Nordic Sustainable Construction

Program

Introduction of Nordic harmonisation of life cycle assessment	Maria Tiainen, Finnish Ministry of the Environment
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Q&A and open discussion	

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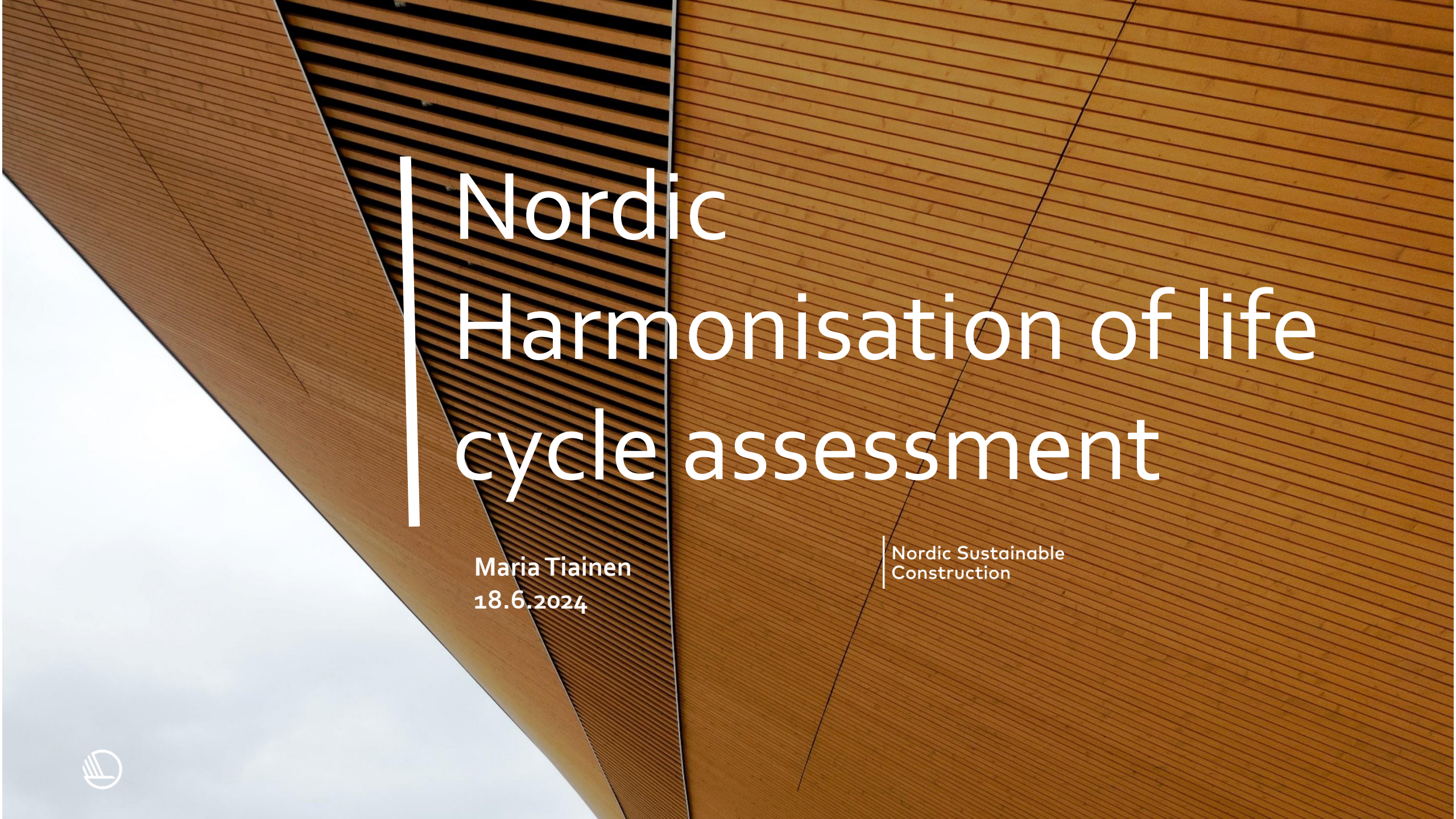


Nordic Harmonisation of life cycle assessment

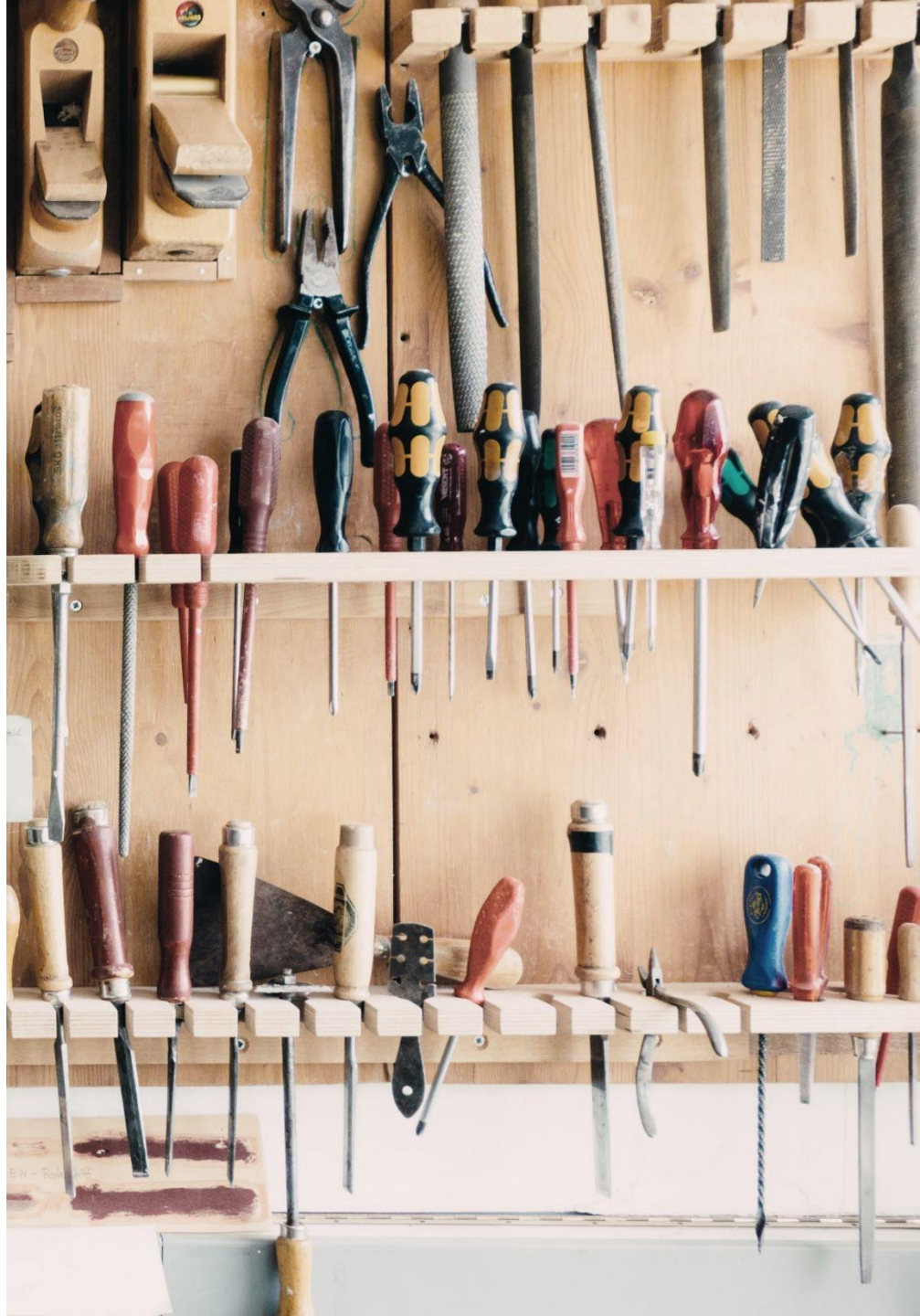
Maria Tiainen
18.6.2024

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

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Ministry of Infrastructure

Danish Authority of Social Services and Housing

Nordic Sustainable Construction - financed by Nordic Innovation, an organisation under the Nordic Council of Ministers

