SWEDISH LIFE CYCLE CENTER

hosted by the Swedish Life Cycle Center

Webinar LCA, climate and buildings

2020-05-29

Program

- Introduction about Swedish Life Cycle Center –Maria Rydberg, Swedish Life Cycle Center
- Introduction about the working group and network – Kristina Einarsson, Swedish National Board of Housing, Building and Planning
- State of the art from the Nordic building authorities – Matti Kuittinen, Ministry of the Environment in Finland
- Reference values for climate and buildings – Harpa Birgisdottir, Aalborg University and Marianne Wiik, SINTEF
- Use of LCA/climate calculations as a tool and potentials in harmonization from an industry point of view – Jeanette Sveder Lundin, Skanska
- Summary and way forward and the Nordic Climate forum in August – Maria Rydberg, Swedish Life Cycle Center and Anders Brodersen, Danish Transport, Construction and Housing Authority
- Questions and discussion – moderated by Maria Rydberg

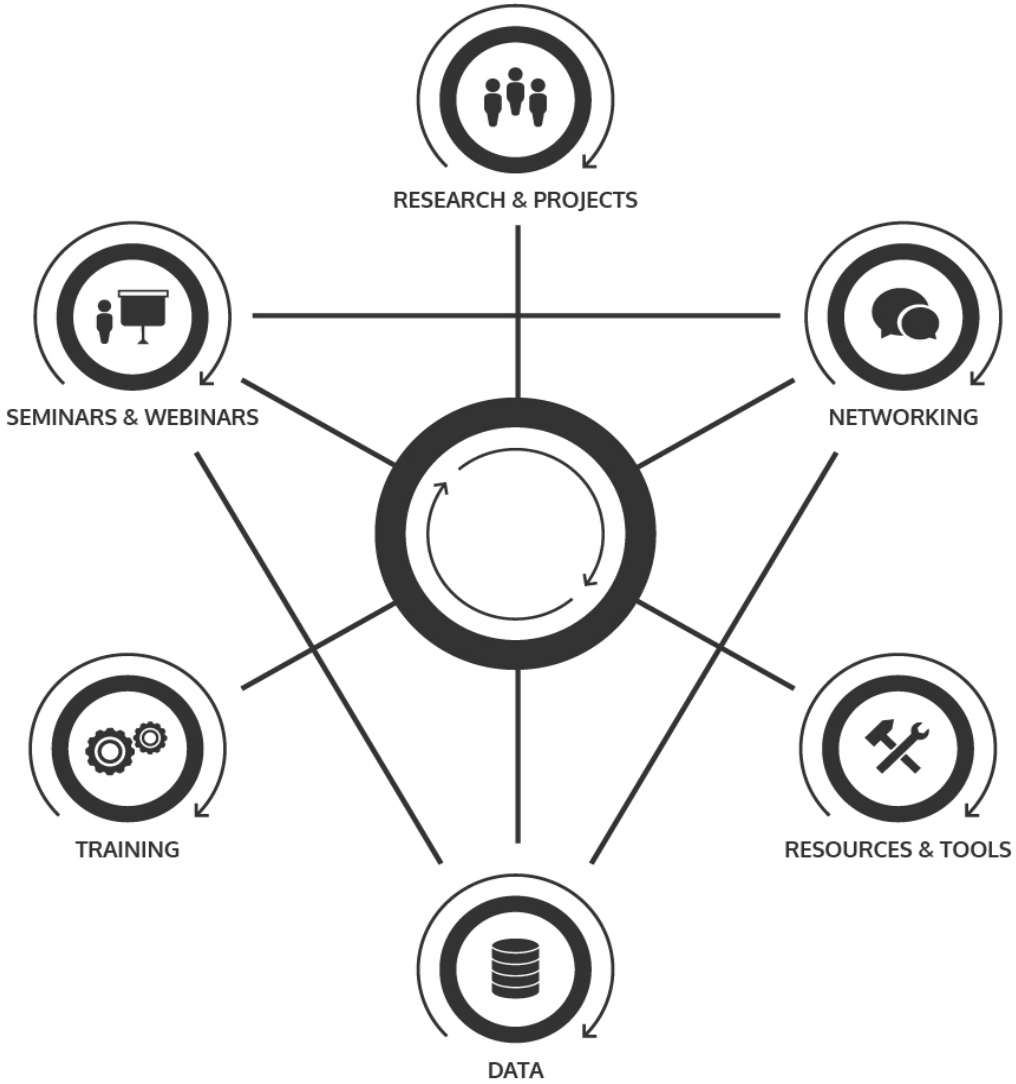
Webinar guidelines & information

- If you do not see the presentations, the presentations can be found here https://www.lifecyclecenter.se/events/
- The webinar starts with presentations – save your questions to the end
- You are muted during the presentation, when it is time for questions we will be able to unmute you
- The webinar will be recorded and can soon after be found in our Youtube channel
- Presentations will be sent to all participants after the webinar

SWEDISH
LIFE CYCLE
CENTER

We aim for credible & applied life cycle thinking globally!

A partner driven center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SWEDISH LIFE CYCLE CENTER

Introduction to the working group and network

Nordic Working Group for LCA, climate and buildings

Kristina Einarsson, Swedish National Board of Housing, Building and Planning, Chair

Background

- Declaration from the Nordic Council of ministers may 2018
- **Nordic Climate Forum for Construction** oct 2019 in Malmö
- The main target for the conference was to start up the work for **Nordic harmonization on regulations and climate emissions** from buildings from a life cycle perspective.
- New declaration from the Nordic Council of ministers in oct 2019

Declaration from the Nordic Council of ministers may 2018

- The worlds most **integrated region** – also within the construction market.
- Share the **common goal of promoting low carbon emissions in construction** as part of a common climate policy and through sustainable development.
- Strengthen the cooperation on **harmonization of building regulation between the authorities in the Nordic countries.**
- The Nordic Council of Ministers can play an important role in the realization of these goals, to coordinate and further develop the cooperation as well as exploring the **possibilities of co-financing the efforts**.

