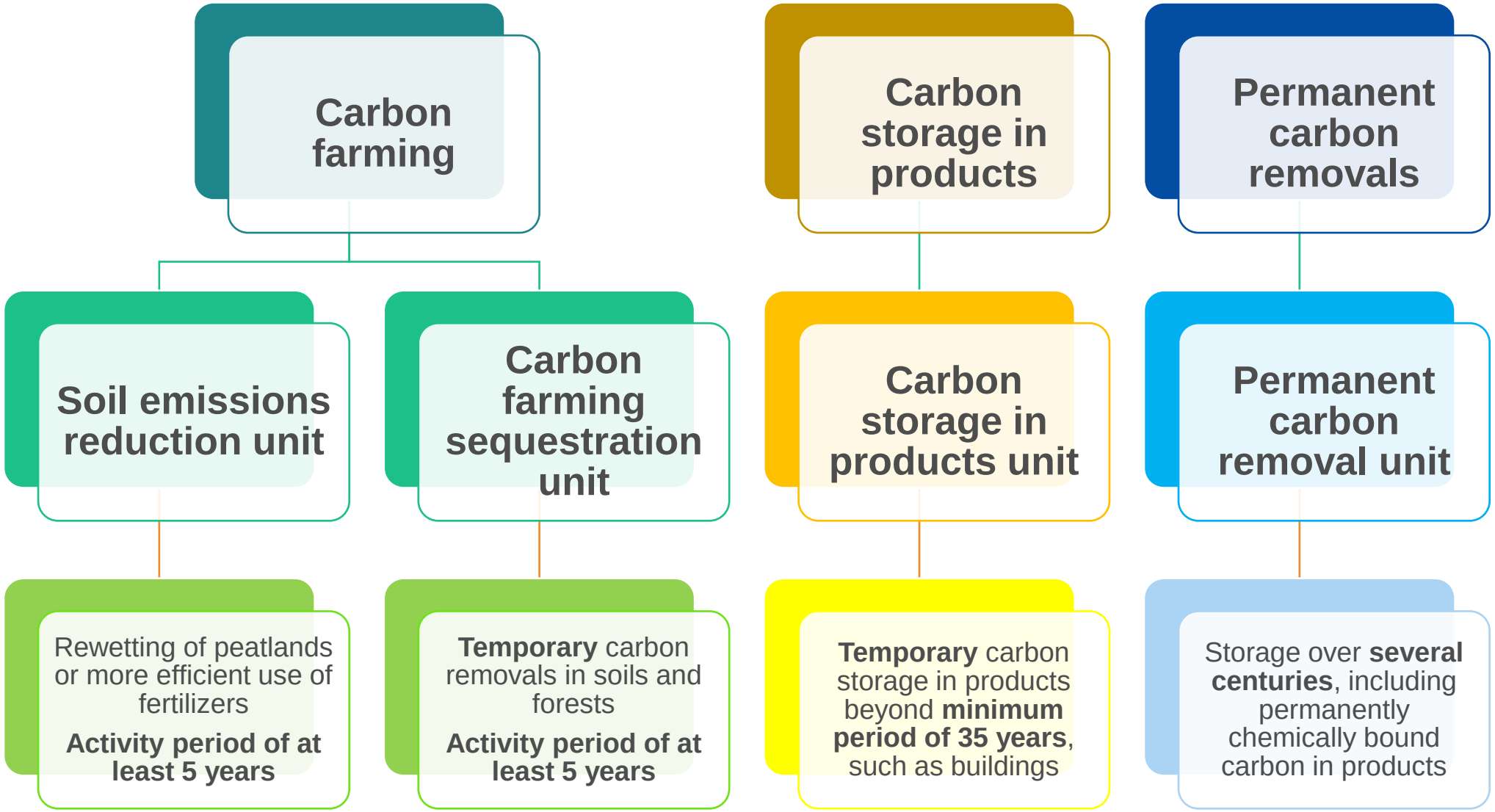
Scope of certification

Article 1 and 2 CRCF Regulation



Next steps towards certification

December 2024	Publication of CRCF in Official Journal	CRCF Regulation (linguist lawyer version): CO_TA (europa.eu)
2025	Proposal of delegated acts on certification methodologies	Permanent removals Carbon farming Carbon storage in long-lasting buildings
	Proposal of implementing act on verification and registries	
2026	Start of certification	EC recognition of certification schemes
		First issuance of certified units
2028	Start of EU registry	

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More information:

- DG CLIMA website on Carbon Removals and Carbon Farming
- CRCF Regulation (linguist lawyer version): CO_TA (europa.eu)
- FAQ: a8abe1c4-a3c6-4c94-be0e-4b76f7fd0308_en (europa.eu)
- EU carbon removals newsletter

Q&A session

Join via Slido

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OVERVIEW

Long-lasting biogenic carbon storage in buildings

1. Presentation, Sevim Aktas, DG CLIMA
2. Presentation of draft elements of the EU certification methodology, Sinead O'Keeffe, CRETA
3. Comments
   - Sacha Brons, Intervention Lead & Strategic Advisor, Climate Cleanup Foundation
   - Cécile Dap, Director, Low Carbon Building Initiative - European carbon standard
   - Mona Menadi, Knowledge and Innovation Lead, Built by Nature
4. Open discussion

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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
7. Annex

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

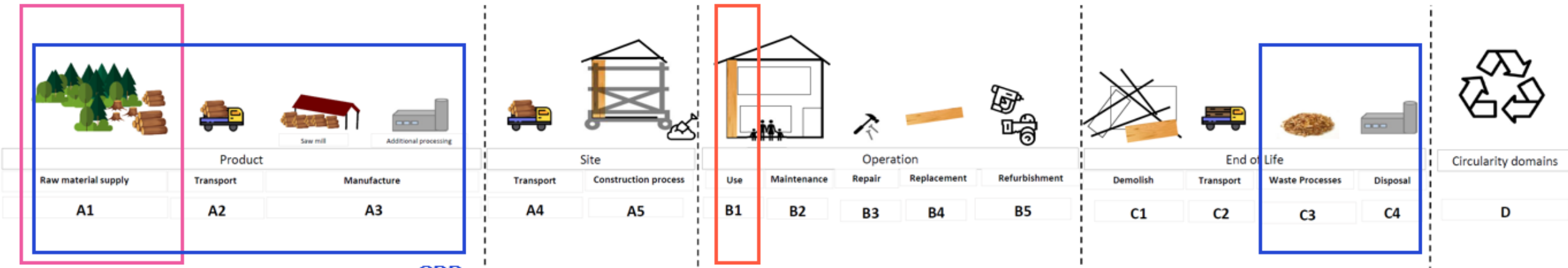
Certification & verification processes integrated into existing building check-up routine

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

Renewable Energy Directive – sustainability

Stricter safeguards

- Protects **biodiversity and ecosystems** (building on the Taxonomy's Technical Screening Criteria (TSC) for sustainability)
- **Prohibitions on harvesting:**
  - High-biodiversity areas (Article 29(3))
  - High-carbon stock regions (Article 29(4))
  - Peatland (Article 29(5)) unless proven undisturbed.

Legal standards for harvesting (Article 29(6))

- Ensures legality, forest regeneration, soil quality, biodiversity protection, and sustainable management.
- **LULUCF Criteria:** (Article 29(7))
- requiring countries of origin to comply with the Paris Agreement and properly account for carbon stock changes, ensuring that reported LULUCF-sector emissions do not exceed removals.

+ learnings from Horizon Europe Projects

SUSTCERT4BIOBASED

- Standards for transparency and accountability in bio-based systems.
- Overview of Chain of Custody (CoC) options, such as:International Sustainability and Carbon Certification (ISCC)
- Roundtable on Sustainable Biomaterials (RSB)

Energy Performance of Buildings Directive

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)

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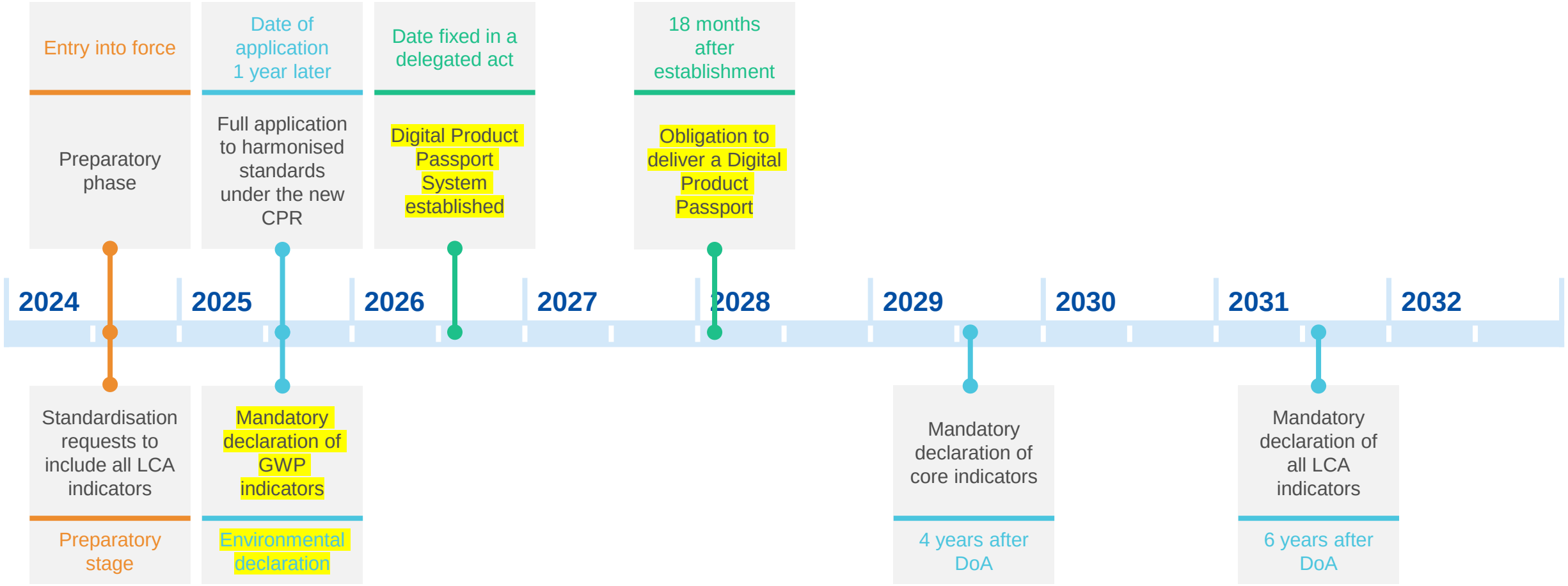
Construction Products Regulation: timeline of new provisions



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+ learnings from Horizon Europe Projects

SustCert4Biobased Project

SUSTCERT4BIOBASED is a 3-year EU – funded project that aims to assess and promote the adoption of sustainability certification schemes and labels for industrial biobased systems to **support tracing the sustainability of the products along the EU and international value chains and trades**.