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Project overview

— The main objective of the project is to seek a common Nordic understanding of the establishment and maintenance of data for environmental assessment of buildings.

— Report for LCA experts and authorities – common base for discussion

Project scope

Common Nordic approach for LCA data

- Review of European development
- Nordic process for typical and specific data
- Nordic approach to life cycle scenarios
- Interoperability of data

New data and principles

- Data for vegetation
- Defining sustainable forestry
- Data for old buildings

Nordic view on data needs and scenario settings for full life cycle building environmental assessment

Authors:

Martin Erlandsson, Frida Görman, Åsa Thrysin, Tarja Häkkinen, Klas Eckerberg, Janne Pesu, Malin Dalborg, Johan Asplund

And annexes with the additional authors:

Tarja Häkkinen

Klas Eckerberg, Tommi Kaartinen, Allan Schiøtz, Trine Dyrstad Pettersen

Ashraful Alam, Martin Erlandsson, Per Erik Karlsson, Eskil Mattsson, Heli Miettinen, Miia Mänttäri, Frans Silvenius and Eeva-Maria Tuhkanen

Per Erik Karlsson, Eskil Mattsson, Martin Erlandsson

Sirje Vares, Jarmo Linjama, Janne Pesu

Other contributors:

Maria Balouktsi, Nicola Francart, Kai Kanafani, Anni Oviir, Anne Rønning, Ólafur Ögmundarson

News

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2023
2024

News

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Vælg år

RECOMMENDATIONS FOR A COMMON NORDIC LCA-APPROACH

NEW REPORT: Recommendations for a Common Nordic Approach to Combat New Buildings Life Cycle Climate Impact

Publiceret 17-06-2024

News WP1

A new report highlights the potential in a common Nordic way to report the climate impact for a building and its full life cycle. This pioneered approach could...

Link to report:

NEW REPORT: Recommendations for a Common Nordic Approach to Combat New Buildings Life Cycle Climate Impact | Nordic Sustainable Construction

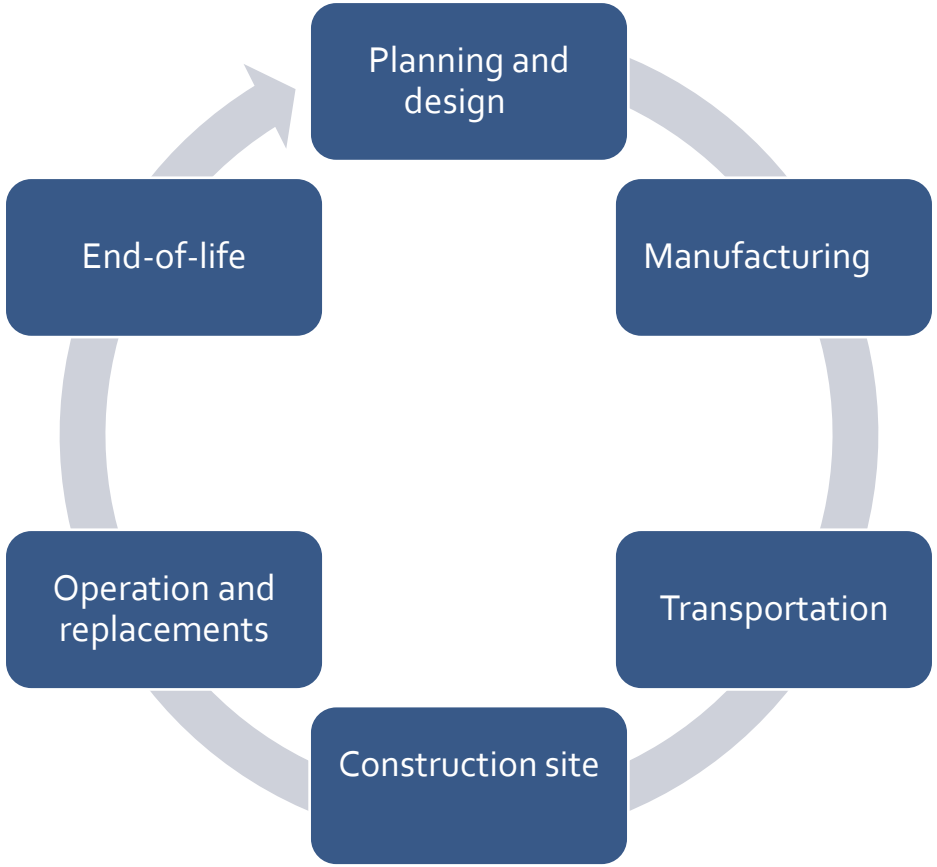
Nordic view on data needs and scenario settings for full life cycle building environmental assessment