https://www.norden.org/en/declaration/declaration-nordic-ministerial-meeting-concerning-buildings-and-construction-29th-may

Declaration from the Nordic Council of ministers oct 2019

Nordic Declaration on Low Carbon Construction and Circular Principles in the Construction Sector

- The Nordic countries can **benefit from sharing best practices**
- Call for **collaboration in the search for low carbon solutions** in spatial and urban planning in Nordic countries.
- Continue the **collaboration on the harmonisation of relevant approaches, methods, data, tools and policies**
- Call for the **stakeholders in the construction** and **real estate sectors** as well as related **industries** to support the joint Nordic efforts
- Call for the **academia and research institutes** to develop channels of communication to increase the knowledge and capacity for a rapid transition
- Global leadership, so that the **Nordic region can become a forerunner** in the development of low carbon construction solutions.

https://www.norden.org/en/declaration/nordic-declaration-low-carbon-construction-and-circular-principles-construction-sector

Organization

Swedish Life Cycle Center will organize and facilitate the network, consisting of

- **working group** (smaller group)
- **dialogue forum** (wider group of stakeholders open for everyone)

Working group

- Forum for experts with focus on LCA and policymaking from authorities, academia and industry.
- Exchange experience, raise knowledge gaps etc. with the aim of facilitating the Nordic collaboration.

What has been achived so far

- Program for the working group
- Proposal of key areas for harmonization
  - Decarbonisation efforts
  - Assessment methods
  - Data and its flow
- Collaboration Nordic database (SWE, FIN)
- Discussion on development of assessment methods

Program for the working group January 2020

EXPECTED IMPACTS

- The Nordic countries have compatible approaches to building regulation, methodology and the assessment of climate emissions from buildings, and share best practice on the subject.
- Reduce the building sector's climate emissions following the same rate as national climate neutrality goals require.
- The Nordic collaboration have made it easier for the industry to construct low carbon buildings in the Nordic countries.

https://www.lifecyclecenter.se/wp-content/uploads/Program-Nordic-Working-Group-LCA-climate-and-buildings.pdf

TARGETS

- ….
- Identify **key areas for harmonization** and a plan for harmonization will be presented in the next conference in Copenhagen 2020.
- The Nordic countries have initiated **common projects**.
- Being an arena for exchange of **best practice**.

