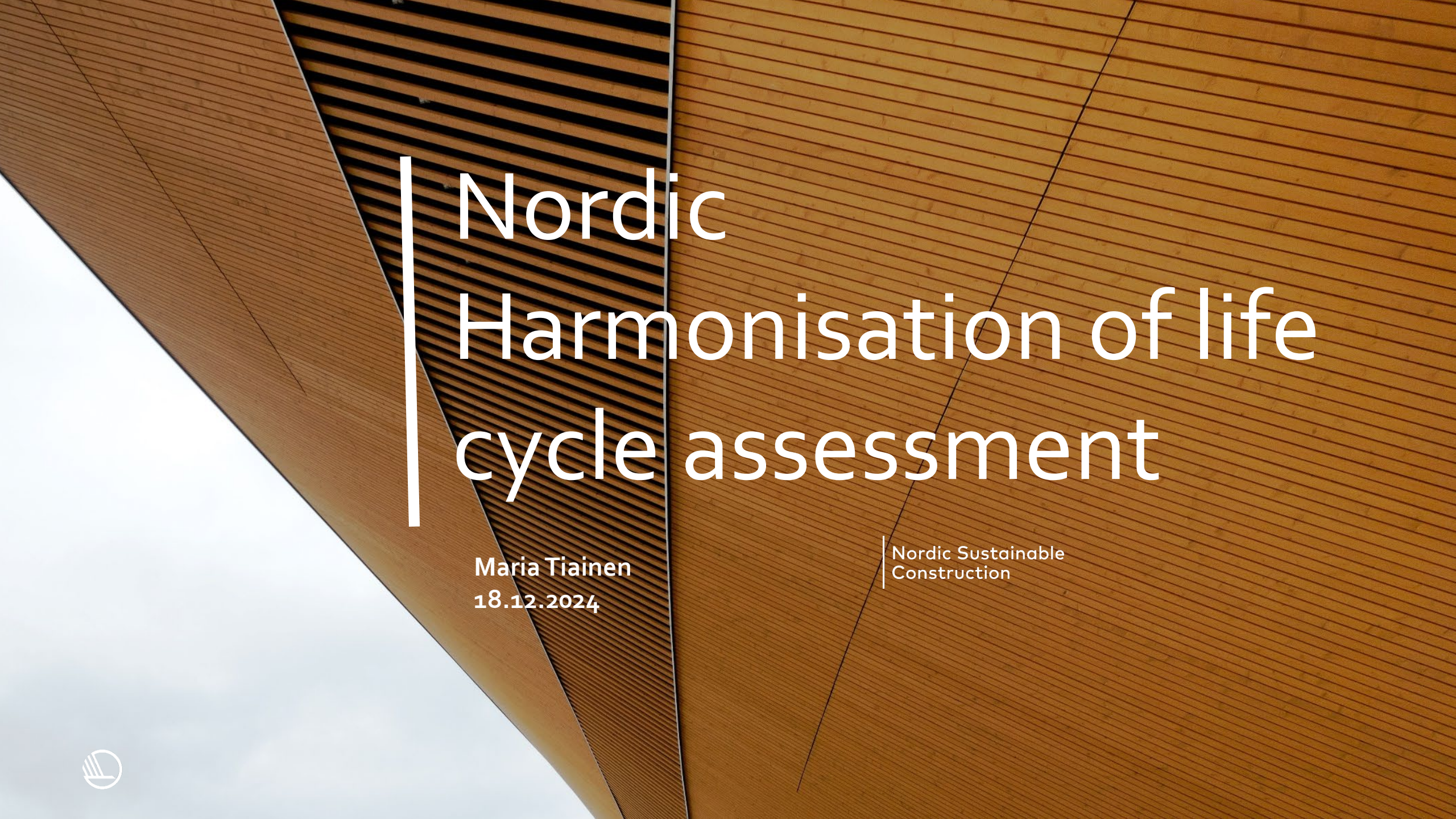


Nordic Harmonisation of life cycle assessment

Maria Tiainen

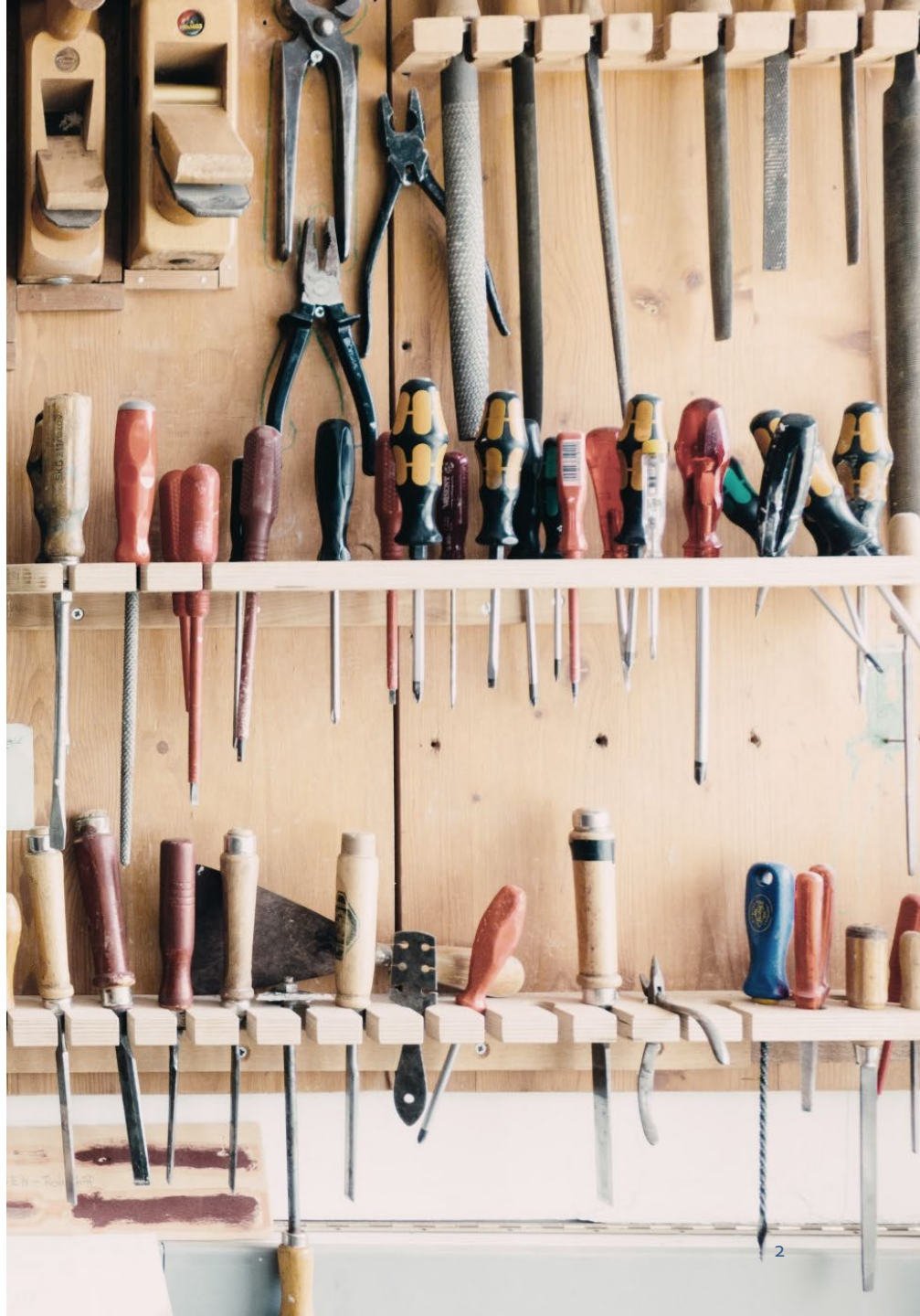
18.12.2024

Nordic Sustainable Construction

Nordic Sustainable Construction

- Nordic Sustainable Construction is a programme under the Nordic Council of Ministers

- Purpose:
  - accelerate the knowledge and capacity for a green transition in the Nordic construction sector
  - strengthen Nordic collaboration
  - ensure an aligned Nordic path



Work Packages

Nordic Harmonisation of Life Cycle Assessment

Harmonisation, regulation, digitalisation, limit values, climate reporting.