CO2NSTRUCT

Modeling Circular Economy in Construction: Mapping six carbon-intensive construction materials—steel, cement, brick, glass, wood, and insulation—across their value chains, emphasising feedback loops and rebound effects crucial to circular practices. The TIMES model will simulate various circular scenarios, delivering actionable policy support insights.

Wood2wood

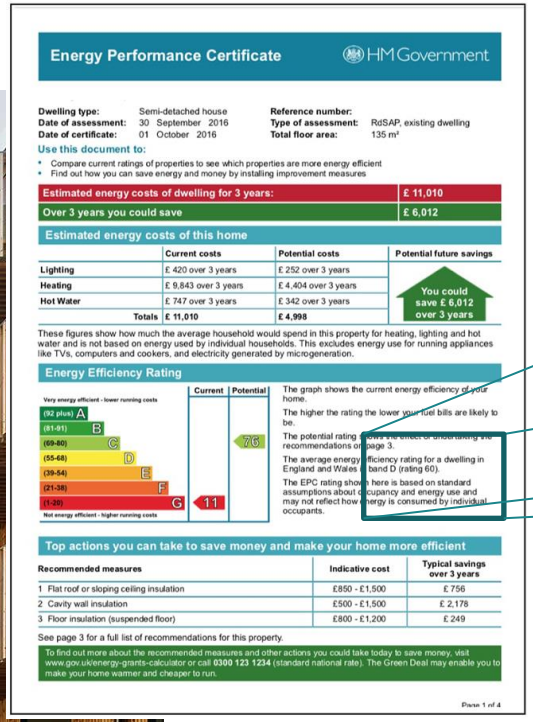
Wood-to-Wood Cascade Upcycling Valorisation Approach

Wood2Wood (W2W) establishes a framework for reusing wood from construction, demolition, and furniture waste, including upcycling technologies, life cycle assessment, and digital product passports. It aims to reduce virgin material use, cut landfill waste, and support circular economy principles.

INBUILT

INBUILT proposes a set of innovative design, retrofit, and construction techniques for both new and existing buildings, focusing on the use and reuse of locally sourced bio- and geo-materials, as well as recycled components. This is supported by a digital platform that serves as a multi-objective decision-support tool, optimizing the integration of these materials into building projects.

Concept



Energy Performance Certificate HM Government

Dwelling type: Semi-detached house
Date of assessment: 30 September 2016
Date of certificate: 01 October 2016
Reference number:
Type of assessment: RdSAP, existing dwelling
Total floor area: 135 m²

Use this document to:

- Compare current ratings of properties to see which properties are more energy efficient
- Find out how you can save energy and money by installing improvement measures

Estimated energy costs of dwelling for 3 years:	**£ 11,010**
Over 3 years you could save	**£ 6,012**

Estimated energy costs of this home

	Current costs	Potential costs	Potential future savings
Lighting	£ 420 over 3 years	£ 252 over 3 years	You could save £ 6,012 over 3 years
Heating	£ 9,843 over 3 years	£ 4,404 over 3 years	
Hot Water	£ 747 over 3 years	£ 342 over 3 years	
Totals	£ 11,010	£ 4,998	

These figures show how much the average household would spend in this property for heating, lighting and hot water and is not based on energy used by individual households. This excludes energy use for running appliances like TVs, computers and cookers, and electricity generated by microgeneration.

Energy Efficiency Rating

	Current	Potential
Very energy efficient - lower running costs		
(92 plus) A		
(81-91) B		76
(69-80) C		
(55-68) D		
(39-54) E		
(21-38) F		
(1-20) G	11	
Not energy efficient - higher running costs		

The graph shows the current energy efficiency of your home.

The higher the rating the lower your fuel bills are likely to be.

The potential rating shows the effect of undertaking the recommendations on page 3.

The average energy efficiency rating for a dwelling in England and Wales is band D (rating 60).

The EPC rating shown here is based on standard assumptions about occupancy and energy use and may not reflect how energy is consumed by individual occupants.

Top actions you can take to save money and make your home more efficient

Recommended measures	Indicative cost	Typical savings over 3 years
1 Flat roof or sloping ceiling insulation	£850 - £1,500	£ 756
2 Cavity wall insulation	£500 - £1,500	£ 2,178
3 Floor insulation (suspended floor)	£800 - £1,200	£ 249

See page 3 for a full list of recommendations for this property.

To find out more about the recommended measures and other actions you could take today to save money, visit www.gov.uk/energy-grants-calculator or call **0300 123 1234** (standard national rate). The Green Deal may enable you to make your home warmer and cheaper to run.

Page 1 of 4

Carbon storage indicator: X tCO2e

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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

Useful links

- Provisional agreement on the CRCF Regulation
- FAQ on CRCF Regulation
- Press release: Commission welcomes political agreement on EU-wide certification scheme for carbon removals
- CRCF website
- Buildings workshop (23 Sept): Recording and documents
- Subscribe to our EU carbon removals and carbon farming newsletter

Contact:
Sevim Aktas
Policy Officer, DG CLIMA C3 Land Economy and Carbon Removals
sevim.aktas@ec.europa.eu

Draft elements of quantification

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

23-10-2024 | Sinéad O' Keeffe and Jannes Nelissen (CRETA)

WAGENINGEN UNIVERSITY & RESEARCH

Partners for Innovation

Presentation Content

1. Overview of the draft methodology status
2. Key questions to the expert group
3. Scope and Basic calculation approach
4. TAP –exploring quantification options- case example
    a. Renovations
    b. New builds

Overview of the status of the methodology

- Quantification (Article 4):
  - Definition of variables in formula given in Article 4 of the provisional agreement.
  - Required expert input on Key questions
- Sustainability (Article 7):
  - Analysis of relevant existing EU regulations and initiatives that can be used as foundation for sustainability criteria.
  - Status has been outlined in technical assessment paper, and the process for feedback beginning in the workshop in Sept

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

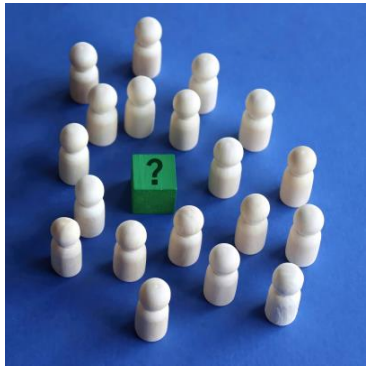
- Additionality (Article 5)
- Storage, monitoring and liability (Article 6)

Key questions for today's discussion

- What should be prioritised for the CRCF quantification methodology: renovation or new build?

- How to ensure that EPBD Whole Life Carbon (WLC) calculation and CRCF carbon storage calculation are compatible so that they can be jointly applied to evaluate carbon storage efficiently? (new builds)

- In the case of data limitations e.g. no EPD (Environmental Product Declaration) for a particular product, how should an uncertainty factor be considered within the quantification methodology?



Question mark surrounded by a crowd. by mohdizzuanbinroslan

Formula for Quantification as per proposed CRCF regulation

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

where:

a. $CR_{baseline}$ is the carbon removed under the baseline situation;

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 [...].

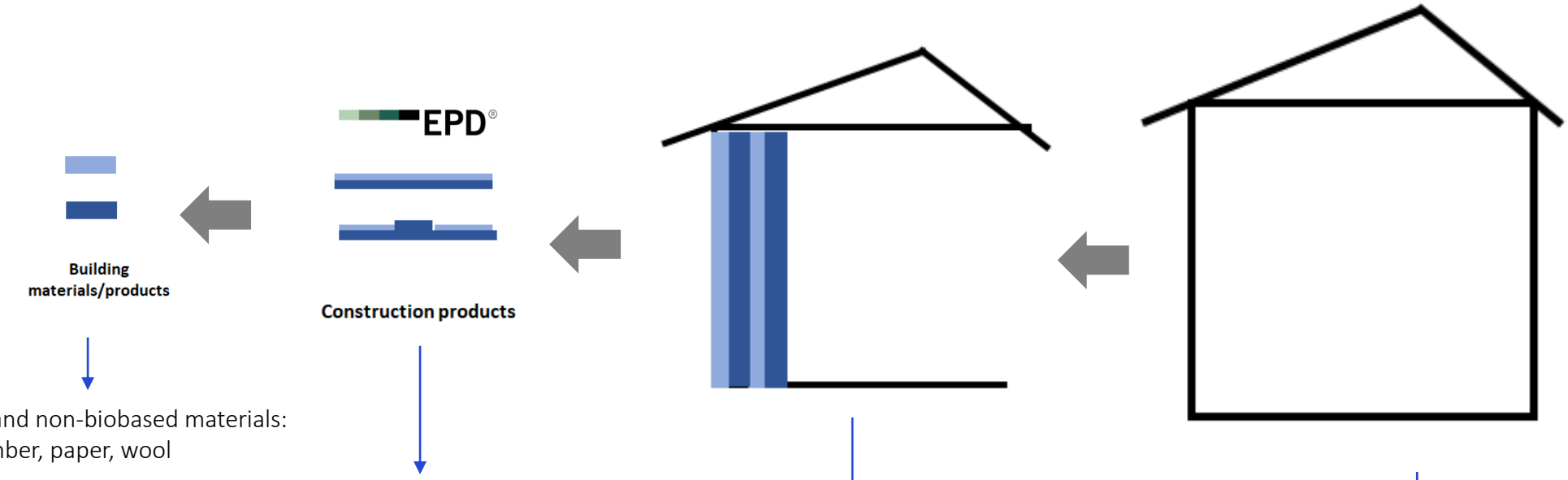
Quantities for parameters (a) –(c) shall be designated with a negative sign (-) if they are net GHG removals and with a positive sign (+) if they are net GHG emissions. The parameters need to be expressed in tonnes CO_2 equivalent.

Scope of certifiable system – Example Timber products

Upfront embodied carbon

"Building Bank"- Period of min 35 years or more

Hierarchal structure of a building



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*.

=> Aligning method with other EU initiatives

Construction elements/products- stipulated Load bearing structures /Insulation material (eligibility min 35 years)

 Graphic dapted from: van Dam, J., & van den Oever, M. (2019). Catalogus biobased bouwmaterialen 2019: Het groene en circulaire bouwen. (Groene Grondstoffenreeks; No. 22). Wageningen Food & Biobased Research. https://doi.org/10.18174/461687 and 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).