Discussion on key areas for harmonization (working group 22 April)

What is happening within decarbonisation efforts that might be of interest? What national examples make sense to hear?

- A momentum for taking the embodied carbon into discussion.
- The ongoing development of databases is important. In addition to products, also the construction works should be considered.
- Pilot projects and findings for GHG limit values of buildings would be relevant to share.
- The ongoing regulatory development and related studies would be valuable for sharing.
- There may be too much discussion on harmonisation, but not enough action towards it.
- We don´t have to proceed at the same pace. Helping each other along the way is more relevant.
- Although we try, we may never reach full harmonisation. Still, there is opportunity for large degree of harmonisation.
- All Nordic countries have the same direction also regarding the climate goals for construction. Getting there is just a question of time.

Discussion on key areas for harmonization (working group 22 April)

Assessment methods

How can we reach harmonization in regulation when we are at different stages of developing laws and regulations regarding the topic?

- Important that we have the same assessment methods
- Harmonize and cooperate about: A4 and A5, existing buildings (reuse), calculation period, same area, reference values for buildings
- But not the same, common limits values
- Calculation and boundaries should be the same.
- It would be good idea with some common goals rather than common limit values
- Need more transparency, so it is possible to compare between countries

Discussion on key areas for harmonization (working group 22 April)

What are important to consider within data and its flows?

- Same background data and calculation rules/methods in each country
- General one database would be easy, and a plan for that should be developed
- Testing period is going on in different countries, we have to be open to changes and adjust and hopefully agree on indicators
- Background information to qualify the values.
- Important with similar indicators in the Nordic regulations.
- The user-perspective becomes important.
- Reporting-format of data should be the same.

Thank you!

Kristina Einarsson, Chair

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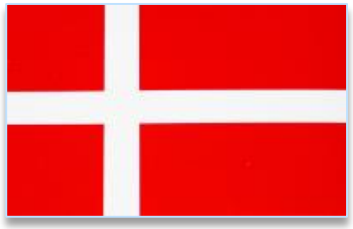
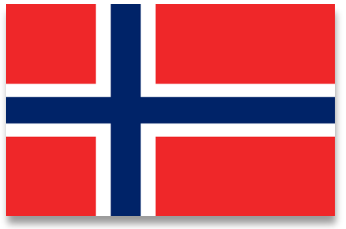
Recent development in the Nordic countries