About this publication
PDF

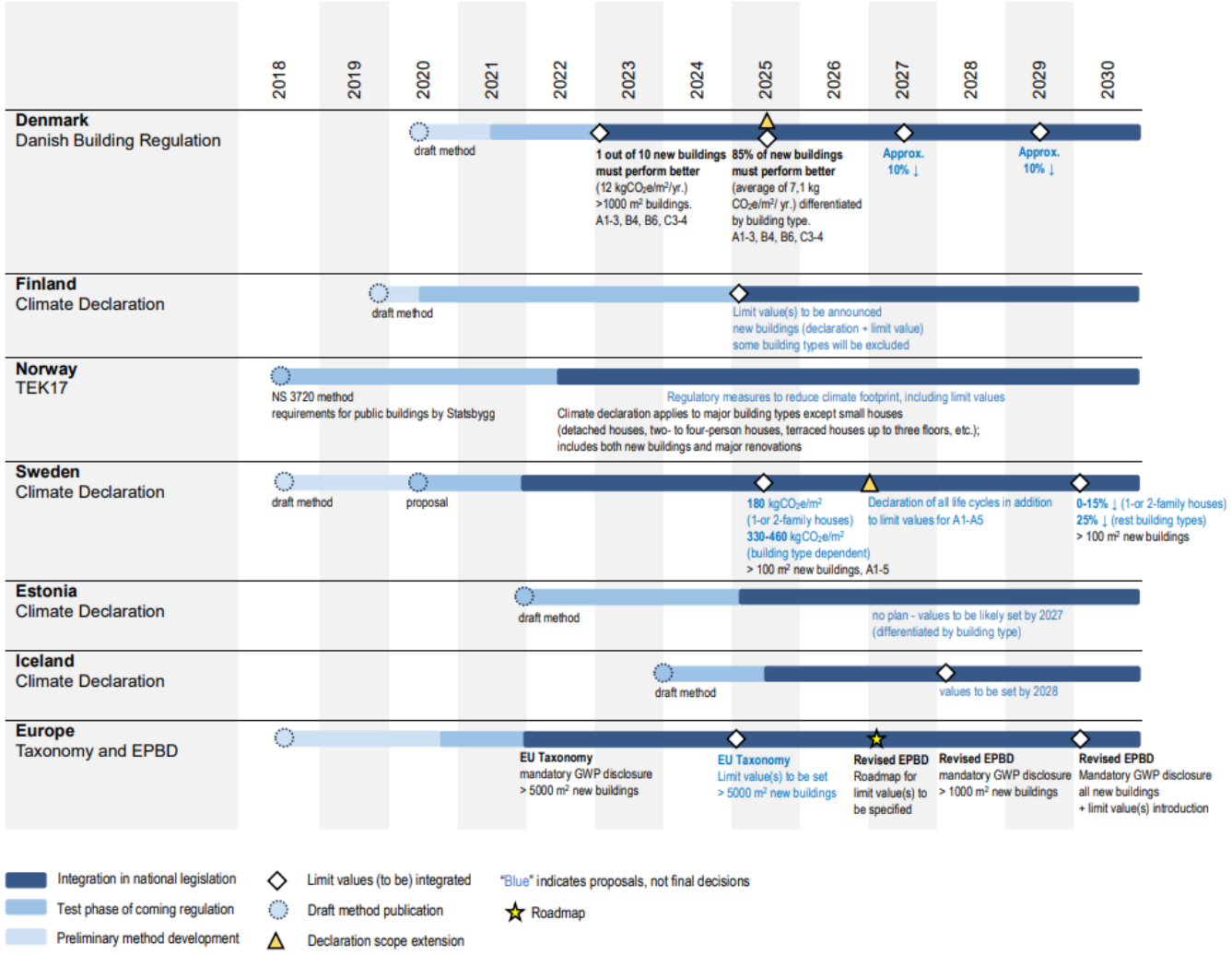
Why?

Lots of stakeholders
Lots of action
Lots of data sources
Lots of tools
Lots of calculations
Lots of regulation

We need a firm foundation
Nordic view and input to EU



Climate declaration and limit values



Nordic Sustainable Construction: Nordic Timeline regulations updated.pdf (nordicsustainableconstruction.com)

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Recommended Nordic approach to GWP data and life cycle scenarios —WP1 Task 2

Martin Erlandsson, IVL Swedish Environmental Research Institute

Disposition

- Implementation of the project
- Standards and legal requirements
- General principals
- Scenario settings
- Methodology specifications
- (Data needed for a full life cycle is presented separately in this webinar)
- Hot spots
- Reference to details, see report

Project layout of the and sister project

Nordic and Estonia	Swedish sister project
Draft scenario, data and methodology setting	Draft scenario, data and methodology setting
Workshops for national experts + authorities	Workshops for project members
Interoperability expert workshops: Classification + DPP format	Pilot calculations
Draft report remitted to authorities	Draft report on open public consultation

The European legal context

Construction products

— Construction products: CPR Acquis

Buildings

— EC Taxonomy, >5,000 m^2, GWP A-C, kg $CO_2e/(m^2 \cdot y)$ and 50 years:
  - EN 15978; methodology, scenario settings etc
  - Level(s); inventory scope, calculation tool

— EPBD: life-cycle GWP, kg $CO_2e/(m^2 \cdot y)$ and 50 years
  - EN 15978; methodology, scenario settings etc
  - Level(s); inventory scope, calculation tool
  - 2025: specifications in the delegated act
  - 2028: declaration A-C for all new public buildings >1,000 m^2
  - 2030: declaration and limit value A-C for all new buildings and renovations that achieve A+, >50 m^2 etc

EPBD certificate listed indicators

Mandatory:

— the **integrated life-cycle GWP indicator** for stage A to C [kg CO_2e/(m^2·year) 50 years]
— **operational greenhouse gas emissions** [kg CO_2e/(m^2·y)]

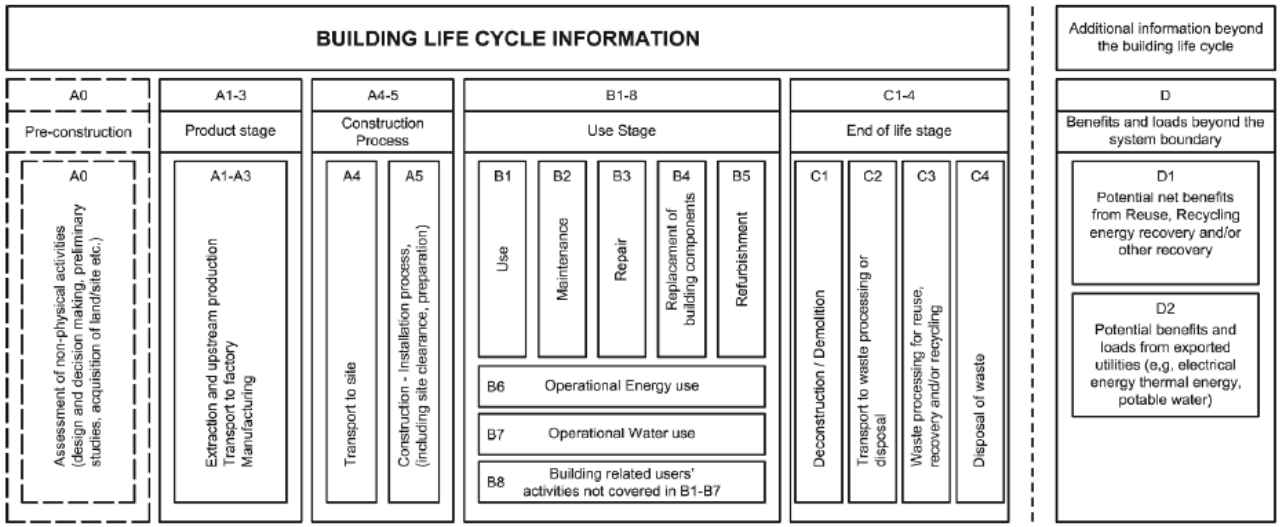
May be reported:

— information on carbon removals associated to the **temporary storage of carbon** in or on buildings
— a '**digital building logbook'** that means "… a common repository for all relevant building data, including data related to energy performance, such as energy performance certificates, renovation passports and smart readiness indicators, as well as on the life cycle GWP, which facilitates informed decision-making and information-sharing within the construction sector, among building owners and occupants, financial institutions and public bodies

The project suggest:

— A **data quality indicator** that specifies the amount of real primary data used in the calculation of the building 'as built', module A1-A5.
— Divide the integrated life-cycle GWP indicator result for 50 y [kg CO_2e/m^2], module by module and into different building system parts as part of a '**transparency reporting**', for supervision and/or as part of the additional limit value for the construction stage (A1-5).