Exploration of Calculation options

Miniature people or small figure worker on puzzles to connect. by photobyphotoboy

Fictious situation: example calculation – Renovation

Jip and Janneke have bought a house in the Netherlands , but it needs an extension

- Timber frame extension
- 50 m^2 useful floor area, over 2 floors

Ask the relevant party:

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

Elements	Material	No of Units
Foundation	Concrete	30
Wall frame	Spruce timber	6
Floor joists	Spruce timber	10
Roof Truss	Spruce timber and fir timber	5
Ceiling and floors	OSB	20
External cladding	Pine timber	30
Insulation	hemp	60
Roof tiles	Clay	100
Fasteners	Steel nails and screws	100

Example: Dummy data

(very) simplified Bill of materials (BOM)

Image: Carpenter constructing wooden frame house. by anatoliy_gleb, envato elements

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

$CR_{baseline}$ is the carbon removed under the baseline situation

Miniature people or small figure worker on puzzles to connect. by photobyphotoboy

$CR_{baseline}$: example calculation

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

$CR_{baseline}$= -30*50*(1/1000)*1

Example: Dummy data

$CR_{baseline}$= -1.5 tCO_2 eq.

Image: Carpenter constructing wooden frame house. by anatoliy_gleb, envato elements

where:

- $CR_{reference}$ 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

$CR_{reference}$ shall be specified per building typology and Member State (stipulated element)

- Based on state-of-the-art 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).

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

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

Total carbon removal -> is the total carbon removals of the carbon storage in products activity

Miniature people or small figure worker on puzzles to connect. by photobyphotoboy

$GHG_{associated}$ Stipulated and eligible- clarification

- Stipulated construction elements are those load bearing structures or insulation products

- However, eligible construction products/elements for estimating the carbon storage potential – are those that contain biogenic carbon and have a minimal lifespan of 35 years.

Image courtesy of Vision Development

CR_{total} : Background theory and reasoning

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

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

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

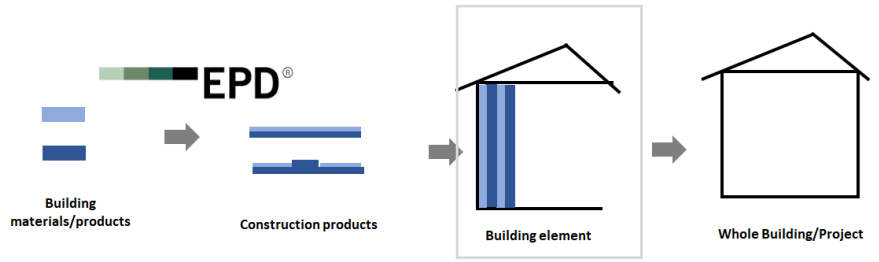
a. $CR_{element,j}$ is the stored carbon in eligible construction element j in ton CO_2 eq
b. $C_{i,j}$ is the carbon content of biobased product *i* in eligible construction element j, expressed in kg carbon per unit product, as defined per EPD
c. n_i is the number of units of eligible biobased product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

Indicator	Unit	A1-A3
Biogenic carbon content in accompanying packaging	kg	1.39
Biogenic carbon content in product	kg	214

Information on biogenic carbon content

Results per functional unit		
BIOGENIC CARBON CONTENT	Unit	QUANTITY
Biogenic carbon content in product	kg C	211
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2



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

CR_{total}: Example calculation

Taking the stipulated elements and estimating the biogenic carbon content included in those from eligible biobased products

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

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

$CR_{wall\ frame}$ = 251.8 * 6* 44/12 * 1/1000 *-1= -5.54 t $CO_{2\ eq}$

$CR_{floor\ joists}$ = 2.01 * 10 * 44/12 * 1/1000 *-1 = -0.074 t$CO_{2\ eq}$

$CR_{roof\ truss}$= 50*5 * 44/12 * 1/1000 *-1 = -0.917 tCO_{2eq}

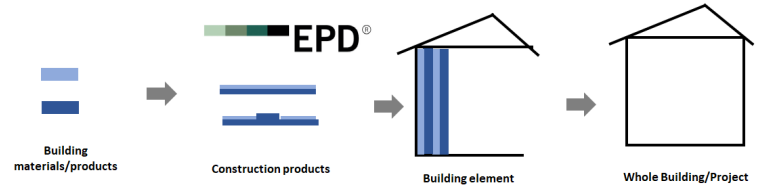
$CR_{insulation}$ = 87 * 60 * 44/12 * 1/1000 *-1 = -19.140 tCO_{2eq}

CR_{total} = -25.67 tCO_{2eq}

Example: Dummy data

Tier 2 Element	Tier 3 Element	Material	Declared unit	Unit products in element, n_i (kg)	Biogenic C
Foundation	Foundation	Concrete	1t	30	0
Load bearing structure	Wall frame	Spruce timber	1m3	6	251.8
Load bearing structure	Floor joists	Spruce timber	1m'	10	2.01
Roof	Roof Truss	Spruce & Fir timber	1m3	5	50
Non-Load bearing element	Ceiling and floors	OSB	1m4	20	430.27
Facade	External cladding	Pine timber	1m5	30	193.1
Non-Load bearing element	Insulation	hemp	1m2	60	87
Roof	Roof tiles	Clay	1t	1	0
Non-Load bearing element	Fasteners	Steel nails and screws	1kg	50	0

Carbon removed (stored)



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

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

is the increase in direct and indirect greenhouse gas emissions, over the entire lifecycle of the activity which are due to its implementation [...].

Miniature people or small figure worker on puzzles to connect. by photobyphotoboy

$GHG_{associated}$: formula- option one

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

$$GHG_{element,j} = \sum_{i=1}^{n_j} (GWP_{fossil,i,j} + GWP_{luluc,i,j}) \times n_i \times U \times Cf_1$$

$$GHG_{associated} = \sum_{j=1}^{N} GHG_{element,j} \times Cf_1$$

with:

a) $GHG_{element,j}$ are the greenhouse gas emissions associated with the stipulated construction element *j*

b) $GWP_{fossil,i,j}$ is the sum of all GWP_{fossil} values in the stipulated A-phases of all construction products *i* in stipulated construction element *j* as per EPD (EN15804+A2) in kg CO_2 eq per unit product.

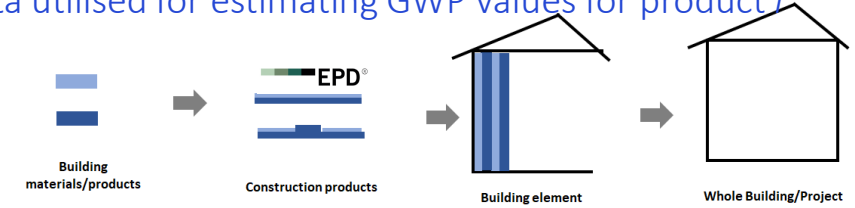
c) $GWP_{luluc,i,j}$ is the sum of all GWP_{luluc} values in the stipulated A-phases of all construction products *i* in stipulated construction element *j* as per EPD (EN15804+A2) in kg CO_2 eq per unit product.

d) n_i is the number of units of construction products *i* in the building element *j*, with the unit product defined by the EPD (EN15804+A2), and the number of unit products verifiable through the bill of materials

e) U is the uncertainty factor accounting for the data quality of the product-specific data utilised for estimating GWP values for product *i*

f) N is the total number of stipulated construction element in the building.

g) Cf_1 is the conversion factor from kg to tonnes (1/1000)



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

$GHG_{associated}$: example – option 1

- All **stipulated construction** elements included
- These elements contain more than just biobased products.

$$GHG_{element,j} = \sum_{i=1}^{n_j} (GWP_{fossil,i,j} + GWP_{luluc,i,j}) \times n_i \times U \times Cf_1$$

$$GHG_{associated} = \sum_{j=1}^{N} GHG_{element,j} \times Cf_1$$

Tier 2 Element	Tier 3 Element	Material	Declared unit	Unit products in element, n_i	GWP_{fossil} (kg CO_2 eq)	GWP_{luluc} (kg CO_2 eq)
Foundation	Foundation	Concrete	1t	30	110.00	0.12
Load bearing structural frame	Wall frame	Spruce timber	1m3	6	214.40	1.46
Load bearing structural frame	Floor joists	Spruce timber	1m'	10	2.32	0.01
Roof	Roof Truss	Spruce & Fir timber	1m3	5	47.84	1.24
Non-Load bearing element	Ceiling and floors	OSB	1m4	20	297.00	0.86
Facade	External cladding	Pine timber	1m5	30	71.10	0.48
Non-Load bearing element	Insulation	hemp	1m2	60	1.22	0.07
Roof	Roof tiles	Clay	1t	1	328.45	1.14
Non-Load bearing element	Fasteners	Steel nails and screws	1kg	50	1.23	0.01

$GHG_{foundation}$ = (110+0.12)*30 * 1/1000 = 3.30 tCO_2 eq

$GHG_{Wall\ frame}$ = (214.4+1.46)*6 * 1/1000 = 1,30 tCO_2 eq

$GHG_{Floor\ joists}$ = (2.32+0.01)*10 * 1/1000 = 0.02 tCO_2 eq

$GHG_{Roof\ triuss}$ = (47.84+1.24) *5* 1/1000 = 0.25 tCO_2 eq

$GHG_{Insulation}$ = (1.22+0.07) *60* 1/1000 = 0.08 t CO_2 eq

$GHG_{associated}$ = 4.95 tCO_2 eq

Example: Dummy data

Temporary net carbon removal benefit = $CR_{baseline} - CR_{total} - GHG_{associated}$ = -(1.5) – (-25.67)-(4.95) = **22.23 tCO_2 eq**

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

$GHG_{associated}$: formula- option 2

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

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

$GWP_{project}$ = 268 kg CO_2 eq/m^2
$GHG_{reference}$ for a renovation project on a single-family home in The Netherlands: 167 kg CO_2 eq/m^2 *

Example: Dummy data

$GHG_{associated}$ = (268-167)*50*1/1000 = 5.09 tCO_2 eq

Temporary net carbon removal benefit = $CR_{baseline} - CR_{total} - GHG_{associated}$ = -(1.5) – (-25.67)-(5.09) **= 19.1 tCO_2 eq**

Where:

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)

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

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

is the increase in direct and indirect greenhouse gas emissions, over the entire lifecycle of the activity which are due to its implementation [...].