Matti Kuittinen

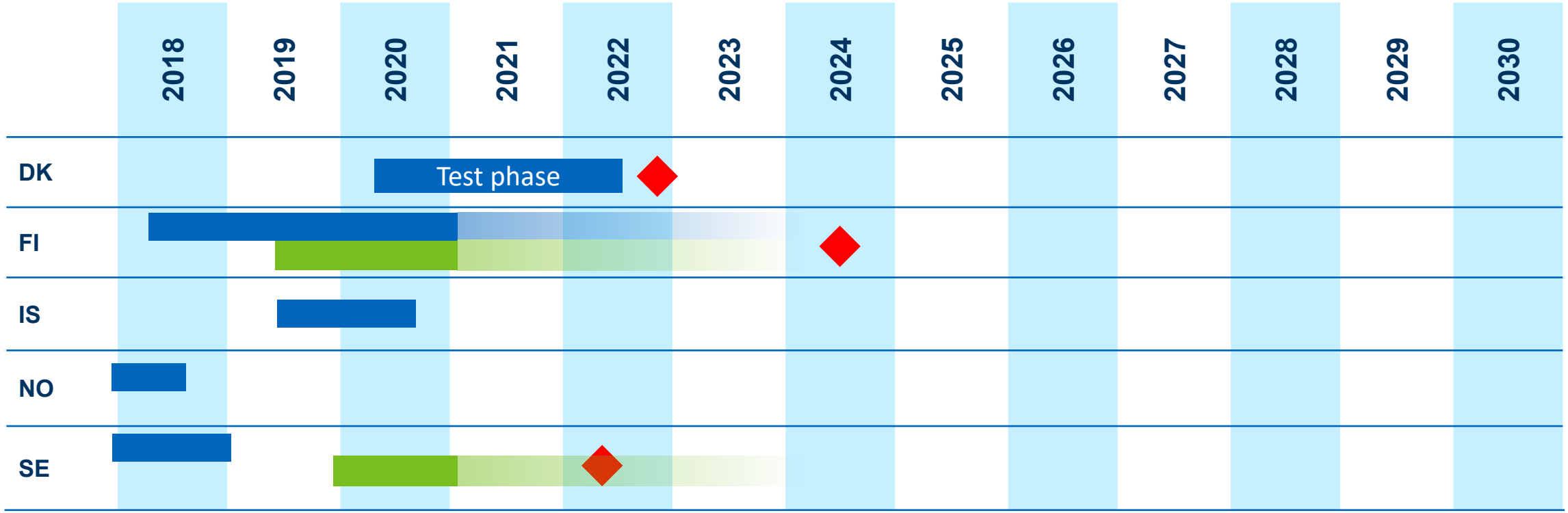
29.5.2020

Current status

Represents an understanding of the status in May 2020. Verify facts and check details from your local authorities.

	Denmark	Finland	Iceland	Norway	Sweden
					
National carbon neutrality goal	–70% by 2030	2035	2040	2030	2040
Regulation on low carbon construction	Possibly 2022	Before 2025		In consideration	From 2022
Currently going on…	• Voluntary sustainability class pilot • Carbon handprint • LCAbyg tool development	• Generic database • Carbon handprint • Limit values • LCA for infrastructure works	• Roadmap to sustainable construction industry 2030 • Interest in joint database	• Climate declaration in consideration	• Proposal for a law and decree • Development of generic database • Limit values for buildings

Development of methods and databases



Represents an understanding of the status in May 2020. Verify facts and check details from your local authorities.

Development of database
Development of methods
Norms in place (planned)

Included life cycle stages

	Production			Construction		Use							End-of-life				Add
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Denmark	x	x	x	x	x				x		x				x	x	x
Finland	x	x	x	x	x			x	x		x		x	x	x	x	x
Iceland				x	x		?	?	?	?	?				x	x	
Norway	x	x	x	?	?		?	?	x	x							
Sweden	x	x	x	x	x												
Level(s) beta	L1	L1	L1	L2	L2	L2	L2	L2	L1	L1	L1	L2	L2	L2	L1	L1	L1

Represents an understanding of the status in May 2020. Verify facts and check details from your local authorities.

Included building types

	Single-family	Residential	Office	Retail and restaurant	Schools and daycare	Hospitals and health	Hotels and dorms	Sports facilities	Industrial	Summer cottages	Renovation projects
Denmark (LCAbyg)	x	x	x	x	x	x	x	x	x	x	x
Finland	x	x	x	x	x	x	x	x		x	x
Iceland	?	x	x	x	x	x	x	x	x		?
Norway	?	x	x	x	x	x	x	x	x		?
Sweden	x	x	x	x	x	x	x	x		x	
Level(s) beta		x	x								

Represents an understanding of the status in May 2020. Verify facts and check details from your local authorities.

Included indicators

Represents an understanding of the status in May 2020. Verify facts and check details from your local authorities.