Circular Business Models and Procurement

Circularity in the construction industry and for public developer through capacity building.

Sustainable Construction Materials and Architecture

Opportunities and barriers to using wood and other biobased construction materials.

Emission-free Construction Sites

Diminishing emissions through regulation, harmonisation, research and practical guidelines.

Programme Secretariat and Competences for Reuse in Construction

Capacity building, strategic partnerships, knowledge sharing.

WP1 Nordic harmonisation of life cycle assessment

Task 1
Nordic LCA practices

- Feasibility study: how far to harmonise?
- Methodological harmonisation for normative needs
- Compatibility of building LCA and infrastructure LCA
- Timely importance for policymaking

Task 2
Database and scenarios

- Joint processes for gathering and verifying generic data
- Joint processes for setting lifecycle scenarios for normative LCA
- Interfaces to LCA tools

Task 3
Digitalisation of LCA

- Development of LCA guidance for BIM
- Development of national reference buildings into BIM
- Development of training models
- Coordination with BIM and other software developers

Task 4
Limit values

- Joint method for defining country-specific limit values where needed
- Joint process for reporting the climate impacts of Nordic built environment

Task 5
Acceleration Programme

- To accelerate the decarbonisation of building and construction sector

Thank you!

Ministry of the Environment Finland

Nordic Innovation

Form Design Center

Government of Iceland
Ministry of Infrastructure

Danish Authority of Social Services and Housing

Want to know more?

Visit our website www.nordicsustainableconstruction.com

Follow us on LinkedIn www.linkedin.com/company/nordicsustainableconstruction and on Twitter www.twitter.com/NordSustConstr

Or write us an e-mail: Nordicsustainableconstruction@sbst.dk

BEST PRACTICE CATALOGUE

Building LCA cases from the Nordic countries and Estonia

Launch webinar

18/12-2024

WORK PACKAGE 1

Nordic Harmonisation of Life Cycle Assessment

WORK PACKAGE 2

Circular Business Models and Procurement

WORK PACKAGE 3

Sustainable Construction Materials and Architecture

WORK PACKAGE 4

Emission-free Construction Sites

WORK PACKAGE 5

Competences for Reuse in Construction & Programme Secretariat

SWECO

Task 5
Acceleration Programme: Knowledge Sharing Clinics and Best Practice Catalogues

WORK PACKAGE 1

Nordic Harmonisation of Life Cycle Assessment

SWECO

Task 5.1
LOW CARBON CLINICS

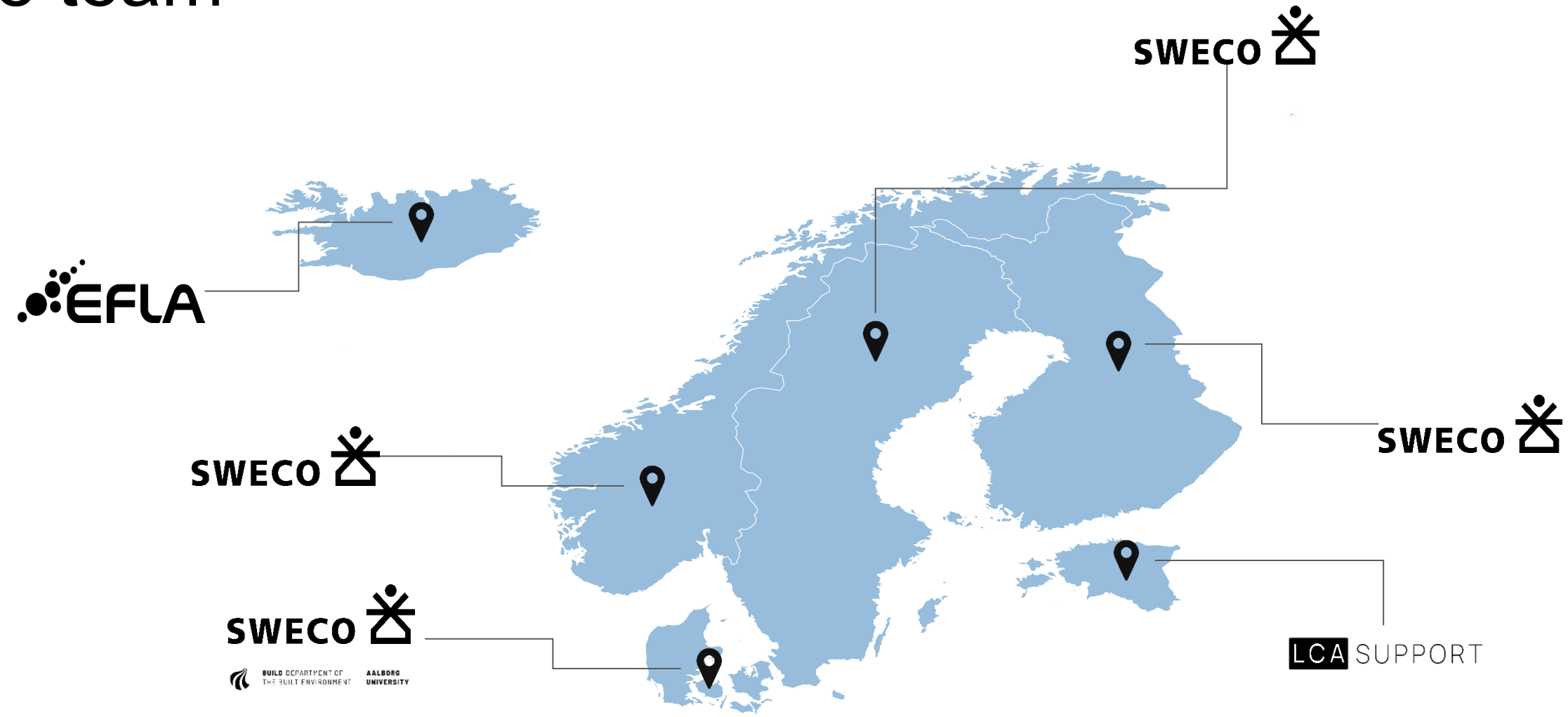
Task 5.2
BEST PRACTICE CATALOUGE

WORK PACKAGE 1

Nordic Harmonisation of Life Cycle Assessment

SWECO

The team



SWECO

The team

Nicolaj Hostrup Langkjær
Sustainability engineer and project manager

Task 5.1

Aims at increasing the know-how in the market

11 workshops for clients with projects in various building phases

Sharing real-life decarbonisation solutions and challenges

Task 5.1
LOW CARBON CLINICS

Launch webinar
23rd of January 2025

https://www.nordicsustainableconstruction.com/

https://www.linkedin.com/company/nordicsustainableconstruction/posts/?feedView=all

SWECO

Task 5.2

Create a catalogue of low carbon buildings from the Nordic countries and Estonia, assess their impacts, and document applicable solutions

Projects were gathered and evaluated to ensure various typologies and low carbon solutions