Miniature people or small figure worker on puzzles to connect. by photobyphotoboy

NEW BUILDS

Example - New build

- Estimating the average family house ~ 120 m^2 in NL
- Amounts of products scale accordingly
- Mineral insulation for sake of the example

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

Example: Dummy data

Image courtesy of EcoHouseMart homes

$CR_{baseline}$= -24*120*(1/1000)*1
$CR_{baseline}$= **-2.88** tCO_2 eq.

where:

- $CR_{reference}$ for a new single-family home in The Netherlands: -24 kg CO_2 eq/m^2
- $A_{project}$ is 120 m^2
- Cf_1 is 1/1000

CR_{total}: Example calculation new build

Taking the stipulated elements and estimating the biogenic carbon content included in those from eligible biobased products

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

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

Example: Dummy data

Image courtesy of EcoHouseMart homes

Tier 2 Element	Tier 3 Element	Material	Declared unit	Unit products in element, n_i	Biogenic C (kg)
Foundation	Foundation	Concrete	1t	72	0
Load bearing structure	Wall frame	Spruce timber	1m3	14.4	251.8
Load bearing structure	Floor joists	Spruce timber	1m'	24	2.01
Roof	Roof Truss	Spruce & Fir timber	1m3	12	50
Non-Load bearing element	Ceiling and floors	OSB	1m4	48	430.27
Facade	External cladding	Pine timber	1m5	72	193.1
Non-Load bearing element	Insulation	Mineral wool	1m2	144	0
Roof	Roof tiles	Clay	1t	2.4	0
Non-Load bearing element	Fasteners	Steel nails and screws	1kg	120	0

$CR_{wall\ frame}$ = 251.8 * 14.4* 44/12 * 1/1000 *-1= -13.3 t $CO_{2\ eq}$

$CR_{floor\ joists}$ = 2.01 * 24 * 44/12 * 1/1000 *-1 = -0.18 t$CO_{2\ eq}$

$CR_{roof\ truss}$= 50 * 12 * 44/12 * 1/1000 *-1 = -2.2 tCO_{2eq}

CR_{total} = -15.67 tCO_{2eq}

$GHG_{associated}$: new build example – option 1

- All **stipulated construction** elements included
- This still includes the insulation material, although it is mineral

$$GHG_{element,j} = \sum_{i=1}^{n_j} (GWP_{fossil,i,j} + GWP_{luluc,i,j}) \times n_i \times U \times Cf_1$$

$$GHG_{associated} = \sum_{j=1}^{N} GHG_{element,j} \times Cf_1$$

Tier 2 Element	Tier 3 Element	Material	Declared unit	Unit products in element, n_i	GWP_{fossil} (kg CO_2 eq)	GWP_{luluc} (kg CO_2 eq)
Foundation	Foundation	Concrete	1t	72	110.00	0.12
Load bearing structural frame	Wall frame	Spruce timber	1m3	14.4	214.40	1.46
Load bearing structural frame	Floor joists	Spruce timber	1m'	24	2.32	0.01
Roof	Roof Truss	Spruce & Fir timber	1m3	12	47.84	1.24
Non-Load bearing element	Ceiling and floors	OSB	1m4	48	297.00	0.86
Facade	External cladding	Pine timber	1m5	72	71.10	0.48
Non-Load bearing element	Insulation	Mineral wool	1m2	144	1.01	0.07
Roof	Roof tiles	Clay	1t	2.4	328.45	1.14
Non-Load bearing element	Fasteners	Steel nails and screws	1kg	120	1.23	0.01

$GHG_{foundation}$ = 7.93 tCO_2 eq

$GHG_{Wall\ frame}$ = 3.10 tCO_2 eq

$GHG_{Floor\ joists}$ = 0.05 tCO_2 eq

$GHG_{Roof\ triuss}$ = 0.43 tCO_2 eq

$GHG_{Insulation}$ = 0.16 t CO_2 eq

$GHG_{associated}$ = 11.968 tCO_2 eq

Example: Dummy data

Temporary net carbon removal benefit = $CR_{baseline} - CR_{total} - GHG_{associated}$ = -(2.88) – (-15.67)-(11.68) = **1.11 tCO_2 eq**

$GHG_{associated}$: new build example – option 2

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

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

$GWP_{project}$ = **226** kg CO_2 eq/m^2
$GHG_{reference}$ for a new build single-family home in The Netherlands: **286** kg CO_2 eq/m^2 *
$GHG_{associated}$ = (226-286)*120*1/1000 = -7,19 tCO_2 eq

But $GHG_{associated} \geq 0$, so $GHG_{associated}$ = **0**

Example: Dummy data

Temporary net carbon removal benefit = $CR_{baseline} - CR_{total} - GHG_{associated}$ = -(2.88) – (-15.67) - 0 = **12.8** tCO_2 eq

Where:

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)

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

Explorative case studies ..

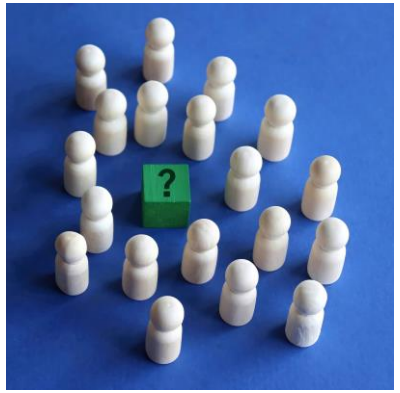
Image: Carpenter constructing wooden frame house. by anatoliy_gleb, envato elements

Miniature people or small figure worker on puzzles to connect. by photobyphotoboy

Image courtesy of EcoHouseMart homes

Key questions for expert input:

- What should be prioritised for the CRCF quantification methodology: renovation or new build?
- How to ensure that EPBD WLC calculation and CRCF carbon storage calculation are compatible so that they can be jointly applied to evaluate carbon storage efficiently? (new builds)
- In the case of data limitations e.g. no EPD for a particular product, how should an uncertainty factor be considered within the quantification methodology?