	Primary energy	Greenhouse gas emissions	Acidification	Eutrophication	Ozone depletion	Summer smog	Fine particles	Human toxicity	Ecotoxicity	Water used	Waste	Damage to biodiversity	Damage to health	Depletion of abiotic resources	Depletion of fossil fuels	Odour	Other environmental impacts
Denmark	x	x	x	x	x	x								x	x		
Finland	x	x															x
Iceland		x									(x)						
Norway		x						(x)	(x)		(x)	(x)	?		(x)	(x)	
Sweden		x															
Level(s) beta	x	x	x	x	x	x								x	x		

(x) = not included in the proposed LCA but are included in the Norwegian Regulation on technical requirements for construction works.

Represents an understanding of the status in May 2020. Verify facts and check details from your local authorities.

Included building parts

	Sub-structure			Structure									Building Services									Finishes				External		
	Foundations	Basement walls	Ground floor structure	External walls	Frame (columns and beams)	External doors	Windows	Internal walls	Floors	Ceilings	Roof	Stairs and ramps	Water system	Sewage system	Electrical system	Heating system	Cooling system	Ventilation system	Conveying system	Data system	Fire protection system	External finishes	Internal finishes	Fixed furniture	Furniture	Balcony	Vegetation	Pavements
Denmark (LCAbyg)	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x				x	x			x		
Finland	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x						x		x		x
Iceland	Under development																											
Norway	?	?	x	x	x	x	x	x	x	x	x											?	?					
Sweden	x	x	x	x	x	x	x	x	x	x	x	x										x	x					
Level(s) beta	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x

Generic product data

Denmark

- German Ökobaudat database in use
- Data and tool are integrated, free for everyone
- Predefined building elements being developed
- No plans for making own data, collaboration with common generic database
- Reuse and recycling in lifecycle perspective

Finland

- Development of a generic database going on
- First version available from 2021
- Predefined building elements to be developed
- Joint datasets with infrastructure works
- Very small number of EPDs available

Iceland

- Foreign databases in use
- EPD Norge and Environdec being used
- Expression of interest for a joint Nordic database