Transparency reporting – prEN 15978



Building parts

- A 'transparence reporting'/'climate declaration' is recommended
- Calculations control require that the information also need to be combined with a KPI per building part (per m^3 etc), why a common classification system is needed
- The suggestion is to follow the international classification system IEC/ISO 81346.
  → Mapping to national systems and building parts listed in prEN 15978 are listed in Annex 3.

Transparent reporting to support comparison module by module

— **GWP-GHG per module is reported**: To make the result comparable per information module is also needed and therefore suggested to report the result per module based on GWP-GHG →Support; fair comparison among materials and (compared to GWP_{total}) allow comparison of the result from the constriction stage A respective end-of-life stage C comparable across different building. It also allows to add limit value for the e.g. the construction stage as complement to the whole life cycle, as a more precise and verifiable instrument (Life-cycle GWP_{total} A to C is equal to GWP-GHG A to C)

Supervision/auditing - fair competition

- Amount bought resources/products to sight 'as built' need to be (digitally) verified. A mapping is required for bought products to the representative generic data
- If advised generic data is replaced by specific EPD data (or generic data is missing) it has to be proved that the EPD is representative for the product article bought
- Where generic optional scenario settings are used these have to be motivated and approved
- 1) A transparence reporting with a granularity type "building element type" is needed (per m^3 etc), if a digital supervision on the LCA result A1-3 shall be made. 2) Cut –off criteria has to be defined and of be proved*. These specifications can be made based on a international common classification system as IEC/ISO 81346
- A personal reflection based on the "Swedish case":
  The importance and requirements needed for a sufficient and cost-effective supervisions require an new digitalization development — specially when limit values are introduced.
  There is almost nothing found on this topic in the current directives and standards

* prEN 15978: The bill of materials … … shall include at least the description of each building component, the element to which it belongs and the amount of the building component in this element. The amount shall be measured in mass (kg) or volume (m3) or in both.

General principals applied to support a streamlined and flexible approach

- **A tiered approach:** The first choice is to use a European common data sources or settings and only when the significant to the over all result national specifications.
  →Support; cost effective, generalization of the result

- **Parametrisation:** Instead of only reporting a fix GWP figure for a resource is the underlying parameters used to calculate the result also published
  →Support; transparency, flexibility to make regional/national/local adoption and simplifies update of the GWP database

Example of parametrization: A4, C2 Transport scenario

First choice:
EU average 0.006 kg/kg ready-mix concrete

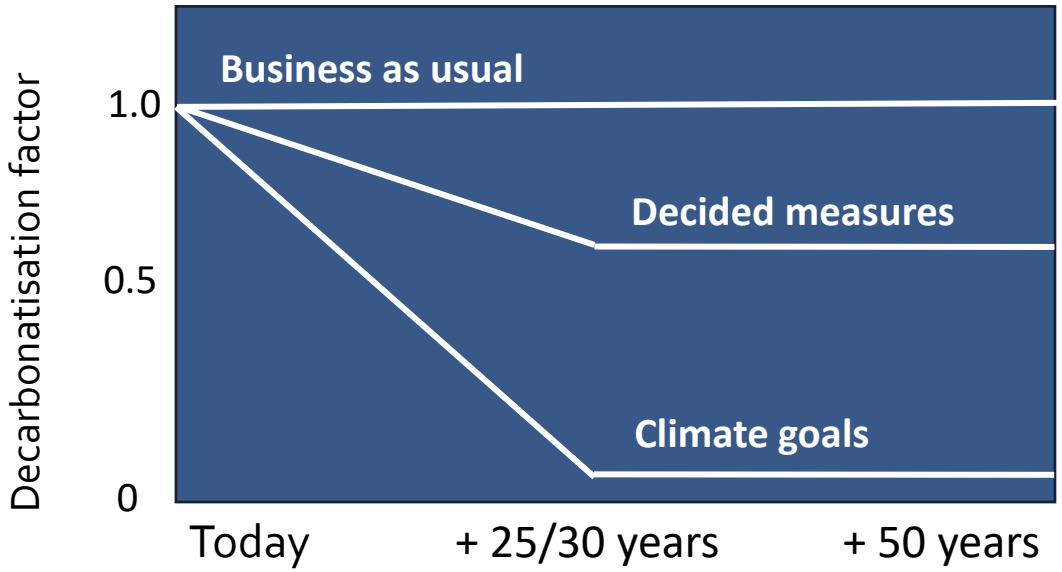
More specific options:
A national scenario can be used that e.g. change the distance. A site specific improvement can be made where e.g. the generic average distance is replaced with the actual one

Note: this information that required by EN 15804

Generic [1]/specific [2]	Value	
Transport leg	Its name	C_4 Ready mix concrete
Leg type	Default list	Last mile
Distance	One way [km]	45 km
Vehicle type	Default list [3]	24 ton cement mixer truck
Energy use	[MJ/ton km] [3]	1,5 MJ, empty return, 1.05 detour and 80% utilisation ratio
Utilization ratio	[-]	
Empty return	0/1 yes/no	
Detour factor	[-]	
Energy ware type	Default list	EC average diesel, 6% biocomponents
Fuel GWP WtW	Default list [kg CO_2e/MJ] [4] for all alternative energy wares	88 g CO2e/MJ