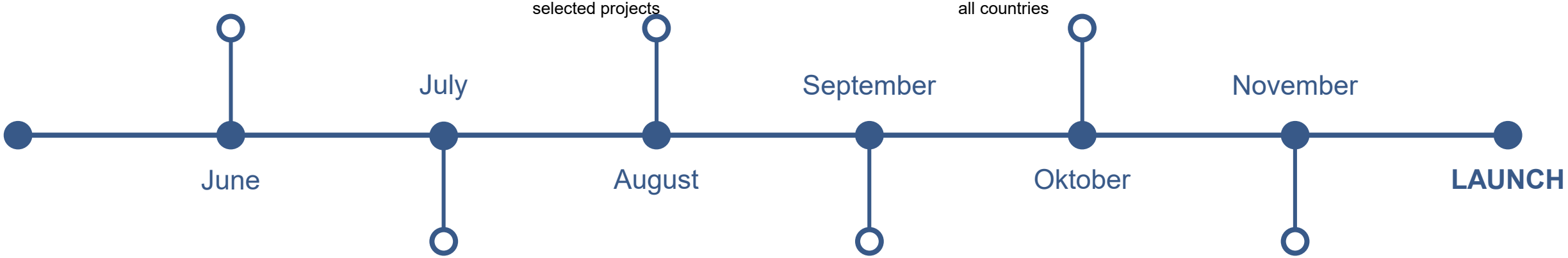
Share low carbon solutions among countries, highlighting regional differences and encouraging their exchange

SWECO

Webinar
First webinar was hosted
- Informing about the project
- Sign-up links

Project selection process
Still contacting clients (summer holiday)
- Review registered projects
- Send data collection sheets to selected projects

Evaluation of the selected projects
Drafting first graphs
- Identifying differences in the countries
- Adjusting graphs to be suitable for all countries

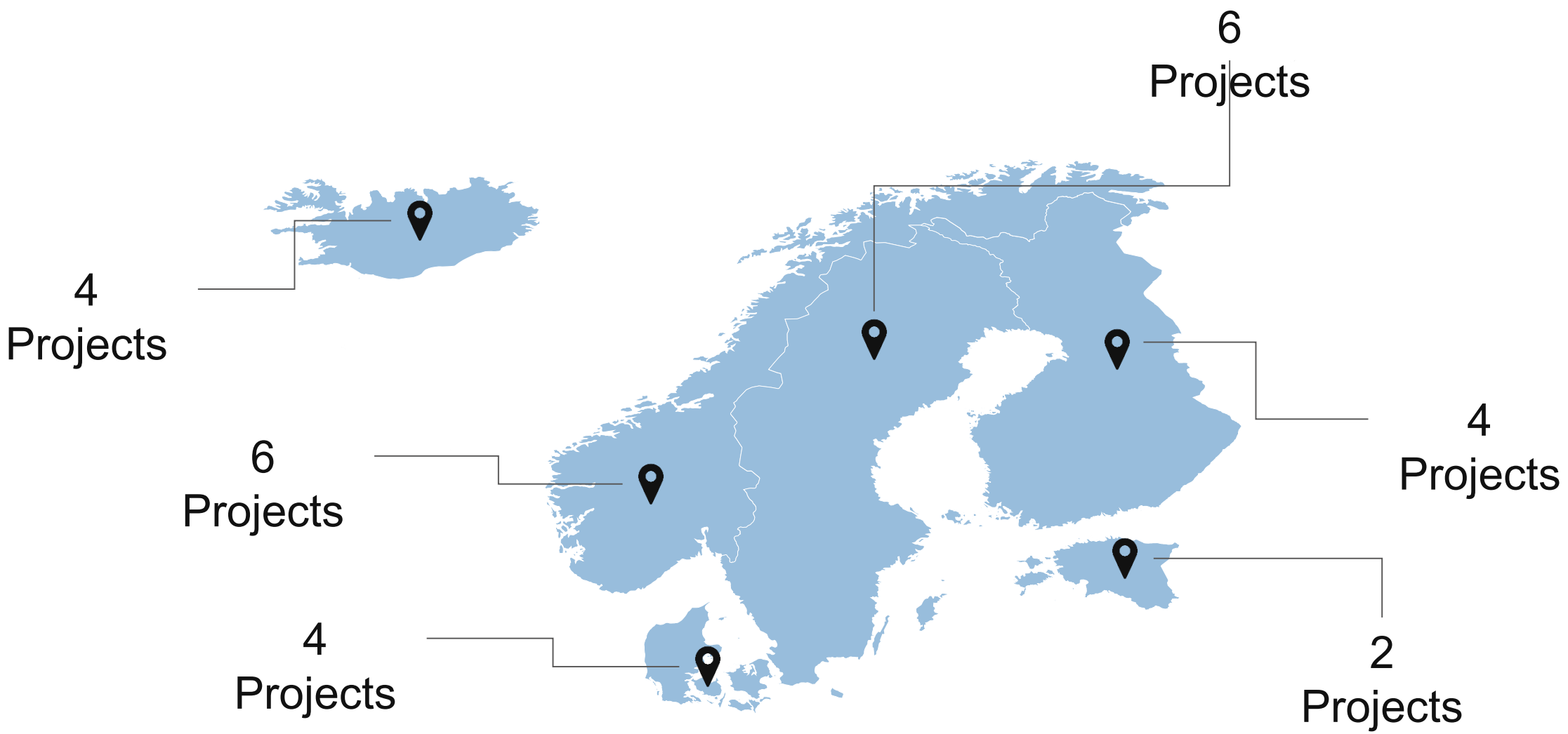


Sign-up period
Contacting customers and partners to inform them about project registration
- What do they gain from participating?
- Develop data collection sheets

Evaluation of the selected projects
Review of projects and data collection sheets
- Adaptation of data collection in different countries

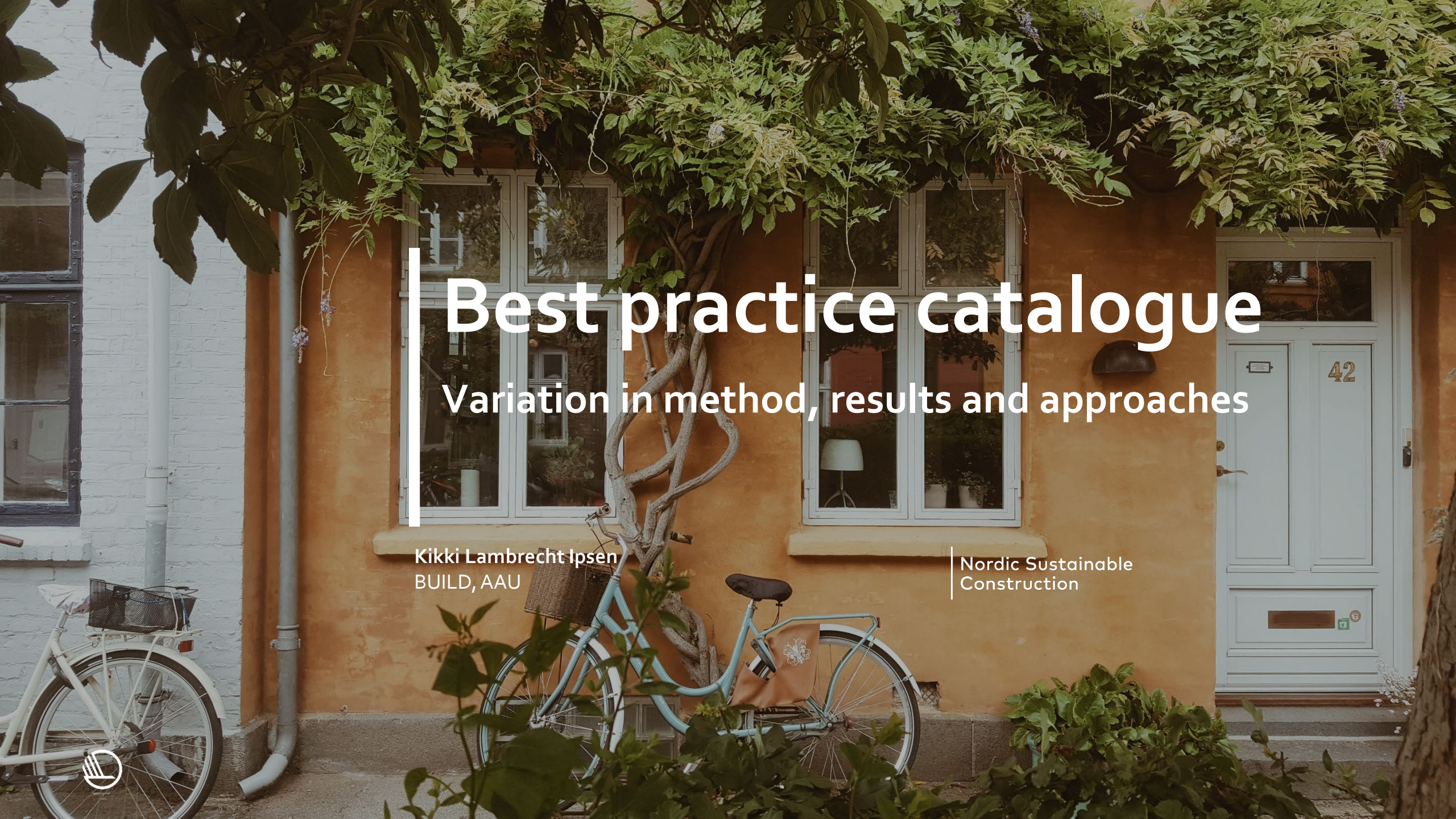
Drafting of catalogue
The final graphs were created and information gathered
- Several proofreading sessions
- Final catalogue send to publisher