Question mark surrounded by a crowd. by mohdizzuanbinroslan

Open to other constructive comments from the expert group

Source: Thank you note by BarbaraNeveu, envato elements.com

Sustainabilty Requirements

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

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

Partners for Innovation

WAGENINGEN UNIVERSITY & RESEARCH

Article 7: Sustainability requirements

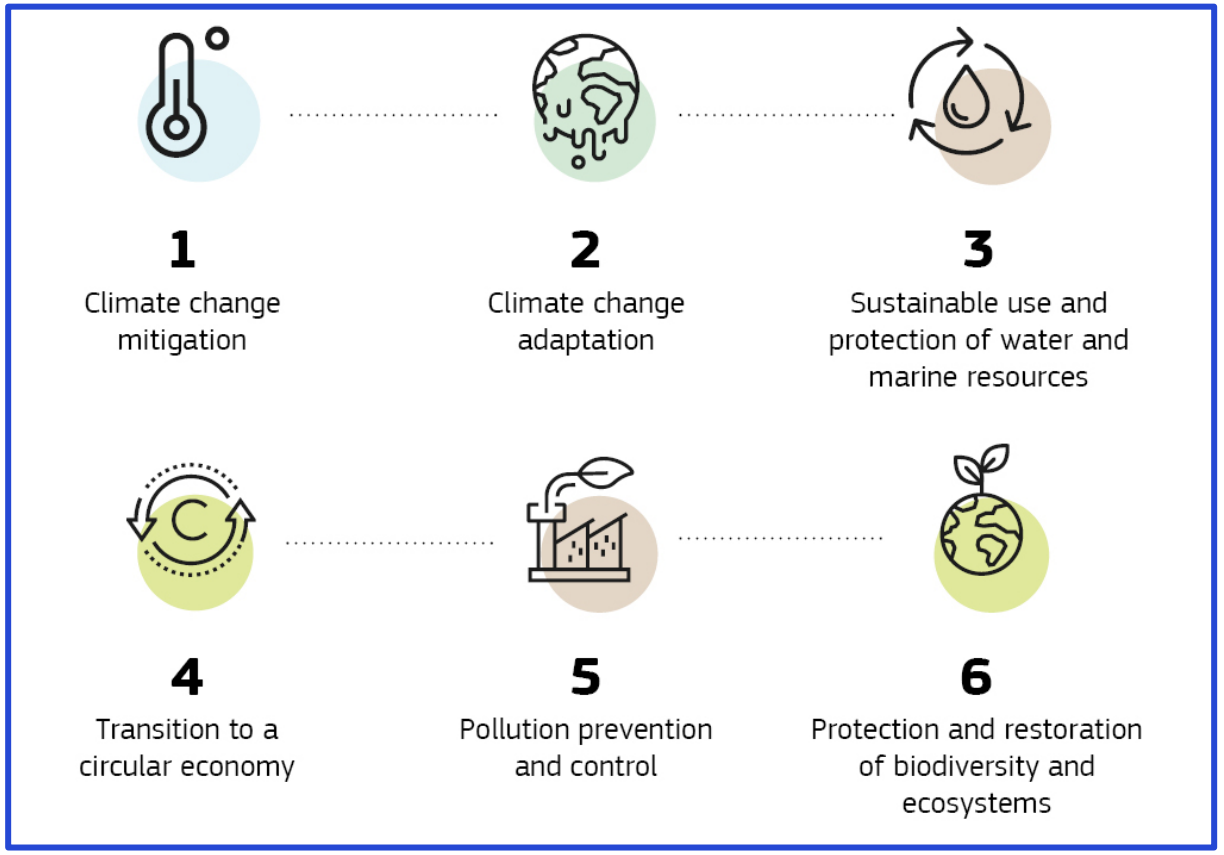
Article 7

Sustainability

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

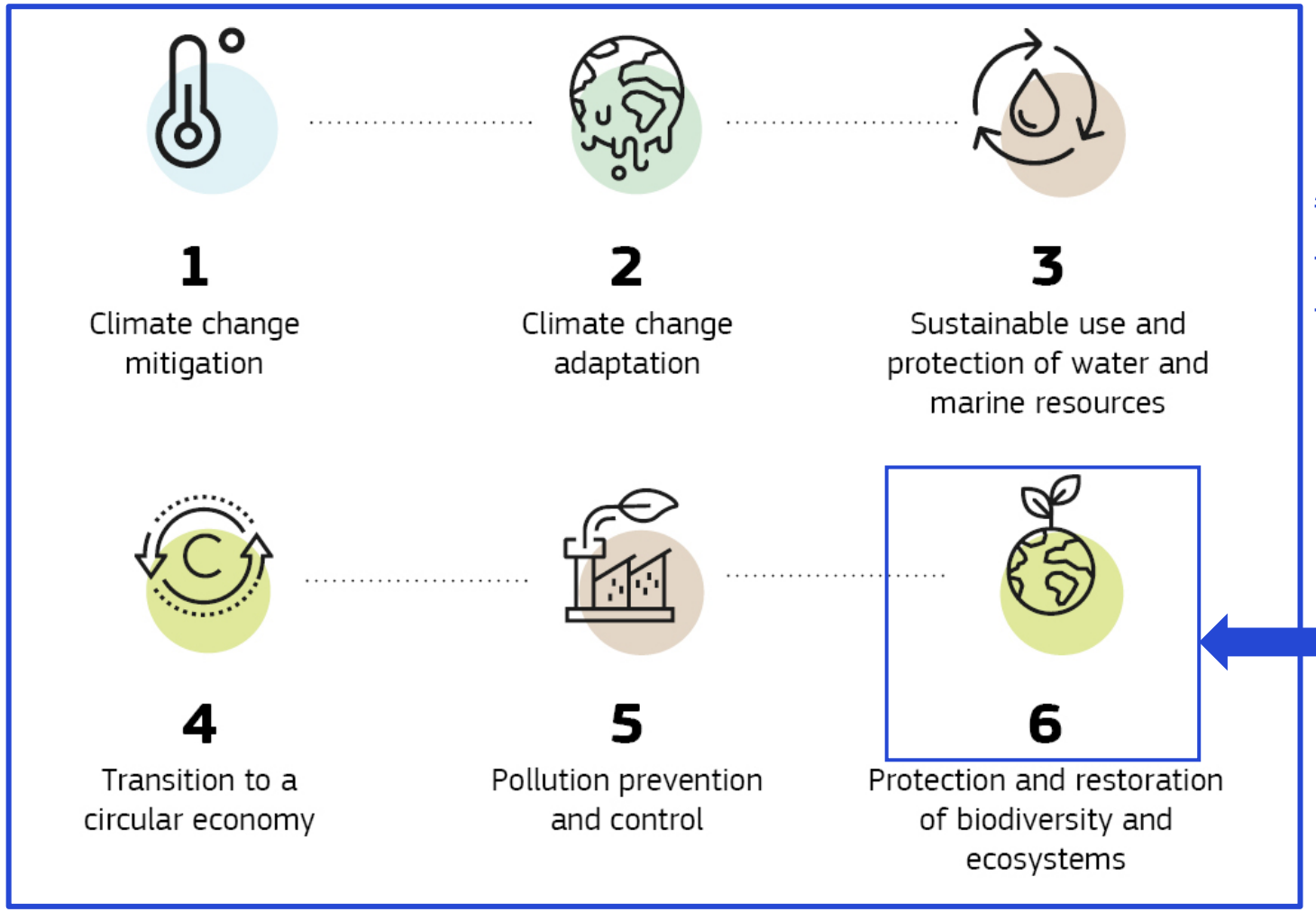
2. "Those minimum sustainability requirements shall, where appropriate, be consistent with the technical screening criteria for the 'do no significant harm' principle. The minimum sustainability requirements shall promote the sustainability of forest and agriculture biomass raw material in accordance 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).



Article 7: Sustainability requirements: Biodiversity and Ecosystems

Safeguards



[Article 29 of Directive (EU) 2018/2001" (RENEWBLE ENERGY DIRECTIVE III)]

2023 revised Renewable Energy Directive – 'RED III'

Sustainability criteria:
- Targeted strengthening
- New rules for forest biomass

Verification of compliance

Nature restoration law

Taxonomy, Technical screening Criteria – new builds

Renewable Energy Directive – sustainability

Stricter safeguards

- Protects **biodiversity and ecosystems** (building on the Taxonomy's Technical Screening Criteria (TSC) for sustainability)
- **Prohibitions on harvesting:**
  - High-biodiversity areas (Article 29(3))
  - High-carbon stock regions (Article 29(4))
  - Peatland (Article 29(5)) unless proven undisturbed.

Legal standards for harvesting (Article 29(6))

- Ensures legality, forest regeneration, soil quality, biodiversity protection, and sustainable management.
- **LULUCF Criteria:** (Article 29(7))
- requiring countries of origin to comply with the Paris Agreement and properly account for carbon stock changes, ensuring that reported LULUCF-sector emissions do not exceed removals.

+ learnings from Horizon Europe Projects

SUSTCERT4BIOBASED

- Standards for transparency and accountability in bio-based systems.
- Overview of Chain of Custody (CoC) options, such as:International Sustainability and Carbon Certification (ISCC)
- Roundtable on Sustainable Biomaterials (RSB)

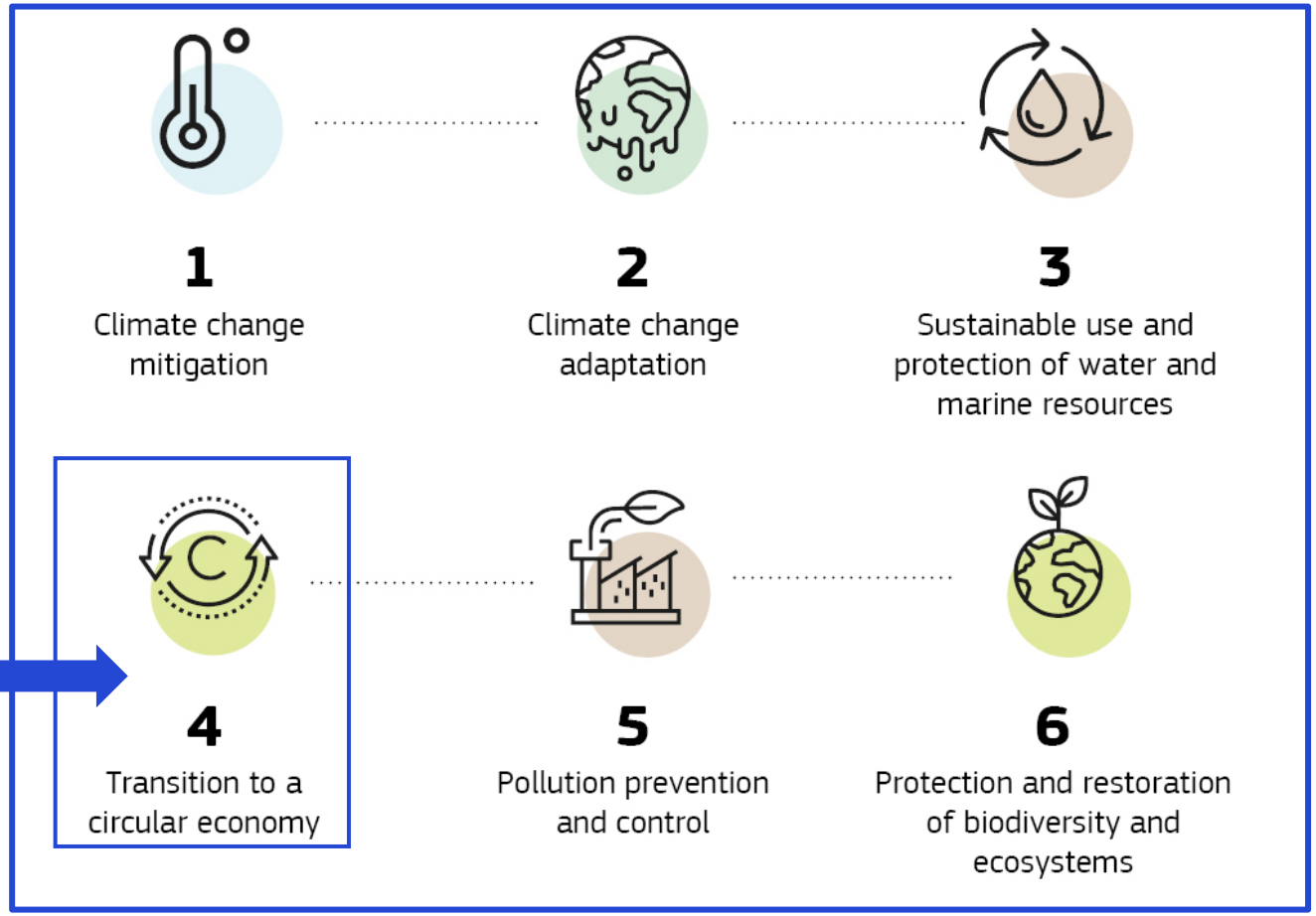
Article 7: Sustainability requirements: Circularity

Level(s) Framework

Thematic areas	Macro-objectives	Indicators			
Resource use and environmental performance	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

Resource efficient material flows

Safeguards



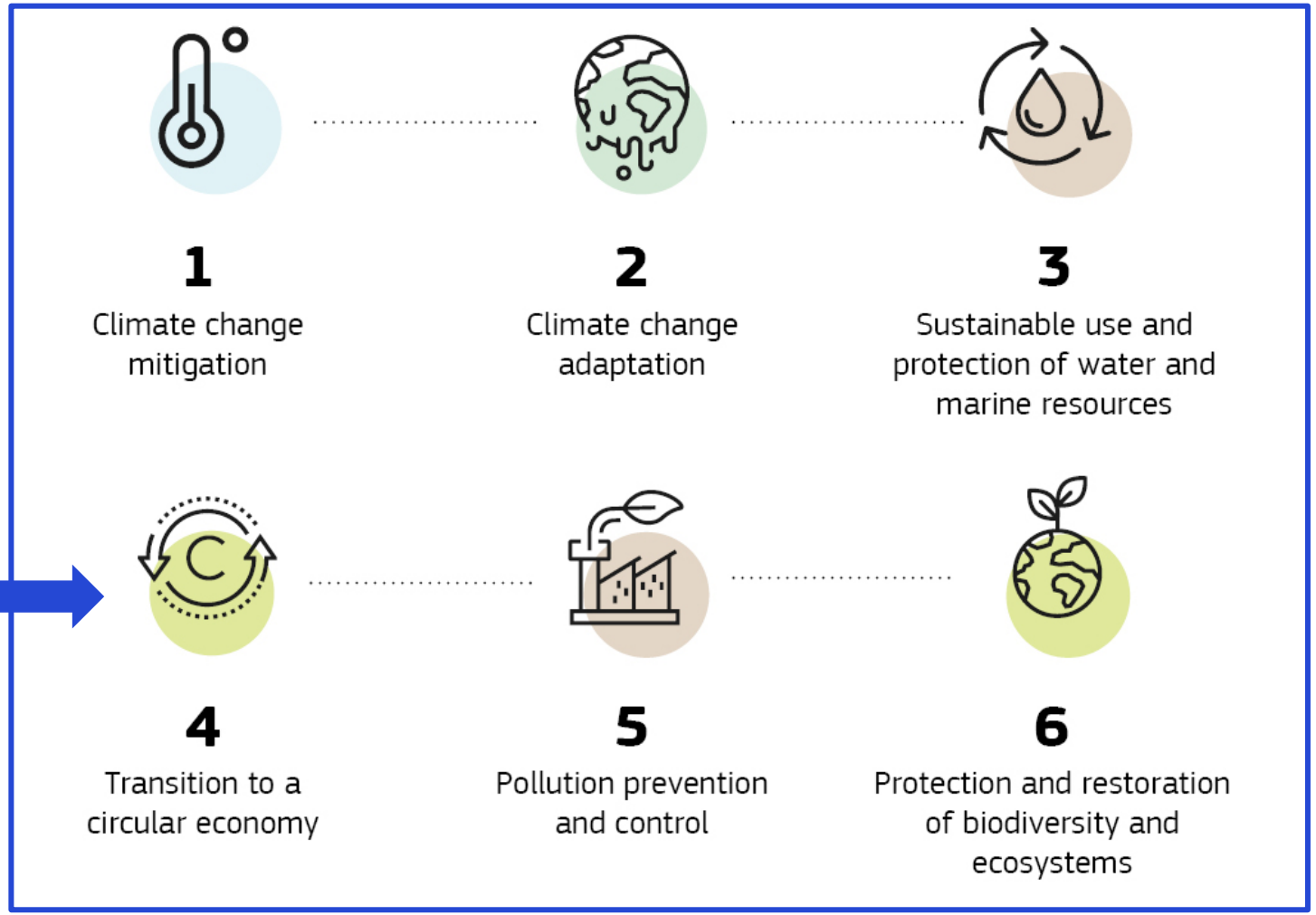
Article 7: Sustainability requirements: Taxonmy Regulation

Safeguards

Technical Screening criteria
New builds
Renovations

substantial contribution criteria

e.g. At least 90% for new builds/70% renovations of non-hazardous waste (by mass) generated on site must be prepared for reuse or recycling



Sustainability requirements - Still work in progress

Miniature people or small figure worker on puzzles to connect. by photobyphotoboy

Thank you!