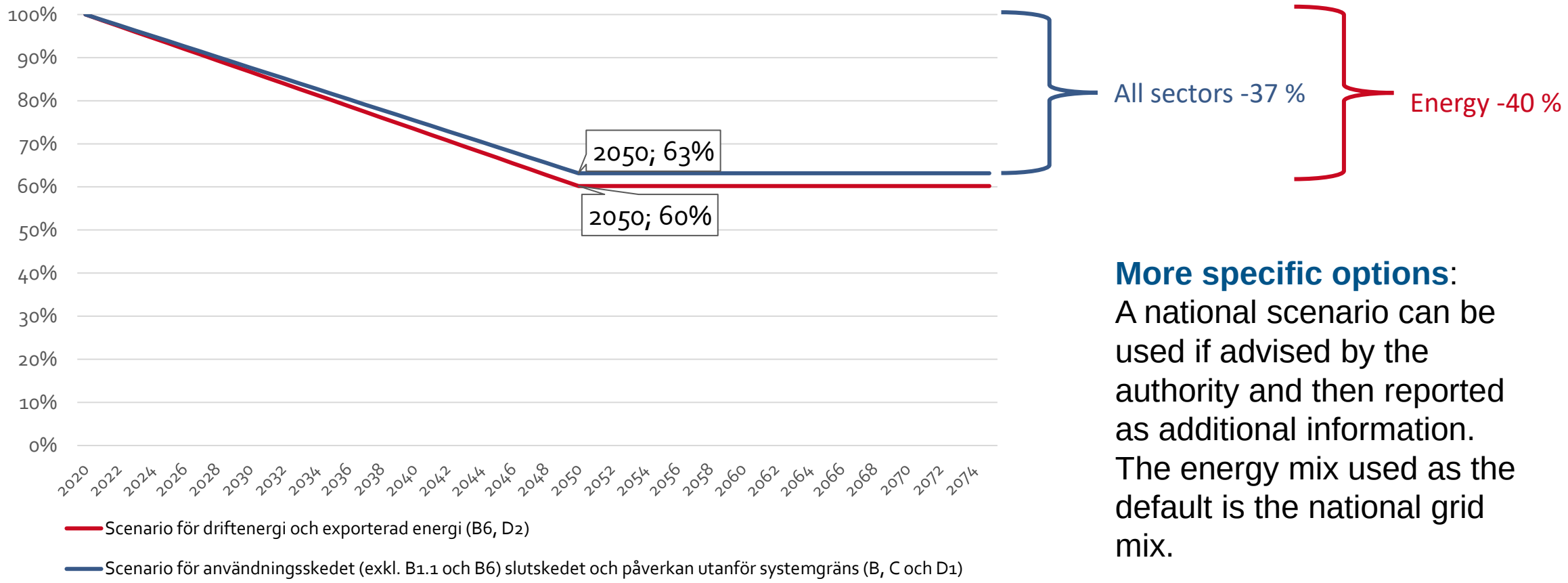
Basic principals for scenario settings

— **Decarbonatisation scenario:** The scenario applied for the use stage B and end-of-life stage C, and reflect improvement that is decided and can be foreseen. This typically describe improvements up to around year 2050 and then we cannot predict, why it is a constant value after this
→Support; the use of the a full life cycle to reflect the impact based on decisions taken and thereby define the gap to policy goals



* WEM = with existing measures/policies
WAM = with additional measures

Decarbonatisation scenario: First choice based on EU Prime



Source: EU Reference Scenario 2020 - European Commission (europa.eu)

More specific options:
A national scenario can be used if advised by the authority and then reported as additional information.
The energy mix used as the default is the national grid mix.

Basic principals for scenario settings

- **C3/C4-100%-scenarios applied for genic data and EPD:** According to the new CPR Acquis EPD we assume that 100% scenario shall be reported for the at least two most likely end-of-life alternatives. The same approach should be applied in generic GWP databases. These figures can on construction works level be adopted to national relevant mixes.
  →Support; cost effectiveness for EPD and increased transparency across EPD and support national or even specific waste handling

- **Generic data and EPD includes energy stored as material**: If the advised genic databases includes the indicator result for stored energy in the products (RPEM, NRPM), meaning energy stored in packaging material is not accounted for, these indicator result can be used for more precise calculation of scenario C3 and C4.
  →Support; fair comparison among materials and cost effectiveness

Basic principals for scenario settings, continuation

- **Generic data includes stored biogenic carbon**: If the advised genic databases and future CPR Acquis EPD "only" includes the biogenic carbon stored in the products, meaning energy stored in packaging material is not accounted for, these indicator results can then be used for more precise calculation of scenario C_3 and C_4.
  →Support; fair comparison among materials and cost effectiveness

Methodology specifications:
Maintenance B2, repair B3 and replacement B4

Number of replacements:

EN 15978:2012

- Only a full number of replacements is allowed
- The value obtained is rounded up

prEN 15978

- Integer or decimal number of replacement
- Integer number of replacement
  - Decimal points between 0 and 0,4, the number of replacements is rounded down
  - Decimal points above 0,5, the number of replacements is rounded up
- Decimal number of replacement
  - No round up or down
  - “This approach shall be used when required by national/regional regulations”

EN 15978:2012

$$NR(j) = E[ReqSL / ESL(j) - 1]$$

where

E[ReqSL/(ESL(j)]	is the function that rounds up function ReqSL /(ESL(j) to the higher integer value;
ESL(j)	is the estimated service life for product j;
$N_R(j)$	is the number of replacements for product j;
ReqSL	is the required service life of the building.

prEN 15978

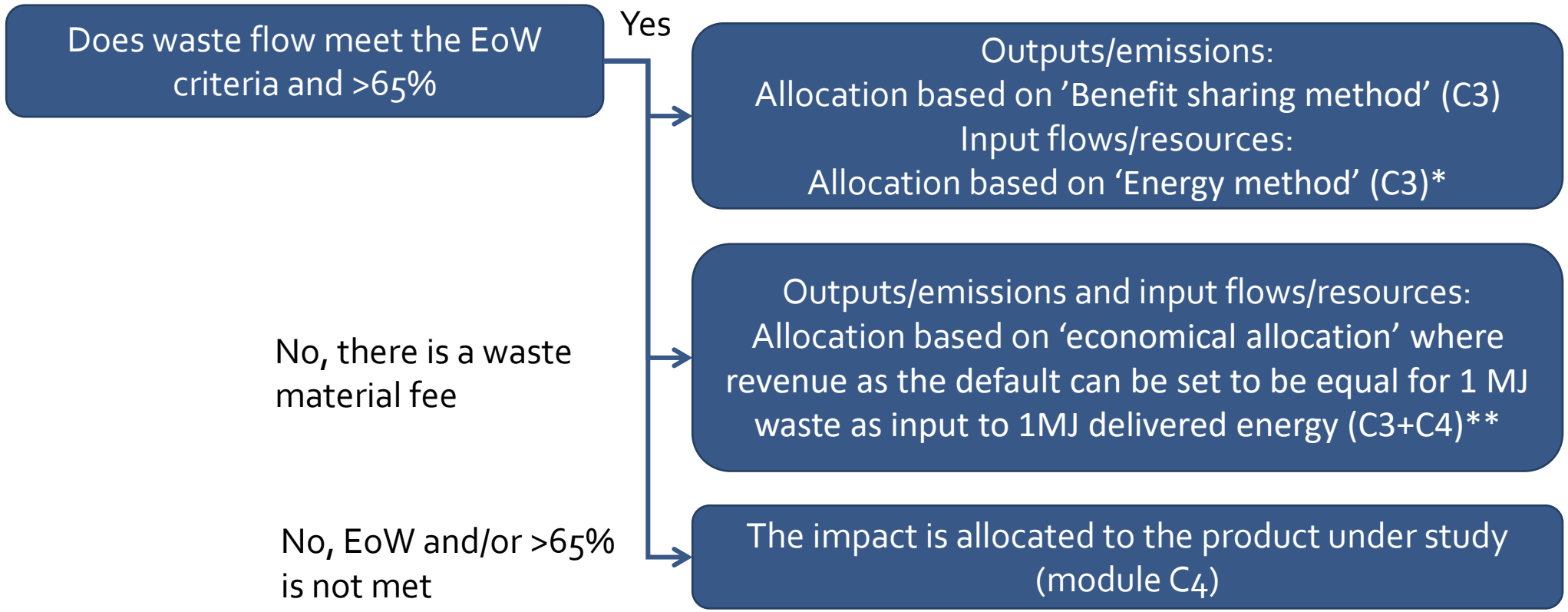
$$NR(j)=[RSP/ESL(j)]-1$$

where

ESL(j)	is the estimated service life for building component j;
$N_R(j)$	is the number of replacements of building component j;
RSP	is the reference study period of the building assessment.

First choice: European default set of the ESL. **Alternatives:** These ESLs can be replaced by a generic nationally-defined ESL. These data can be replaced by the EPD data if it is based on a cPCR (life span) that includes generic ESL data and/or instructions for a product-specific specified ESL.