SWECO



Best Practice Catalogue – Building LCA cases from the Nordic countries and Estonia

SWECO



Best practice catalogue

Variation in method, results and approaches

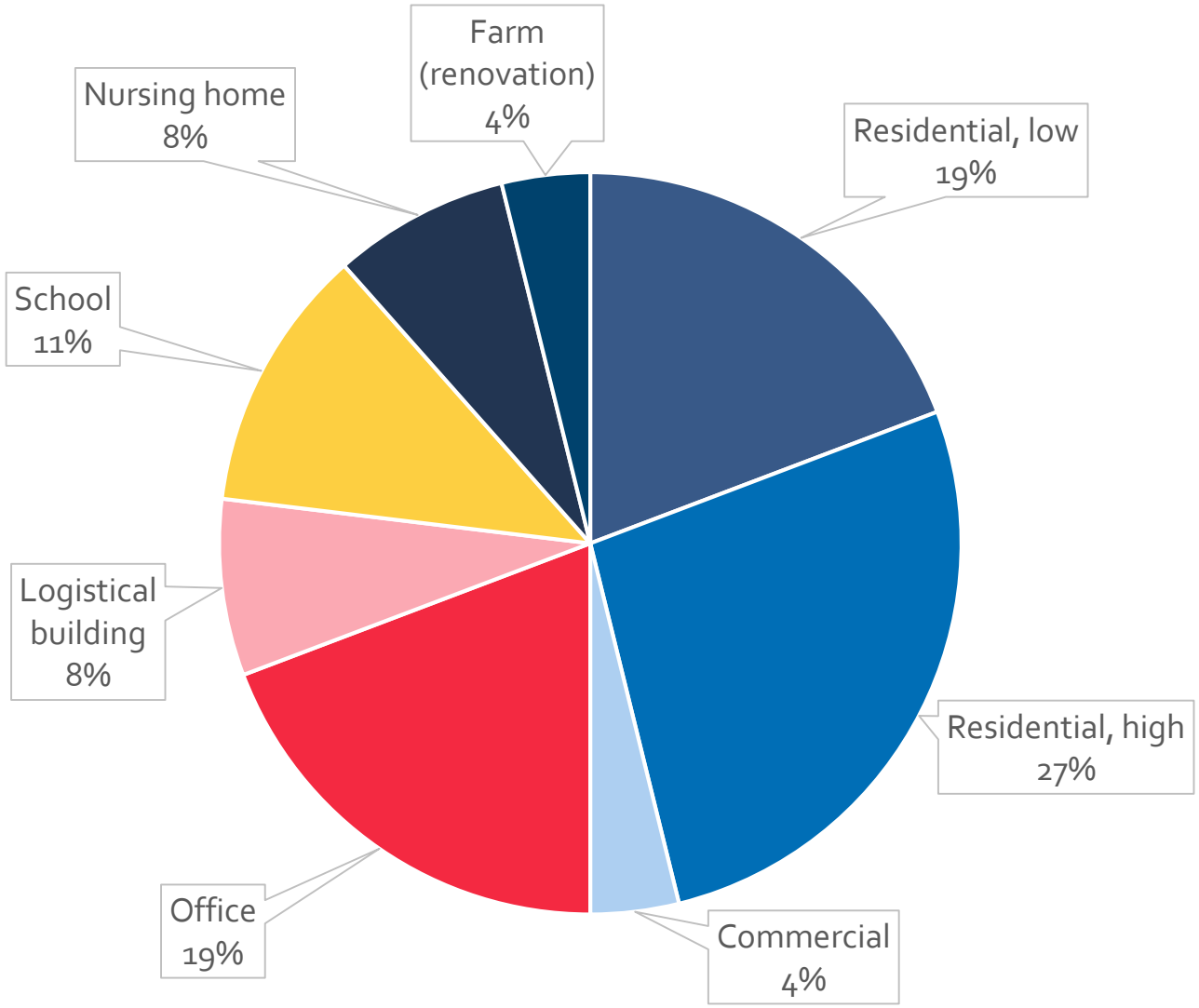
Kikki Lambrecht Ipsen
BUILD, AAU

Nordic Sustainable Construction

The different types of buildings

There are 26 cases in the catalogue

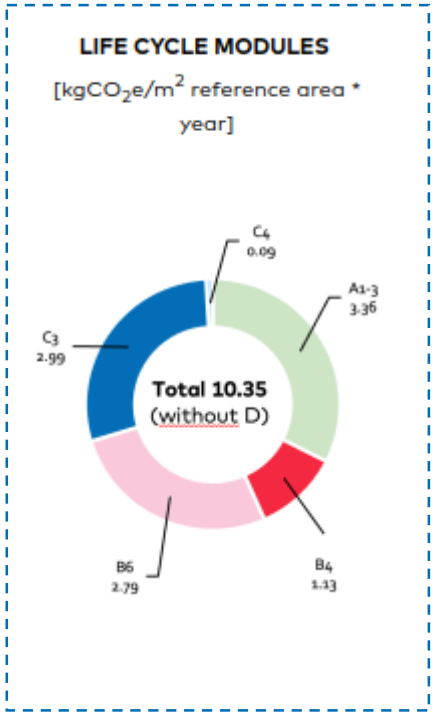
Most of the cases are new construction



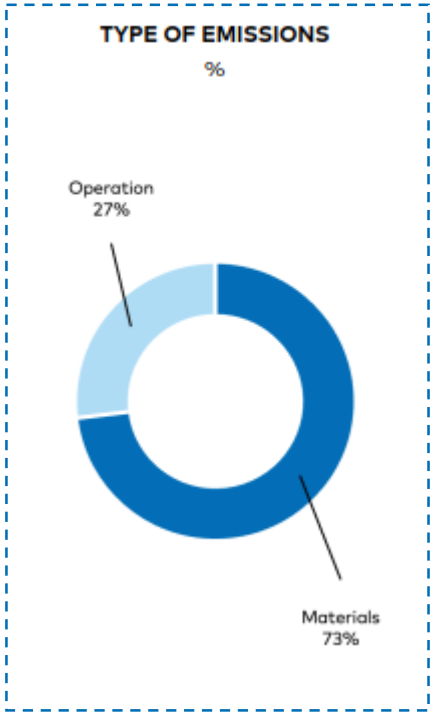
LCA results in catalogue

What type of emission occur and when

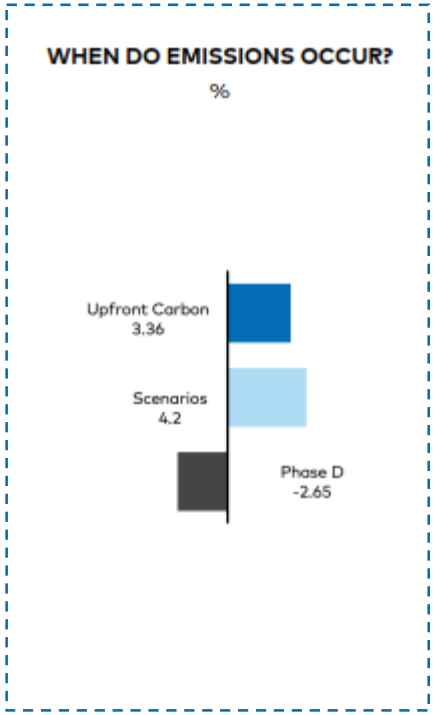
Total Global Warming Potential (GWP) for all included life cycle modules.