Source: Thank you note by BarbaraNeveu, envato elements.com

Please remember to provide your written feedback too!

OVERVIEW

Rules on third-party verification and certification schemes

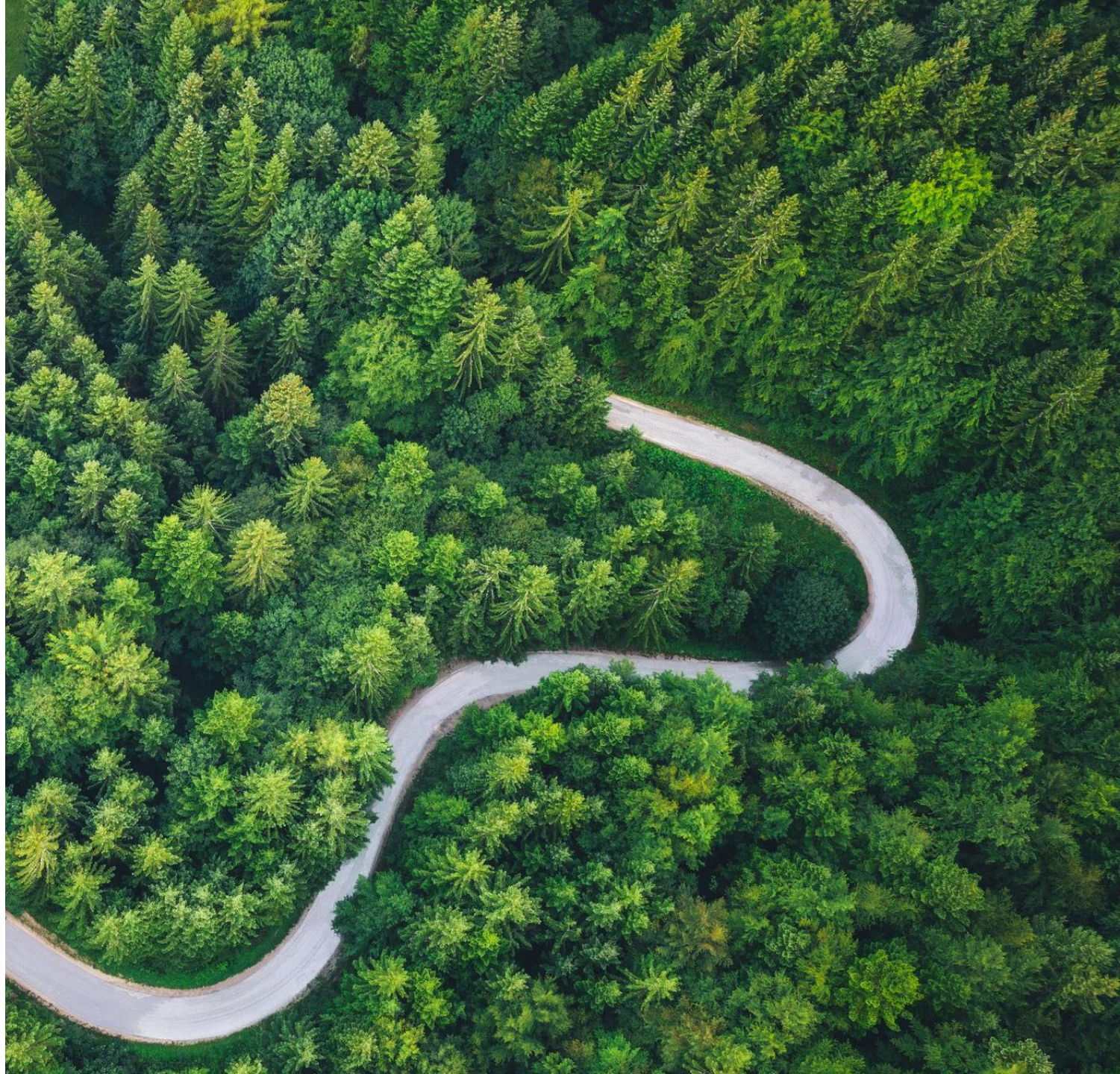
1. Update on the VERTA stakeholder workshop, Giulio Volpi, DG CLIMA
2. Q&A

European Commission

Guidehouse Trinomics RICARDO

Project VERTA

Rules on CRCF verification and registries - technical assistance



VERTA project goal & objectives

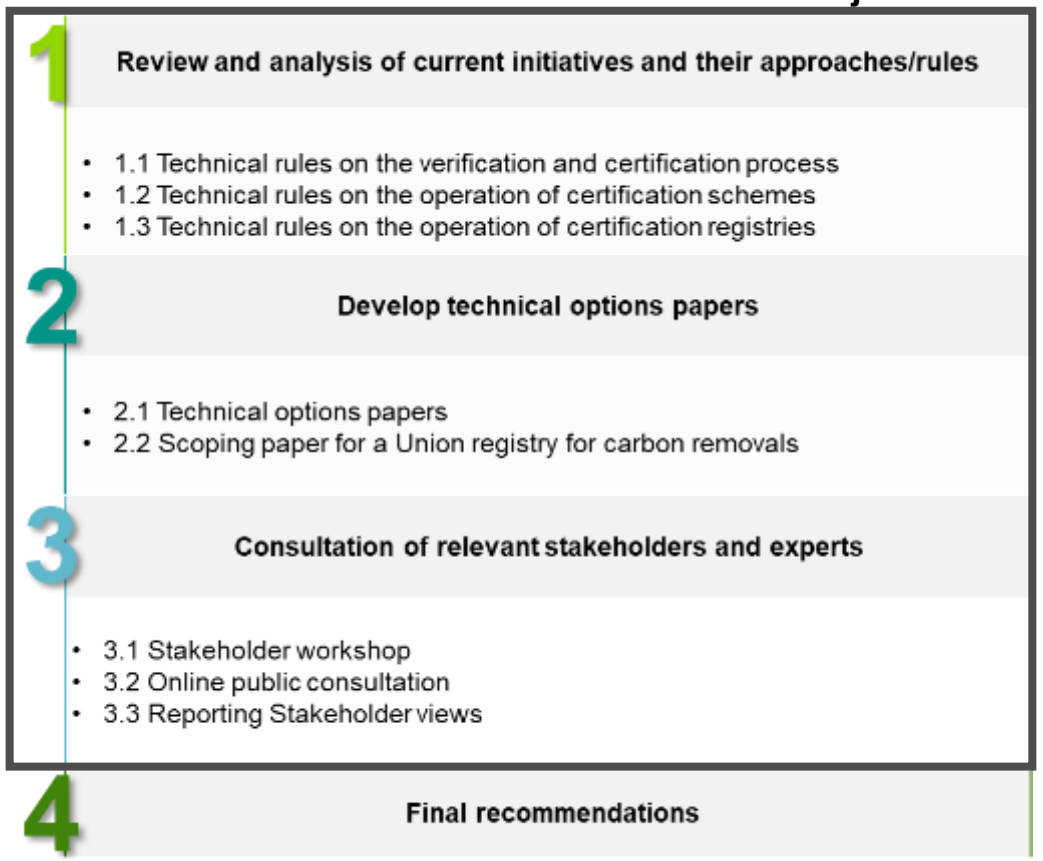
The **goal** of the VERTA project is to help the Commission set the foundations for implementing rules for the **verification** of carbon removals and **certification registries**, **under the CRCF Regulation**

We will provide recommendations to DG CLIMA on the following areas:

1. Third-party verification rules
2. Operation of certification schemes for carbon removals
3. Minimum requirements for certification registries for carbon removals, including interoperability options
4. Initial scoping of the Union registry for carbon removals (CRCF registry)

- **Timeline:** November 2024 – December 2025

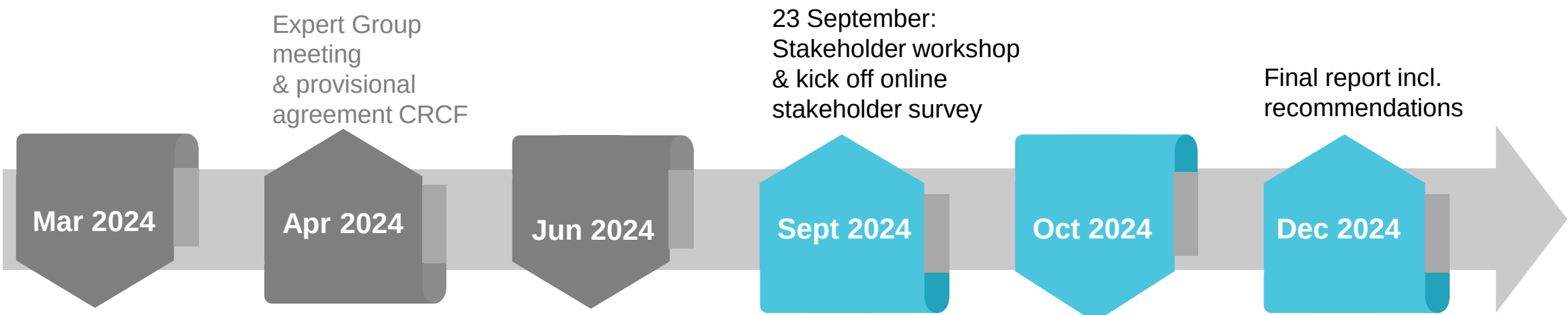
Project status



Guidehouse

European Commission

VERTA project timeline



VERTA workshop on CRCF verification rules - 23/9/2024

- **Aim** of the workshop was to present and **gather stakeholder feedback** on two working papers.