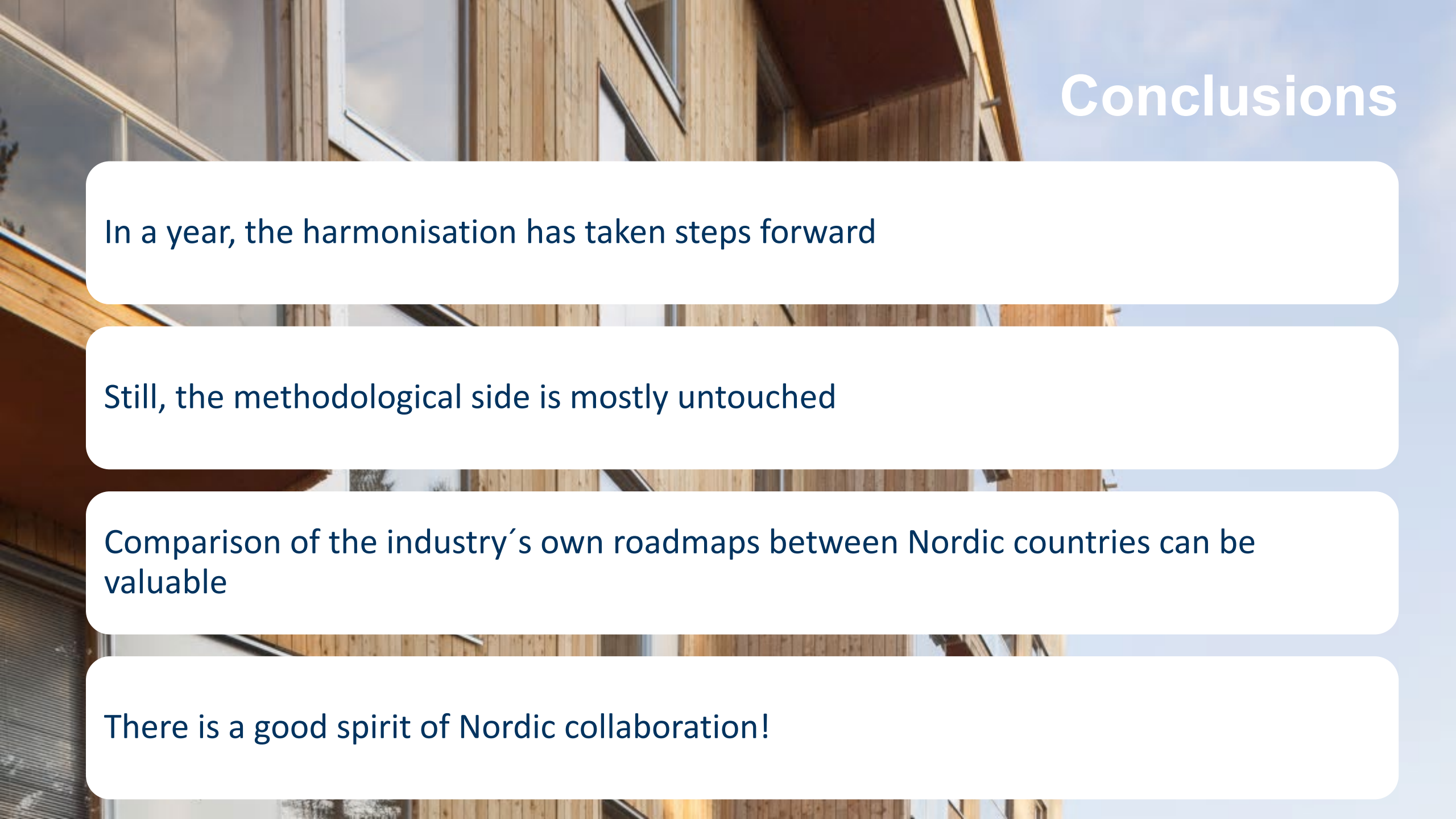
Norway

- No generic database
- Klimagassregnskap now closed, OneClick used instead
- Emphasis on EPD´s
- Nordic collaboration may help
- Research initiatives going on (Östfold Forskning)

Sweden

- IVL has a tool (BM verktyg) free to use, that includes a limited generic database
- Trafikverket has an limited open database
- Governmental assignment includes a database to be completed latest by 2022
- Development work to be completed by 2020

Represents an understanding of the status in May 2020. Verify facts and check details from your local authorities.



Conclusions

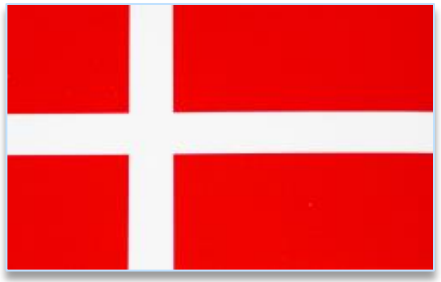
In a year, the harmonisation has taken steps forward

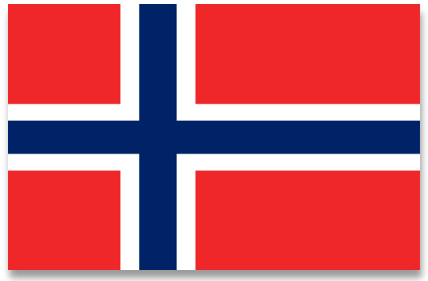
Still, the methodological side is mostly untouched

Comparison of the industry´s own roadmaps between Nordic countries can be valuable

There is a good spirit of Nordic collaboration!