Total GWP divided into operation (B6, B7) and materials (A1-A5, B1-B5, C1-C4).

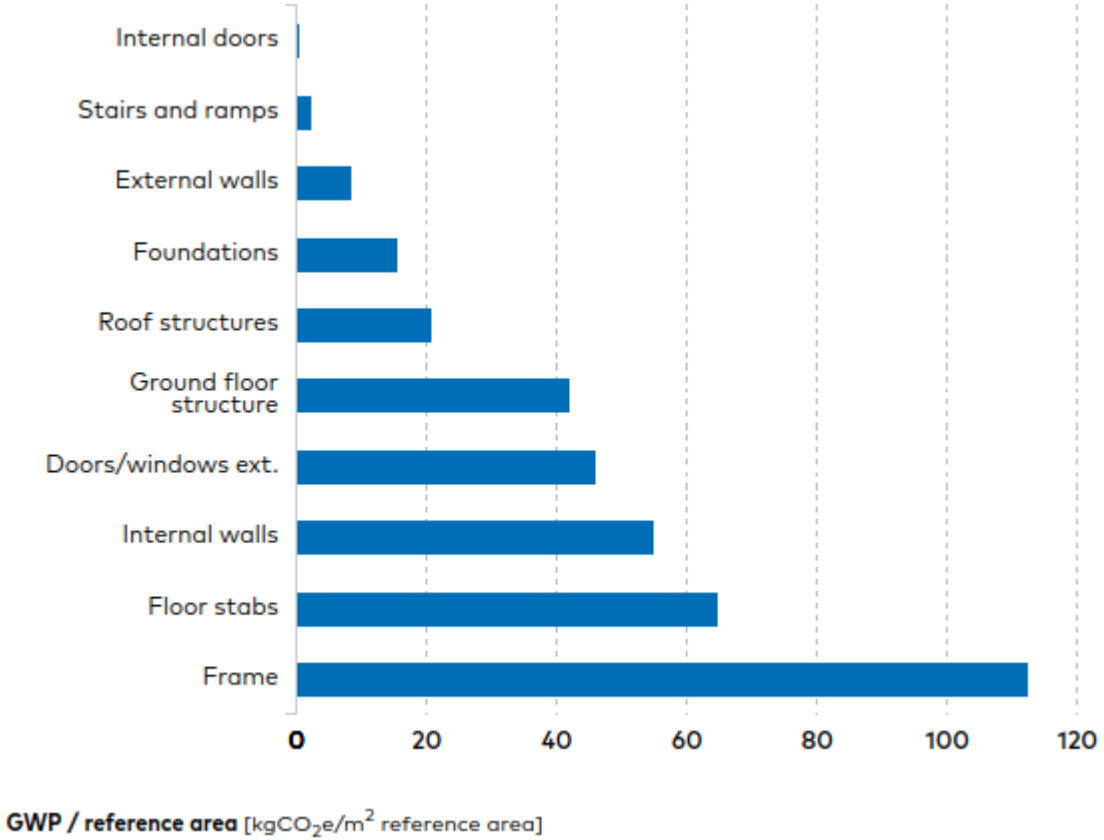


Total GWP divided into upfront carbon (A1-A5) and future scenarios (B1-B5, C1-C4), while D is shown separately.



LCA results in catalogue

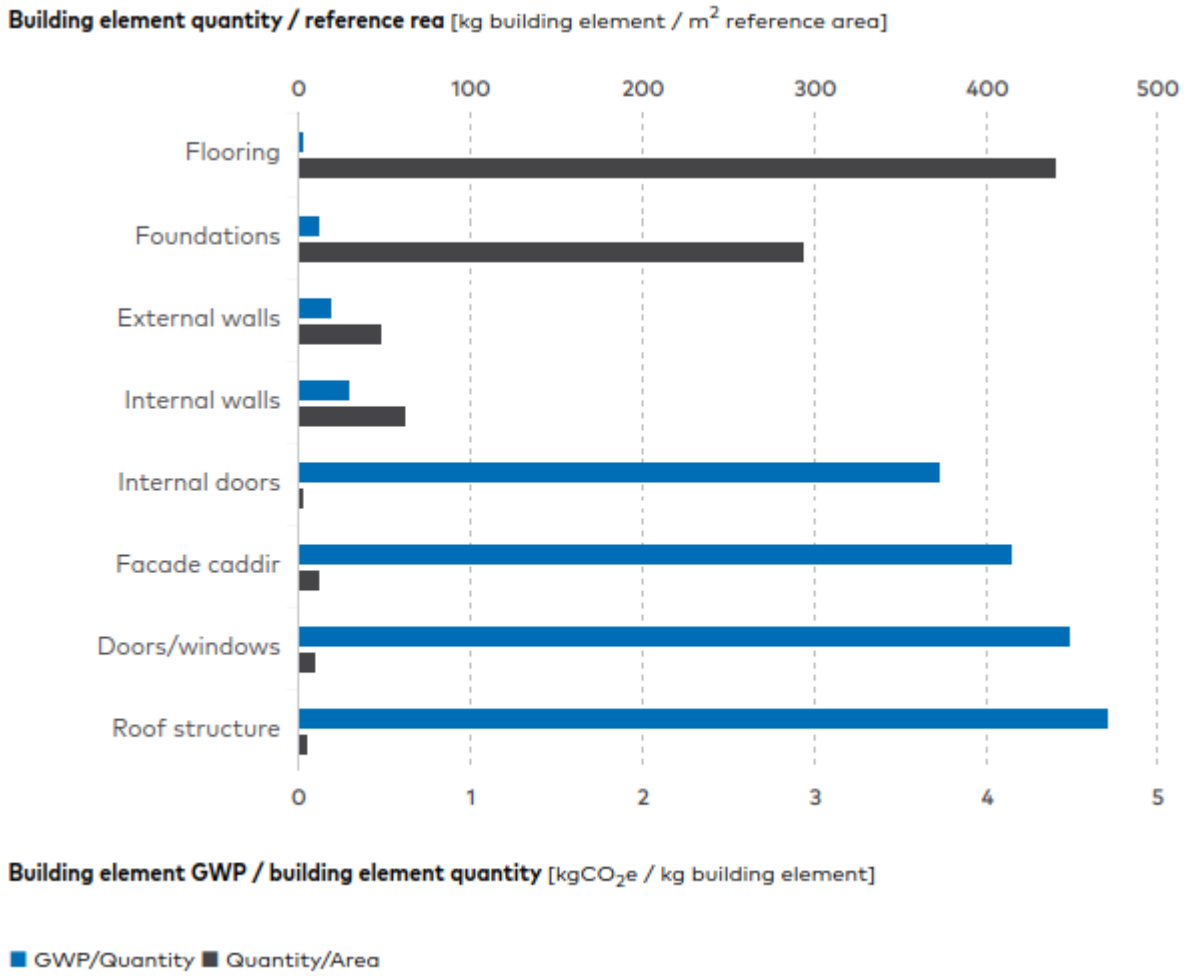
Impact of the building elements



GWP of building elements for all material-related impacts (A1-A5, B1-B5, C1-C4) in the project.