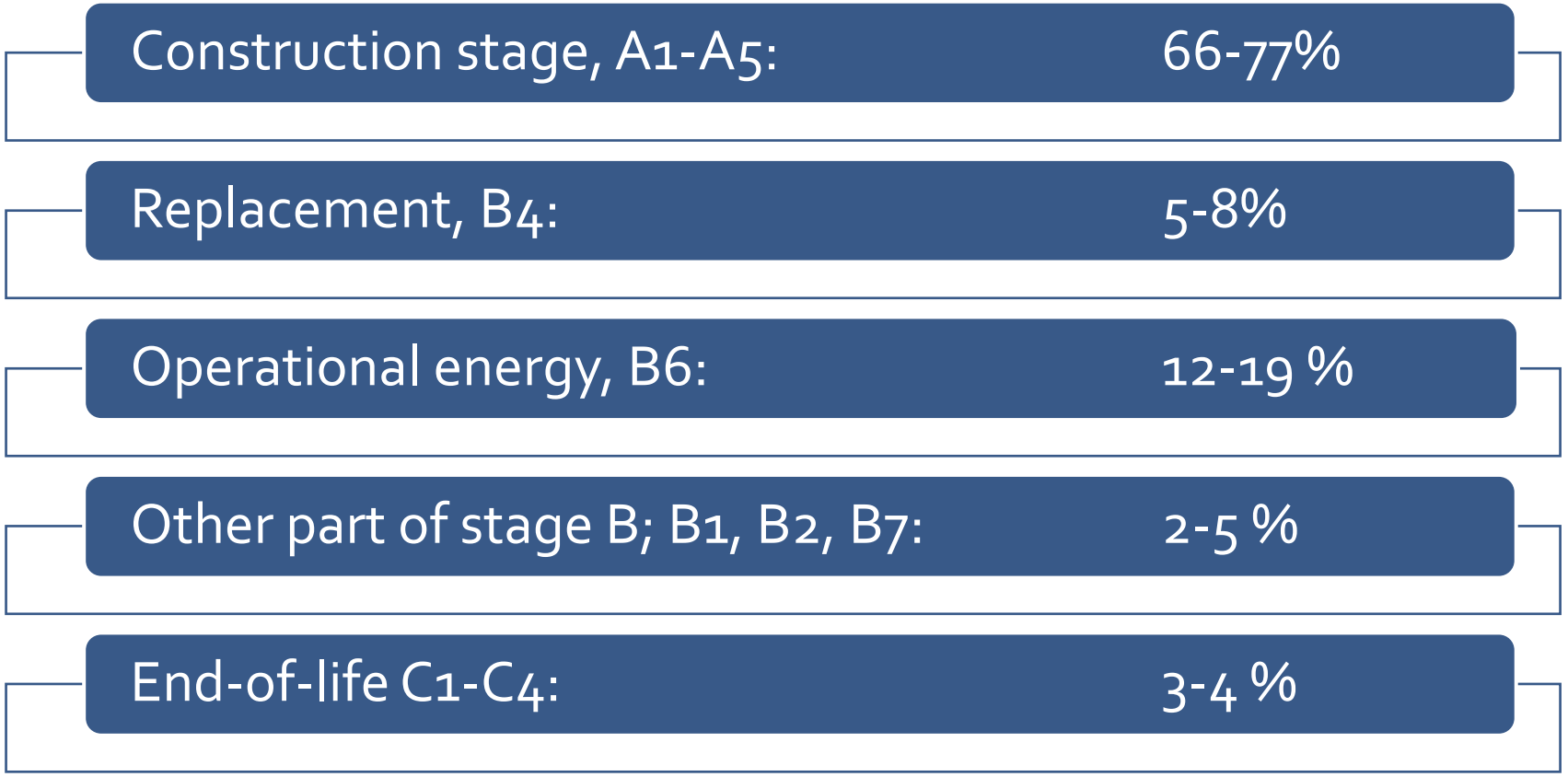
Methodology specifications:
Multi input output allocation of waste



* In order to follow the approach "inherent properties cannot be allocated away"
** Other default figures can be regulated nationally and updated regularly

Hot spots: 4 pilot calculations

Based on the Swedish project Whole life LCA for buildings*



Including the carbonatisation scenario based on decided measures

The suggested waste allocation approach suggested here will increase the importance of C3.

*Report will be published in the end of June 2024, see project site:
https://www.ivl.se/vart-erbjudande/forskning/hallbart-samhallsbyggande/klimatberakning-av-en-byggnads-hela-livscykel.html

See report for detailed information

Module	Recommendation
C1 Deconstruction, demolition	A European generic parametrisation is recommended and the corresponding data to be used is presented here. EPD support: The same parameterisation can be used in the EPD and then directly used for input on the building level.
C2 Transport	Similar to A2 in a building permit, but where a European (one figure) average distance is 50 km, or different distances per material category, can be overruled by national additions or potentially specific distances. EPD support: In an EPD, it is possible to publish several scenarios for C2 for different European regions and/or countries.
C3 Waste processing and C4 Disposal	It is recommended that C3/C4 is based on parameterisation that can be used to develop on a 100%-scenario of different waste treatment scenarios that are listed in this report. Then the ready-made 100% scenario can be published, representing European averages in the EPBD delegated act. EPD support: The 100% scenario data can be supplied by a EPD that then must include the relevant 100% reported separately and defined in the PCR.
D Re-use, recovery, recycling potential	Not included in the EPBD life cycle GWP. Optional to add on a national level.

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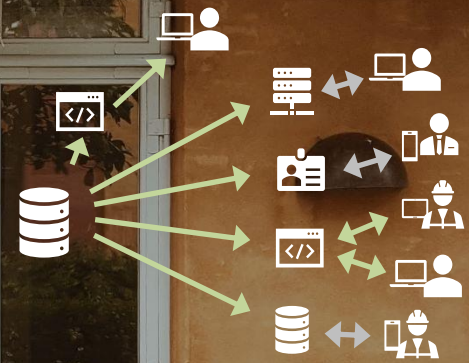
One data, many uses



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Role of national GWP databases

Provides typical data to enable the assessment of buildings
Needs to correspond to the assessment methods

Official data for many purposes
Open and updated data

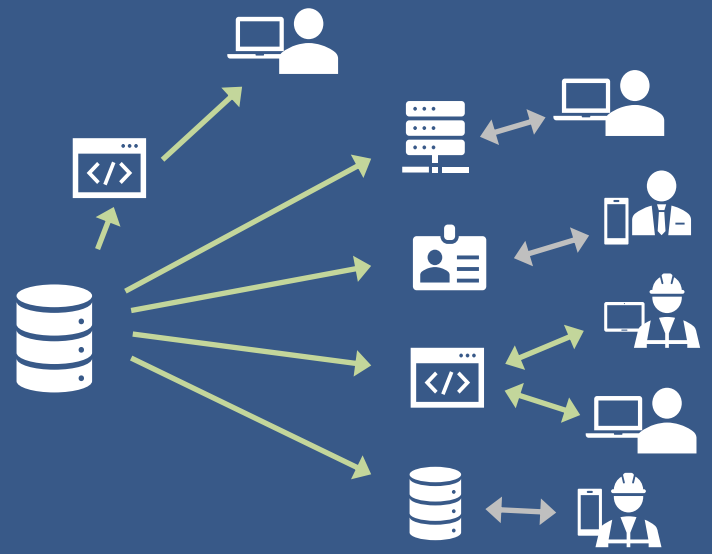
Data for building LCA
Where are we now?