Nordic contact persons




Denmark

- Anders Brodersen Jensen
- Luzie Rück

Finland

- Harri Hakaste
- Matti Kuittinen

Iceland

- Sveinn Pálsson
- Þóra Margrét Þorgeirsdóttir
- Jón Guðmundsson

Norway

- Ingunn Marton
- Inger Grethe England

Sweden

- Kristina Einarsson
- Erik Olsson
- Cathrine Engström
- Thomas Johansson

Klimapåvirkninger fra 60 bygninger

Senior researcher, Harpa Birgisdottir

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DENMARK

Purpose

SBI 2020:04

Klimapåvirkning fra 60 bygninger

Muligheder for udformning af referenceværdier til LCA for bygninger

- To establish sufficient data background on the climate impact of buildings in Denmark over their life cycle.
- On the basis of this, possible reference values are calculated and suggested

https://sbi.dk/Assets/Klimapaavirkning-fra-60-bygninger/SBi-2020-04.pdf

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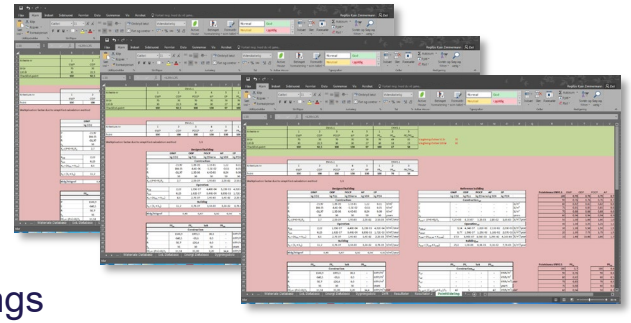
Background data

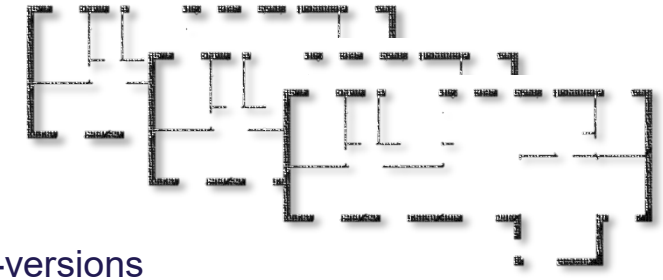
Residential buildings	Single family houses	11
	Terraced houses	12
	Apartment buildings	11
Offices		22
Others		4
Total		**60**

Input data

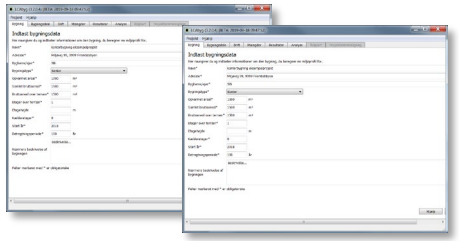
DGNB certifications
DGNB-Excel sheet (LCA)