LCA results in catalogue

Carbon intensity of building elements versus element weight per reference area



Blue scale: GWP per element quantity, meaning carbon intensity of one unit of an element relative to its weight.

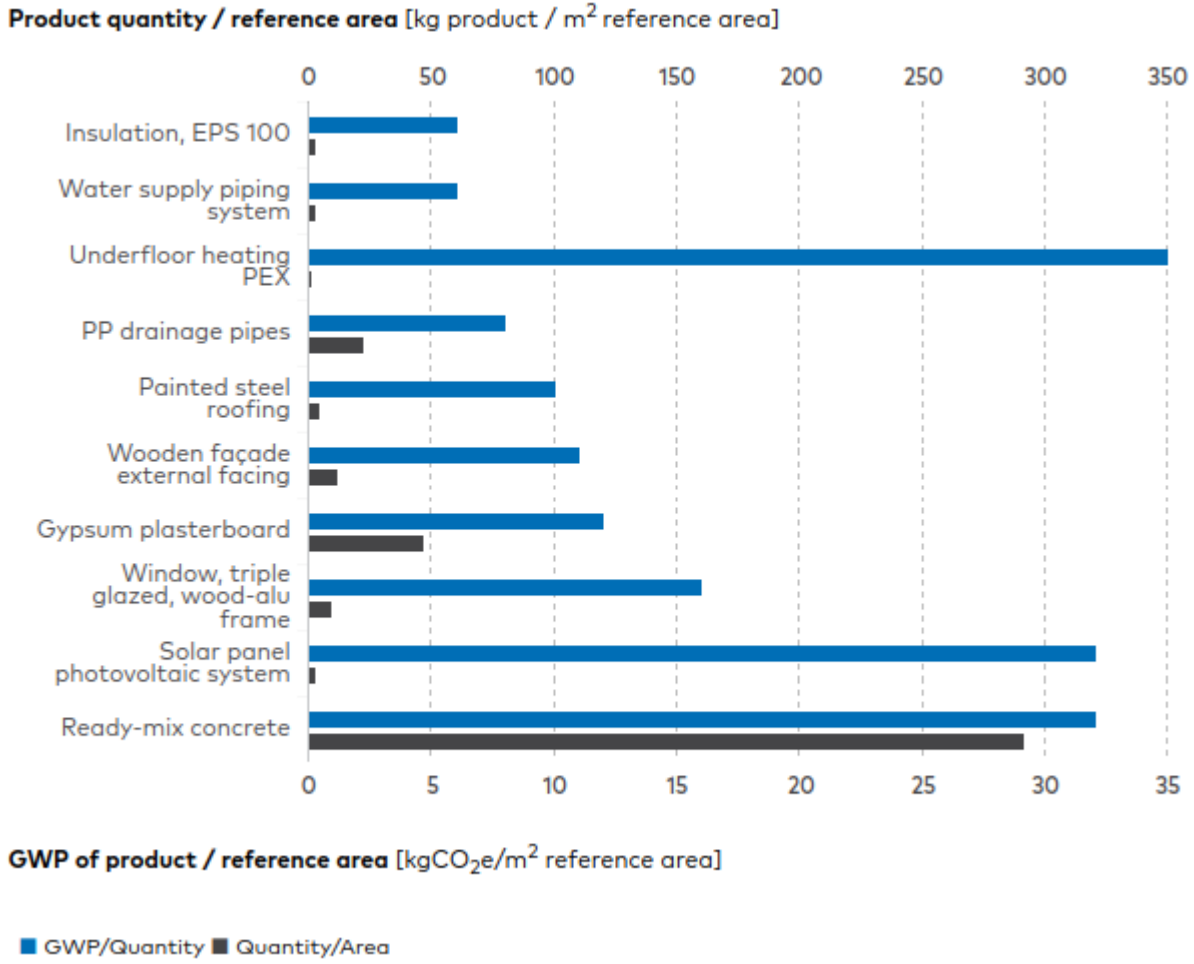
Black scale: Element quantity per building reference area, meaning weight per building unit.

LCA results in catalogue

Carbon intensity of building product versus product weight per reference area

Blue scale: GWP per building reference area, meaning carbon intensity of products.

Black scale: Product quantity per building reference area, meaning weight per building unit.



Variation in method

Comparison of the LCA results across cases should always be done with the variations of the used method in mind:

- Variation in included modules (life cycle stages)
- Variation in included building components
- Other variations in method
  - GWP indicator
  - Climate impact data
  - Decarbonization scenarios – energy and materials
  - Exported energy

Table 1: Overview of main methodological aspects

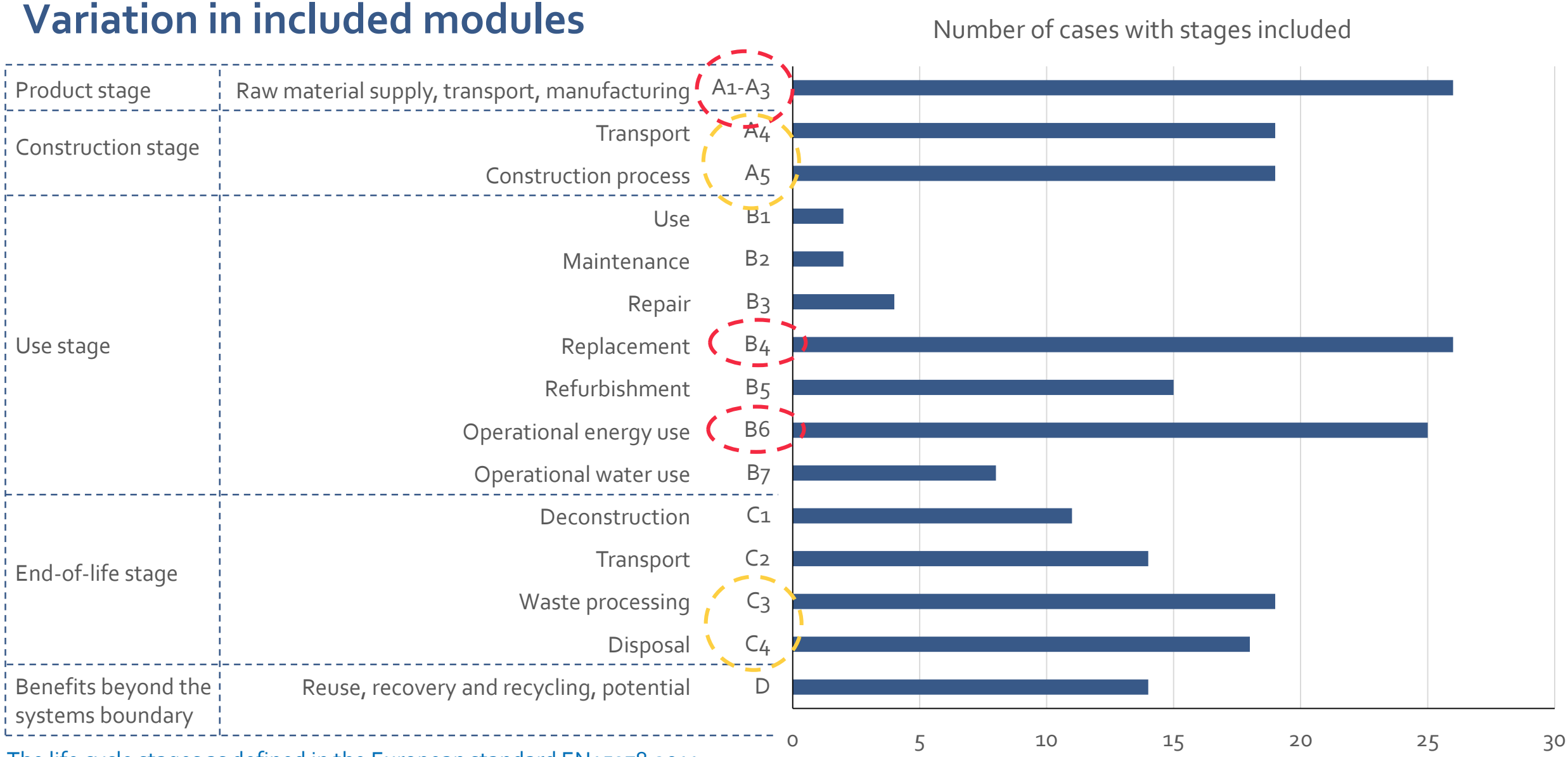
		Type	Stages included	Elements excluded	Area definition	GWP indicator	Generic material emission data	Decarb. scenario (energy)	Decarb. scenario (materials)	Exported energy included
01		School	A1-A3, B4, B6, C3, C4, D	FF, SG	GFA / HFA	GWP-total	Yes, +EPDs	Yes	No	Module D
02		Renovation farm	A1-A3, B4, B6, C3, C4, D	BS, FF, SG	GFA / HFA	GWP-total	Yes, +EPDs	Yes	No	Module D
03		Residential low	A1-A3, B4, B6, C3, C4, D	FF, SG	GFA / HFA	GWP-total	Yes, +EPDs	Yes	No	Module D
04		Residential high	A1-A3, B4, B6, C3, C4, D	FF, SG	GFA / HFA	GWP-total	Yes, +EPDs	Yes	No	Module D
05		Commercial	A1-A5, B4, B4-B6, C2-C4	N/A	HFA	GWP-total	Yes, +EPDs	Yes	No	N/A