Regulation and databases

- Most Nordic countries have regulation on low-carbon construction
- Emissions data is available
- Methods and data vary considerably

Voluntary action !

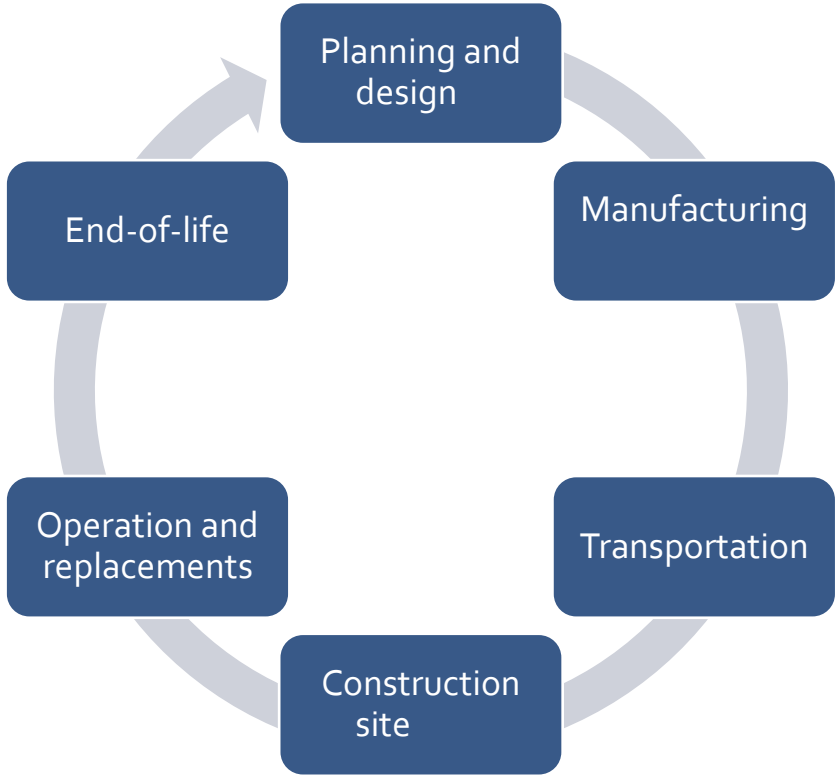
- Pilots and research
- Consultants
- Industry associations
- Manufacturing
- Rental equipment companies
- Builders
- Cities
- Investors



Information available and widely used in third party software and systems

Users of the database are not LCA experts

- Designers (architect, structure, building technology)
- Product manufacturers
- Construction companies
- Environmental consultants
- Researchers
- Cost accountants
- Software developers
- Project management



The standardisation and regulation is under development and schedule rather open. All necessary standards, templates and regulation may be in use within 3-5 years – or not.

Can we wait and reach intended targets?

Future of data and databases for building LCA

- Future regulation and availability of official generic data has started the ball rolling – the impact can already be seen in the market
- KISS* has been success and generic data spreads widely in construction sector tools and processes, but interoperability requirements are growing
- Early design, building permit or as built – all have very different demand on data and potential for impacts
- Lots of new data is needed, but continuity and trust are still key to creating impact

*) The KISS principle (Keep It Simple Stupid) is to avoid unnecessary complexity and focus on creating straightforward solutions that are easy to understand, use, and maintain as simplicity guarantees the greatest levels of user acceptance and interaction.

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Annex 4: Carbon stock and sink data of trees in urban areas in the context of building climate reporting

Alam Ashraful, Erlandsson Martin Karlsson Per Erik , Mattsson Eskil , Miettinen Heli , Mänttäri Miia , Silvenius Frans, Pesu Janne and Tuhkanen Eeva-Maria

18 06 2024

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Background – need for vegetation data in building LCA

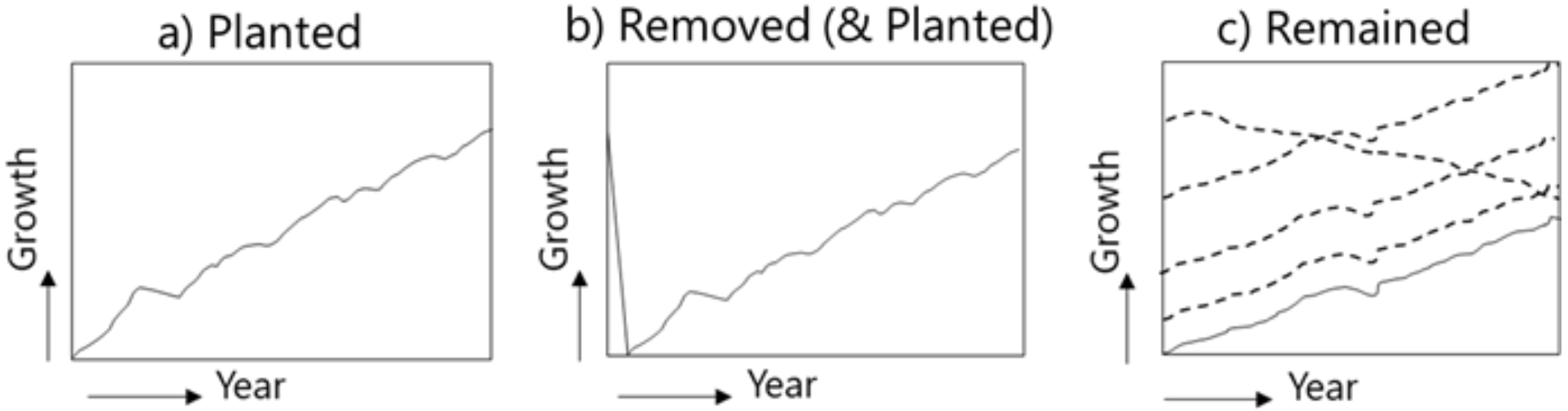
Latest research findings show, that the carbon sequestration potential of green areas in urban environment and the capacity of green spaces to offset fossil fuel emissions in cities can be significant.

Nevertheless, there is no general method to add vegetation data to construction databases.

This report aimed to create a simplified life cycle carbon balance approach and provide example data from limited geographical area to account for the carbon balance of the living biomass in individual trees.

We assessed the changes in the carbon stock resulting from **the individual urban trees that are felled, retained, and planted in the construction area over a 50-year** period and produced **generalised values** for the construction emission database combined with life cycle assessment results.