- Sessions with expert panelists were held on the following topics:
  1. CRCF third-party verification process
  2. Scoping of CRCF registry
  3. Rules for certification scheme registries

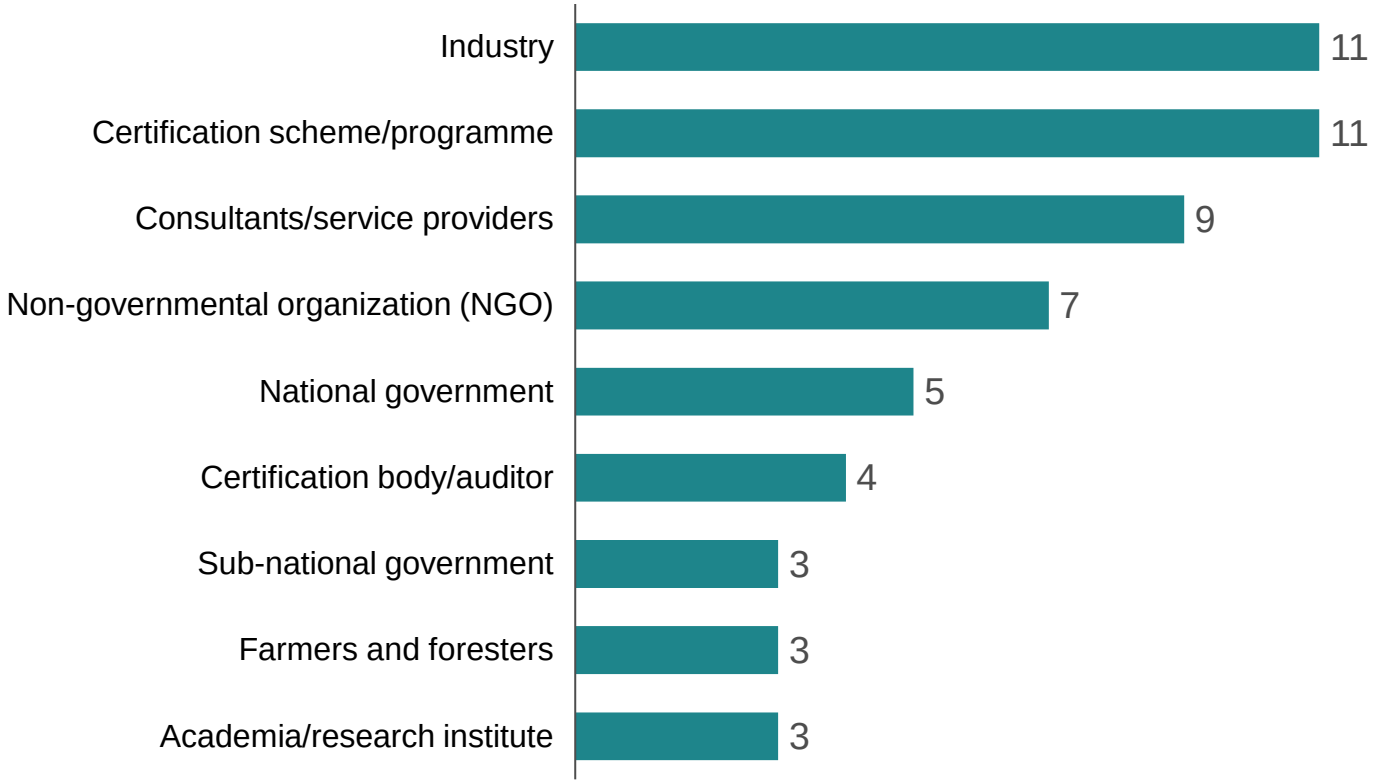
350+

- Over 70 in-person attendees in Brussels and almost 300 online attendees

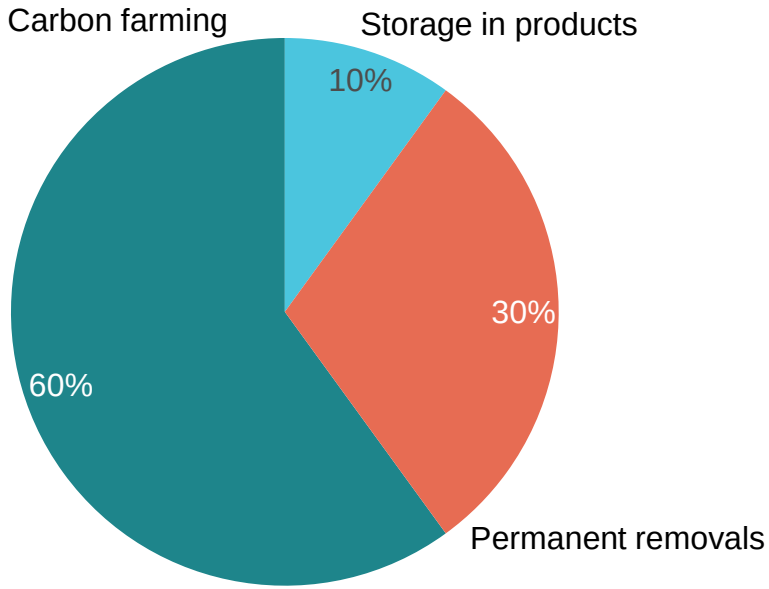
- Recordings, presentation materials and background reports are available online: https://shorturl.at/uaLnR

Online Survey on VERTA option papers (23/9-14/10)

In total, **56 responses to the VERTA online survey** were collected, with the following **distribution across stakeholder types**:



Participants were **most interested in the following activities:**

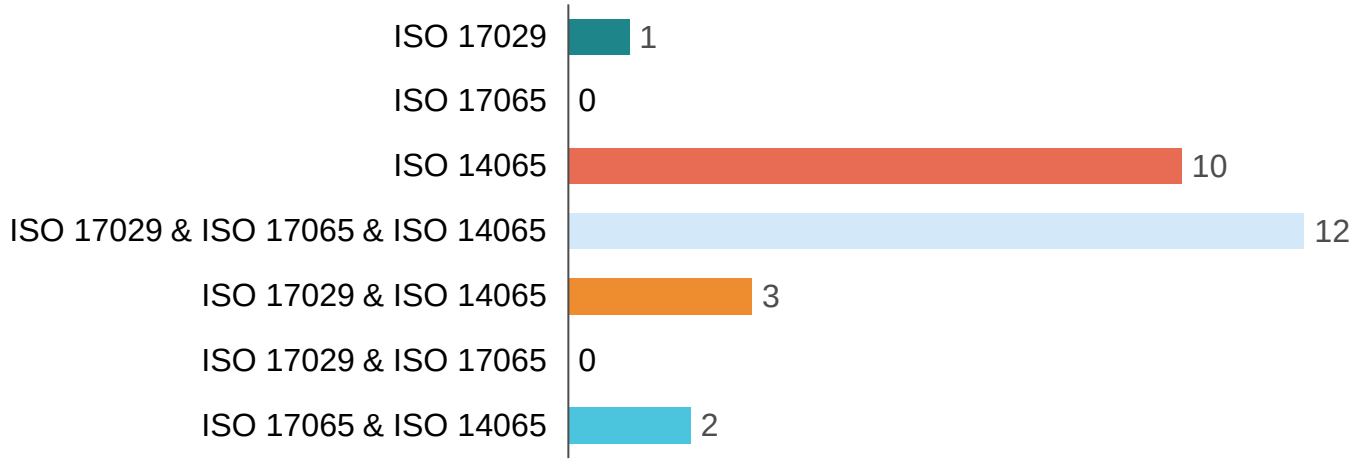


Certification bodies and accreditation

- **Initial take-aways:**

- CRCF allows CB accreditation by a National Accreditation Body or recognition by a Member State Competent Authority.
- Need proportionate approach to accreditation of CBs, ensuring harmonised recognition across Member States
- CBs should be accredited for a specific scope
- Accreditation bodies accredit CBs in their country and then the CB can conduct audits across the EU
- CBs and accreditation bodies need to know what standard will be the basis for accreditation (e.g. ISO 17029, 17065 or 14065)

Which ISO standards should certification bodies be required to be accredited to?



ISO 17029: Conformity assessment: General principles and requirements for validation and verification bodies

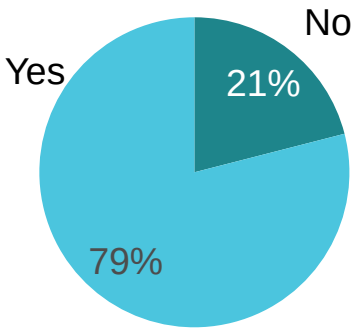
ISO 17065: Conformity assessment: Requirements for bodies certifying products, processes and services

ISO 14065: General principles and requirements for bodies validating and verifying environmental information

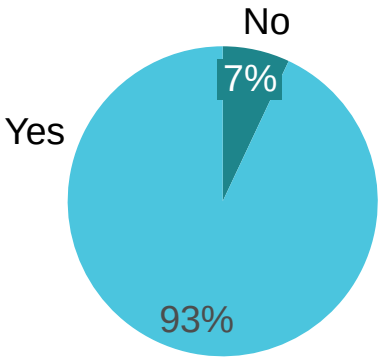
Group certification

- **Key messages:**
  - Particularly relevant for carbon farming
  - Group certification is a promising way to include small operators
  - The frequency of low-risk audits can reduce administrative burden
  - Remote auditing and digital tools have a role to play to reduce the cost of auditing, but it cannot replace the need for onsite auditing

Should the frequency of audits for low-risk operators be reduced, as seen in other sectors like EU organic agriculture, where official controls may occur every two years under specific conditions?



Are you in favour of **allowing the use of remote sensing technologies**, such as satellite imagery, **to support or replace on-site audits** in certain scenarios?



Certification registries – legal basis

Article 11 Operation of certification schemes

4. Certification schemes shall publish in their certification registries […] a list of the appointed certification bodies, stating for each certification body by which national accreditation body it was accredited or by which national competent authority it was recognized and which national competent authority is monitoring it.