Assessment method in the cases

For each case we more or less show the same info as is in table 1.

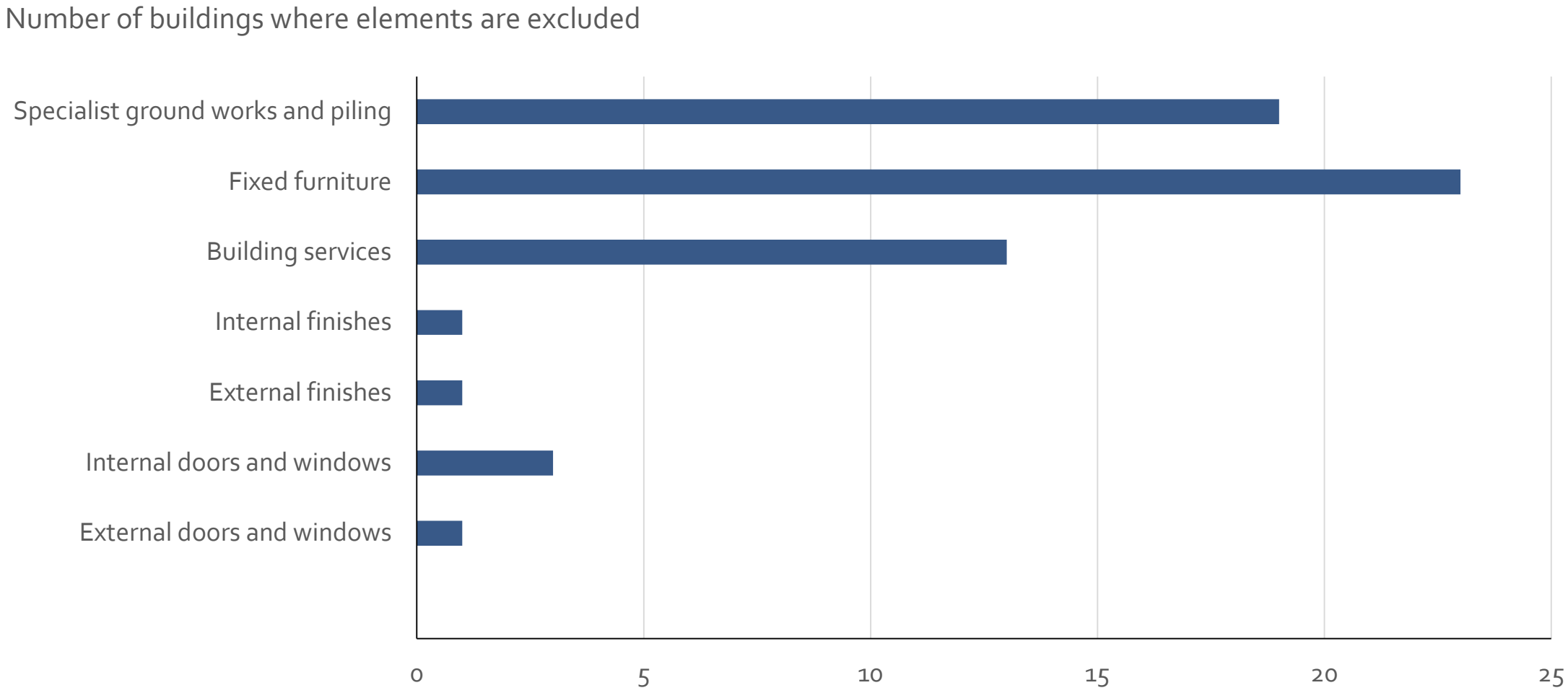
LCA scheme compliance	–
LCA tool version	LCAbyg 5
Life cycle stages included	A1-A3, B4, B6, C3, C4, D
Material emission data	EPD and generic Danish database (from LCAbyg and DGNB)
Material decarbonisation scenario	–
Energy calculation method	According to building regulations
Energy, dynamic scenario	Dynamic development of energy supply according to frozen policy, based on an official national report

Variation in included modules



The life cycle stages as defined in the European standard EN15978:2011

Variation in included building elements



Other variations in method

GWP indicator

The countries currently uses different scope for GWP

GWP-total (includes biogenic carbon, and emissions from land use and fossil fuels)

GWP-GHG (includes emissions from land use and fossil fuels)

Climate impact data

Information on the specific use of EPDs have not been collected

Product specific EPDs

EPDs from national industry associations

Generic environmental data

Decarbonization scenarios – energy

Current or future emissions from energy use

Planned renewable conversion of production for electricity, district heating and gas.

Relevant for calculating B6

Several of the methods include scenarios for gradual decarbonization

Decarbonization scenarios – materials

Materials used in future processes

Relevant for example for B4 (replacement)

Only one of the used methods, FutureBuilt, incorporate these scenarios

Exported energy

The portion of renewable energy generated on site that is send to the energy grid