Tree life cycle scenarios



- Seedling production
- Logistics
- Fertilization
- Soil preparation
- Maintenace

- Harvesting tree
- Logistics
- Wood chipping
- Use as energy

Life cycle inventory

Results are shown as follows

- Soil preparation
- Seedling production
- Planting
- Fertilization
- Maintenance
- Leaf collection & treatment
- Harvesting & transportation
- Avoided heat

Seedling at nursery

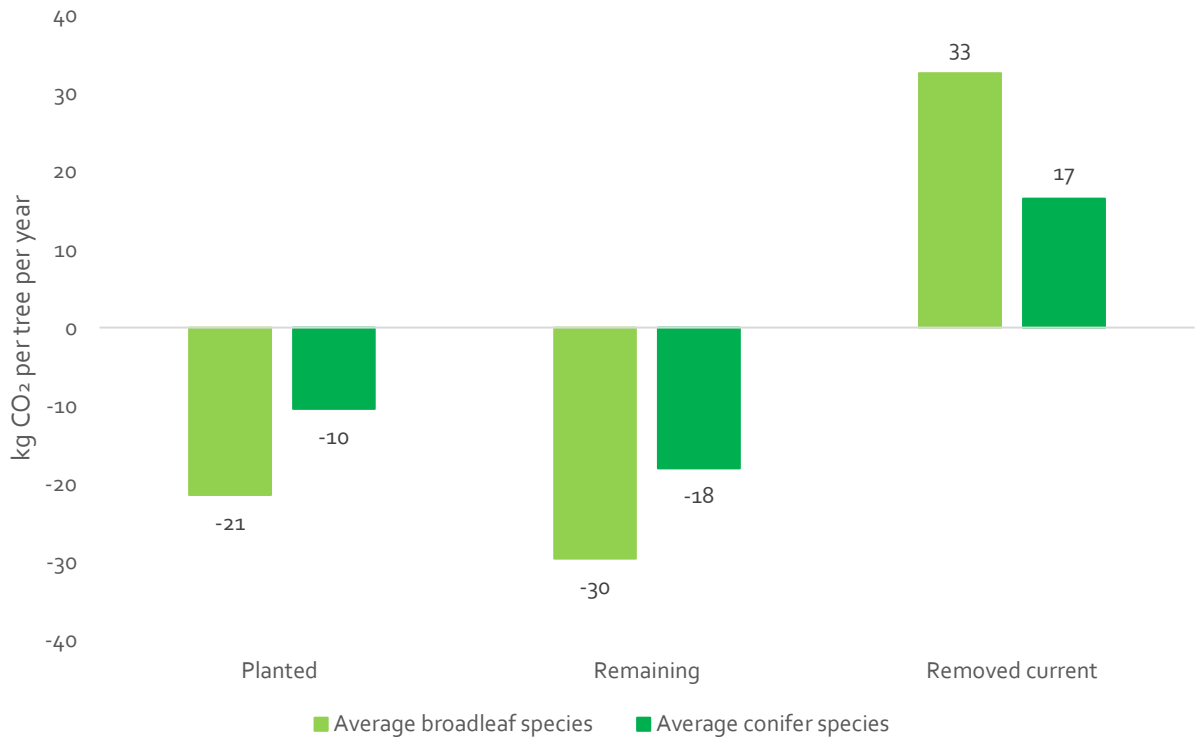
- Greenhouse
- Fertilization
- Polypropylene pot
- Maintenance
- Electricity and heat use

Annual tree carbon sink over 50-year period

Tree carbon stock estimations and carbon sequestration predictions of three scenarios were done using iTree Eco software for 30 most typical urban tree species used in largest cities in Finland.

The size and species of trees have a significant impact on the result. In this analysis, mean carbon sequestration is higher for broadleaved than conifer trees over 50 years.

Even when using species-specific figures, **results** are gross simplifications based on assumptions and **should interpret as indicative figures**.

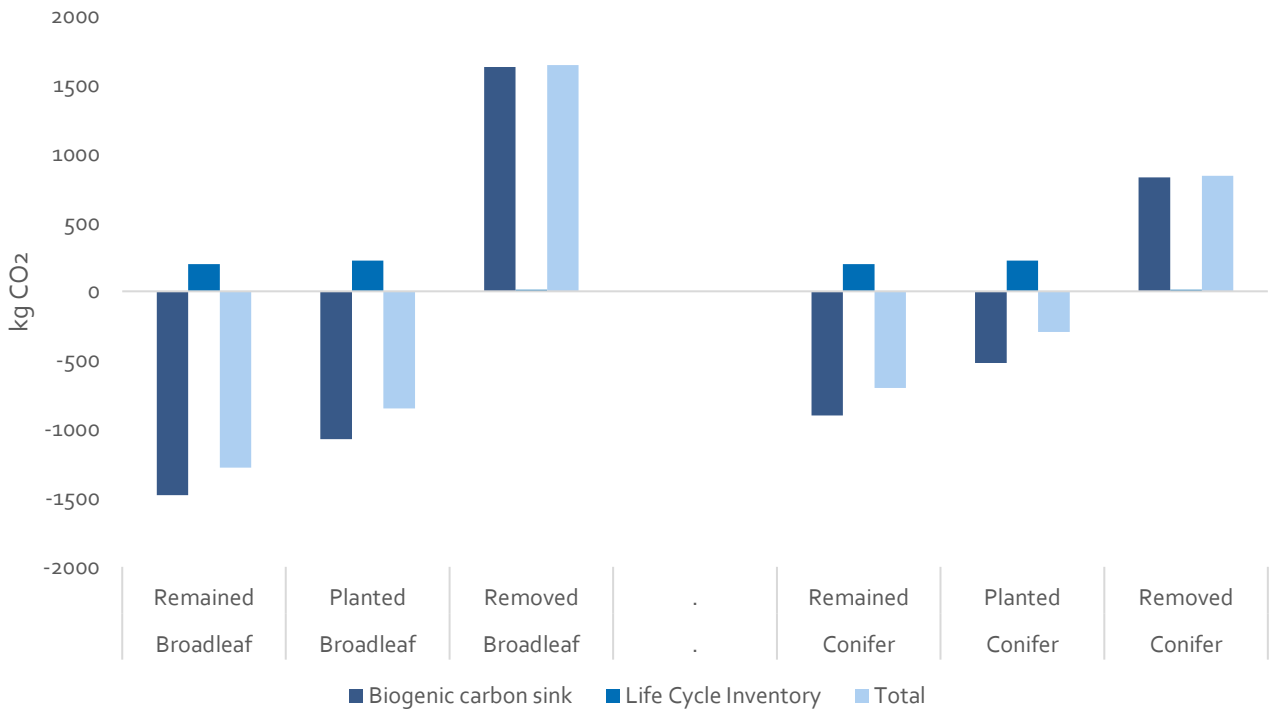


Combined results of biogenic carbon sink and life cycle emissions over 50-year period

The scenario comparison shows that the **highest carbon sink is achieved when trees are retained in the area** and felling trees are avoided.

Tree removal results in the highest emissions; however, these emissions can be **partly compensated for by planting new trees**.

Important to remember that the figures are rough generalisations based on several assumptions about climate, tree growth, tree health and most typical practices.



Program

Introduction of Nordic harmonisation of life cycle assessment	Maria Tiainen, Finnish Ministry of the Environment
Introduction to webinar and project overview	Janne Pesu, Finnish Environment Institute (Syke)
Recommended Nordic approach to GWP data and life cycle scenarios	Martin Erlandsson, IVL Swedish Environmental Research Institute
Learnings from national GWP databases	Janne Pesu, Finnish Environment Institute (Syke)
Carbon stock and sink data of trees in urban areas in the context of building climate reporting	Heli Miettinen, Natural Resource Institute Finland (LUKE)
Q&A and open discussion	

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*…" Reaffirm our commitment to continue our collaboration on harmonising relevant regulations, methods, **data, tools**, and policies for carbon neutrality in the built environment, in accordance with the basic principles of a Roadmap, jointly developed within the Nordic Sustainable Construction network.*

…

(Nordic Ministerial Declaration, Sep 2023)

Questions and discussion

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Thank you