Article 12 Union wide registry for permanent carbon removals, carbon farming and carbon storage in products

1. Until the establishment of the Union registry, **a certification scheme shall establish and duly maintain a public certification registry to make publicly accessible and in a secure way the information resulting from the certification process**, including the certificates of compliance and updated certificates of compliance, containing, as a minimum, the information set out in Annex IIa, **to enable the tracing of the quantity of units certified** […]

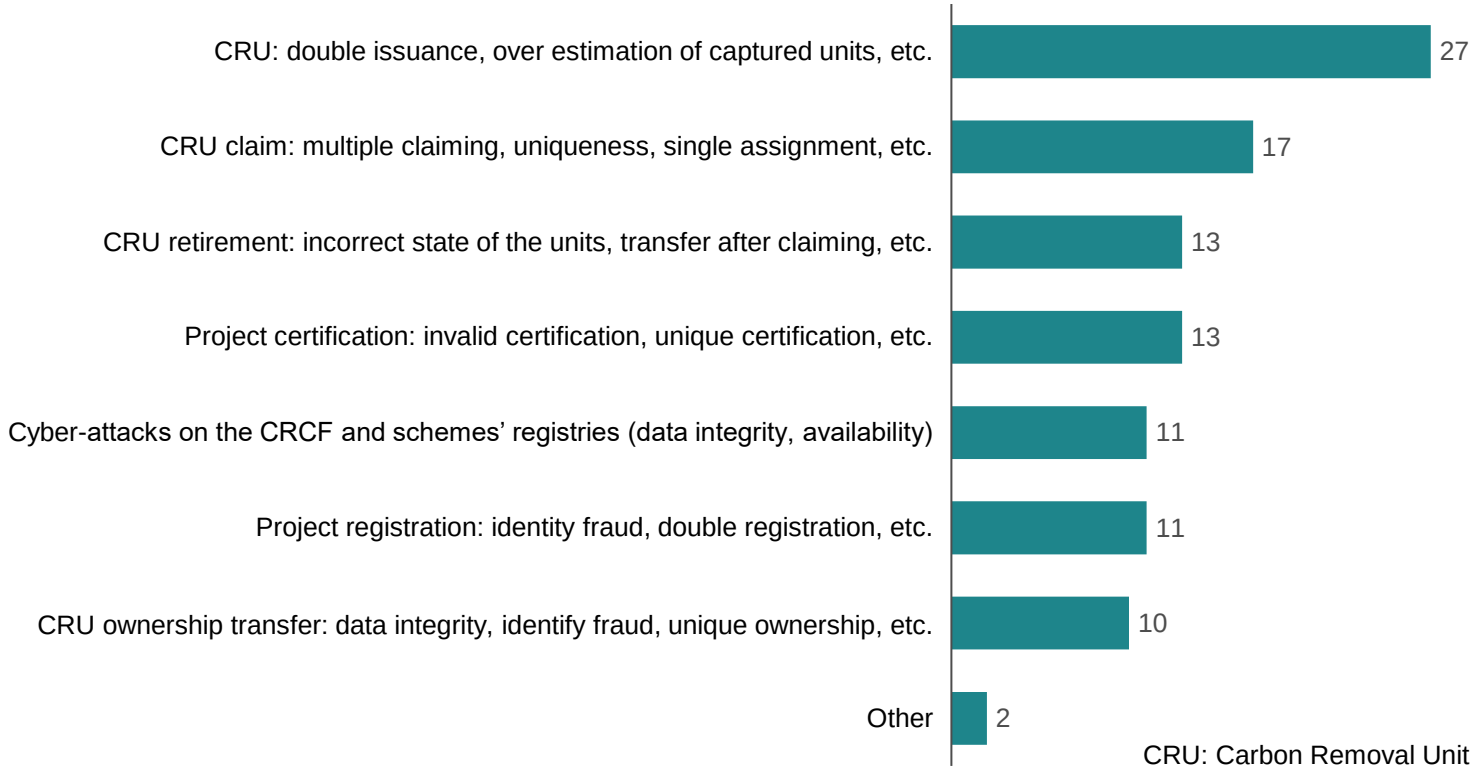
A certification registry shall use automated systems, including electronic templates, and **shall be interoperable with registries of other recognised certification schemes in order to avoid double counting**. The Commission shall adopt implementing acts setting out the structure, format, and technical details of the certification registries, of the recording, holding or use of certified units […]

Interoperability of certification registries

Key messages:

- **Transparency** is very important to mitigate double issuance/claiming, each unit needs to be traceable
- **Existing VCM registries** already comply with transparency provisions and publish the required information, may need to align on format
- **Application Programming Interface (API)** option mentioned as viable and straightforward way to connect registries (CAD Trust approach is a working example)

What do you consider to be the **most likely threats to the integrity of the CRCF** or areas for potential fraud?



CRU: Carbon Removal Unit

CRCF registry – legal basis

Article 12 Union wide registry for permanent carbon removals, carbon farming and carbon storage in products

1. […] the Commission shall establish and duly maintain a **Union wide registry for permanent carbon removals, carbon farming and carbon storage in products, to make publicly available the information related to the certification process**, in an accessible way, containing, as a minimum, the information set out in Annex IIa […] The Union registry shall use automated systems, including electronic templates, to make publicly accessible in a secure way the information related to the certification process, including the certificates of compliance and updated certificates of compliance**, to enable the tracing of the quantity of certified units and avoid double counting**. The Union registry shall be financed by annual fixed fees payable by users, proportionate to the use of the Union registry, to sufficiently contribute to the coverage of the annual operating costs of its establishment and management of the Union registry […]

1a. **Certified units shall be issued by certification registries or, by** … [OJ: 4 years from the entry into force of this Regulation], **by the Union registry** […] Any certified unit shall not be issued more than once and shall not be used by more than one legal or natural person at any point in time. Permanent carbon removal units, carbon farming sequestration units and carbon storage in products units, and soil emission reduction units shall remain distinct from each other.

CRCF registry – legal basis

Annex IIa Minimum information included in the Union registry and certification registries referred to in Article 12

The Union registry and certification registries referred to in Article 12 shall include the following minimum information for each activity and each certified unit:

a) **name and type of the activity**, including name and contact details of the operator or group of operators;

b) **location of the activity**, including geographically explicit location of the activity boundaries, respecting 1:5000 mapping scale requirements for the Member State;

c) **duration of the activity**, including start date and end date;

d) **name of the certification scheme**, including its recognition decision referred to in Article 13, its rules and procedures and the list of appointed certification bodies referred to in article 11, and its annual reports referred to in Article 14;

e) reference to the **applicable certification methodology** referred to in Article 8;

f) expected **annual net benefit** referred to in article 4;

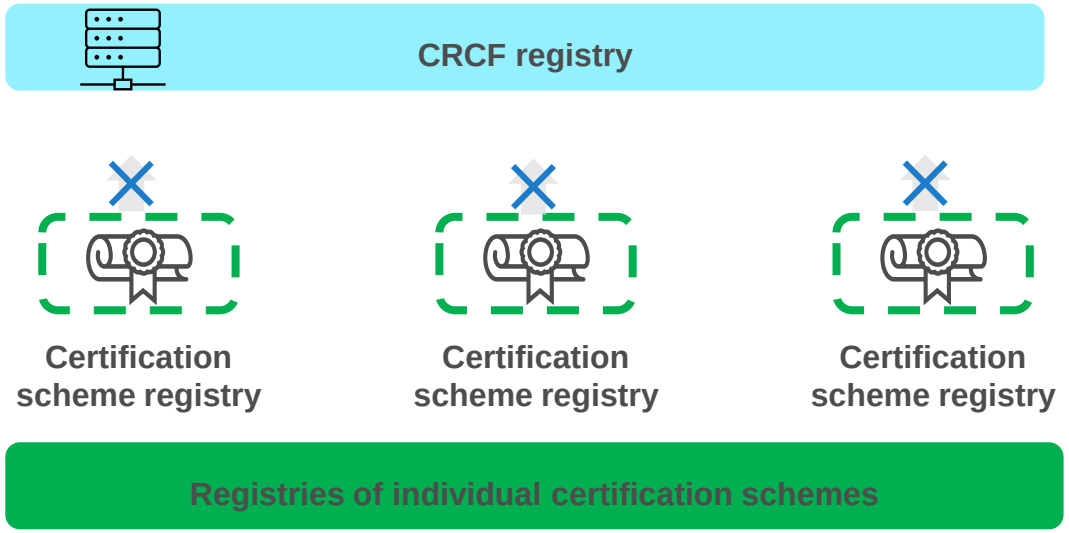
g) any **sustainability co-benefits** referred to in article 7;

h) **certification status**, including certificates of compliance and certification and recertification audit reports referred to in Article 9; **quantity and status of the certified units** (e.g. issued, retired, expired, cancelled, allocated to a buffer), and **end-use purpose** of the certified units and the using entity.

Scoping of CRCF registry

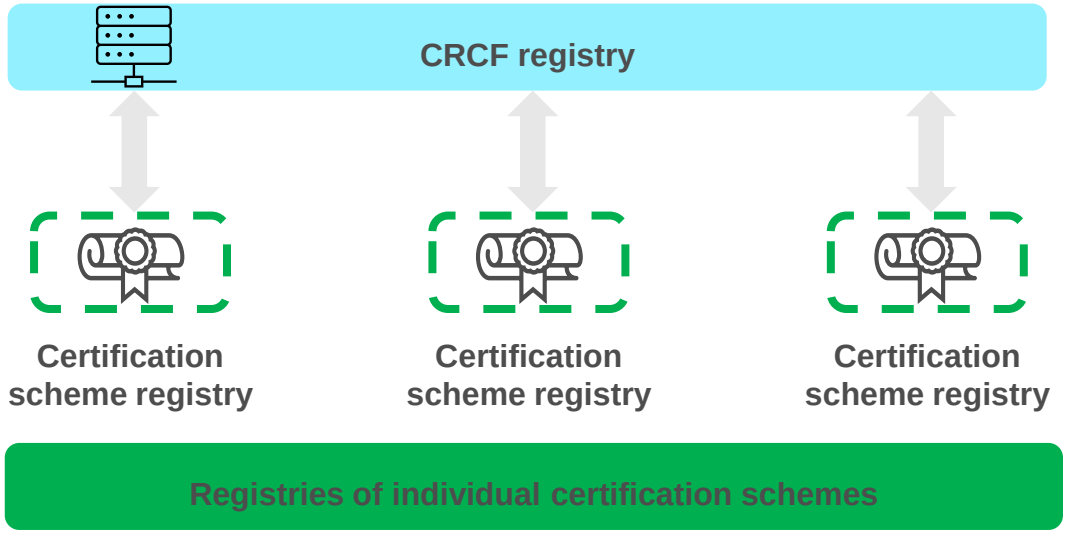
1 Full functionality option

- All operations are performed within the CRCF registry.
- No link required with certification scheme registries.



2 Central repository option

- All operations are performed in individual certification scheme registries. Issuance* performed by CRCF registry.
- Certification registries share data with CRCF registry.



*Issuance to be defined, could be done without two-way link of registries.

Next steps on verification rules (tentative)

- Vote in Climate Change Committee

More information:

- CRCF Hybrid Workshop: Rules on Verification and registries - European Commission (europa.eu)
- DG CLIMA website on Carbon Removals and Carbon Farming
- CRCF Regulation (linguist lawyer version): CO_TA (europa.eu)
- FAQ: a8abe1c4-a3c6-4c94-be0e-4b76f7fd0308_en (europa.eu)
- EU carbon removals newsletter