Current approached vary across certifications systems and regulations

Involves considerations about how saving are allocated and supply chain impact

Carbon mitigation measures in the cases

Renewable energy systems

Material efficient design

Bio-based materials

Transport supply chain

Carbon optimized conventional products

Reuse, recycling, recovery

Collaboration

Other measures

Cross-case analysis

Table 2: Carbon mitigation measures in the case projects

Identifying the product

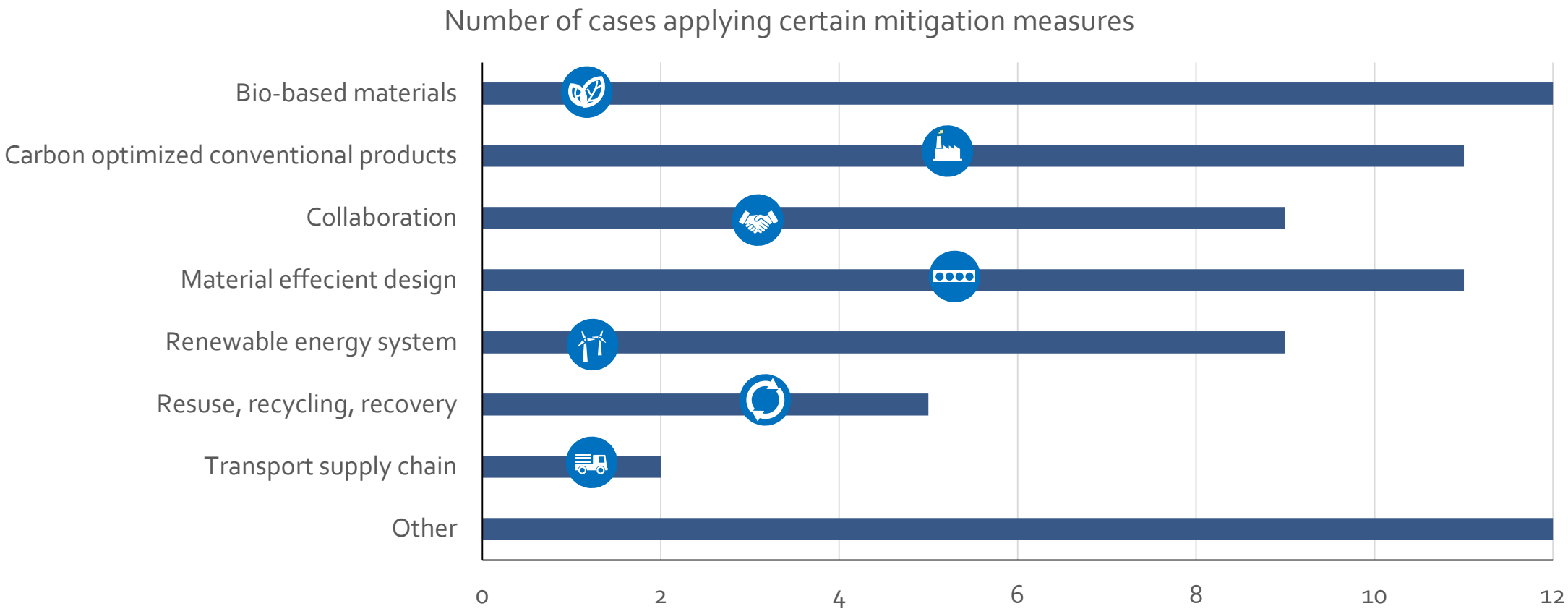
Explanation of carbon mitigation measure

Identifying the carbon mitigation measure

Case	Country	Building type	Types of whole-life carbon reduction measures
01	Denmark	School	Extensive use of wood (columns, beams, façade cladding, interior).
02	Denmark	Renovation farm	Use of traditional, local materials (i.e. oakwood and a straw roof) that reduce transportation emissions
			The farmhouse is built using over-dimensioned oakwood and a straw roof
			Restoration as a pilot project by The Agency for Culture and Palaces indicates an emphasis on sustainable practices in the conservation of heritage buildings
03	Denmark	Residential low	Optimised building design, with focus on available knowledge and materials, can reduce the climate footprint and improve the indoor environment compared to the current practice.
			Use of CLT in the walls and roof, and with a ground screw foundation
			Optimal use of natural ventilation through placing windows and openings in the interior structure

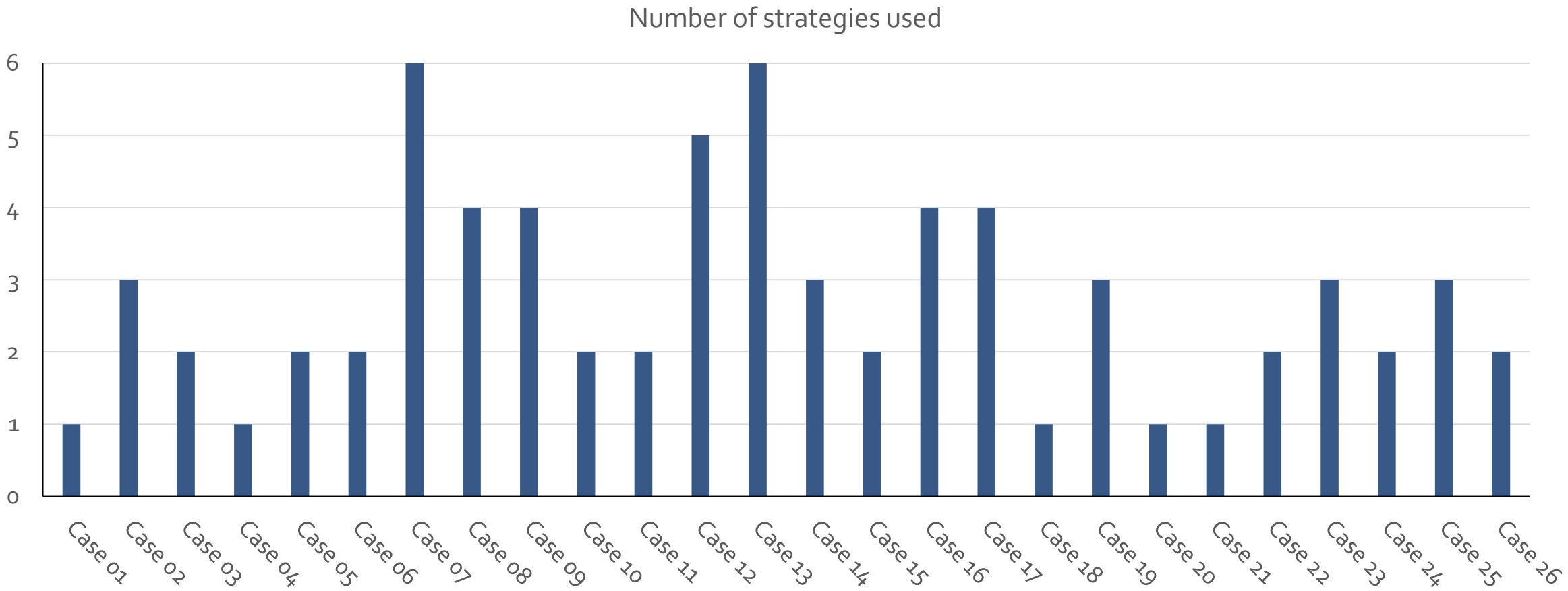
Carbon mitigation measures

How many cases uses the mitigation measures

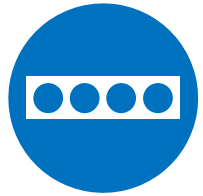


Carbon mitigation measures

How many measures does the cases apply



Example: Material efficient design



Office:

Flexible layout design to allows tenants to modify the space according to their needs

Modular dimensions for installations to ensure efficient use of materials and easier future adaptations

Slimmed-down structure

Residential high:

Prioritisation of low-tech solutions

Multifunctional spaces to allows for adaptable use, and reduce the need for additional buildings or modifications in the future

Different building types:

Use of the FutureBuilt certification program which have the goal to reduce CO_2 emissions from energy use and materials

Logistical building

Specific use of building elements: Sheet metal sandwich wall elements with a stone wool core and concrete slab without joints and reinforcement.

Residential low:

1. Optimised key building components

2. Optimised building design

Example: The other measures

Energy-efficient design. Green roofs to mitigate the urban heat island effect and reduce the need for cooling

Building performance monitoring with sensors

AI-based energy management

Energy-efficient systems to reduce operational energy use

Focus on low energy consumption during operation

Long-term climate impact evaluation to support ongoing improvements in sustainability

Passive ventilation design promoted through the building's unique geometric design

Early LCA calculation to identify carbon impact-material hotspots**, follow-up on carbon intensity and energy use** three years after completion

Optimal use of natural ventilation through placing windows and openings in the interior structure

Want to know more?

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- Follow us on LinkedIn www.linkedin.com/company/nordicsustainableconstruction
- Or write us an e-mail: Nordicsustainableconstruction@sbst.dk