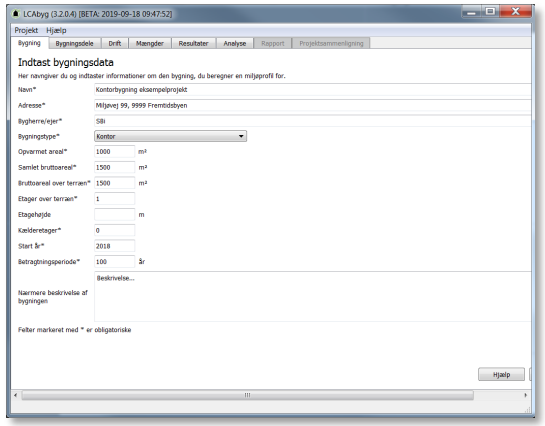
Building plans and drawings



Earlier LCAbyg-versions



60 cases in LCAbyg
Calculated in the same tool and with same methods



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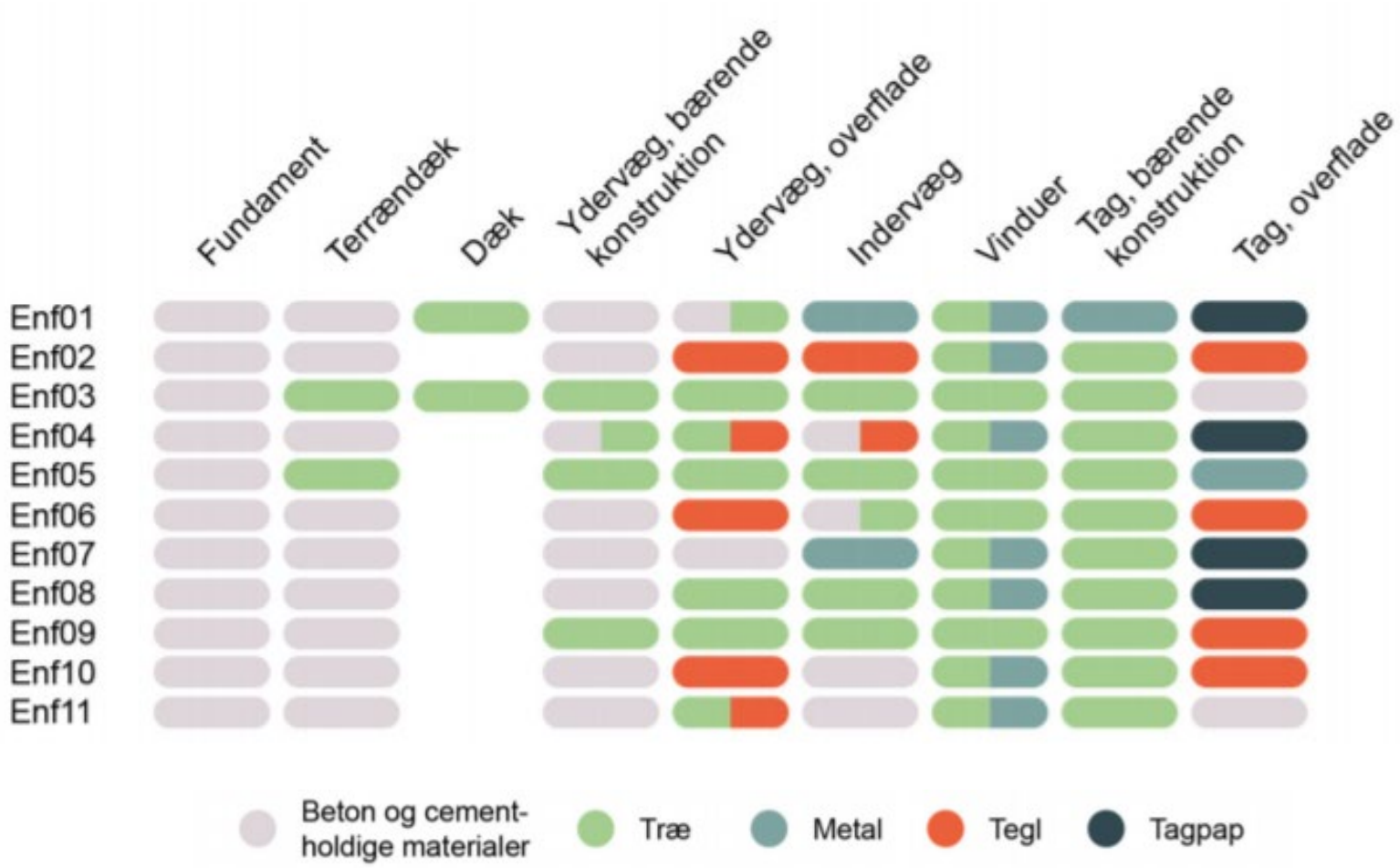
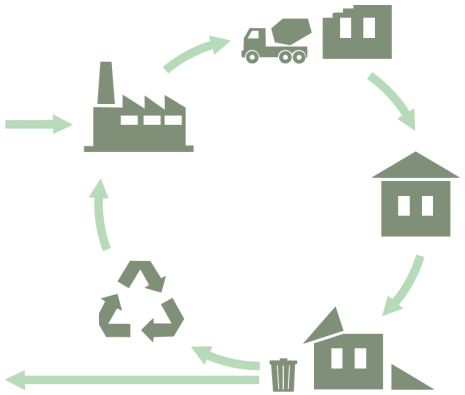
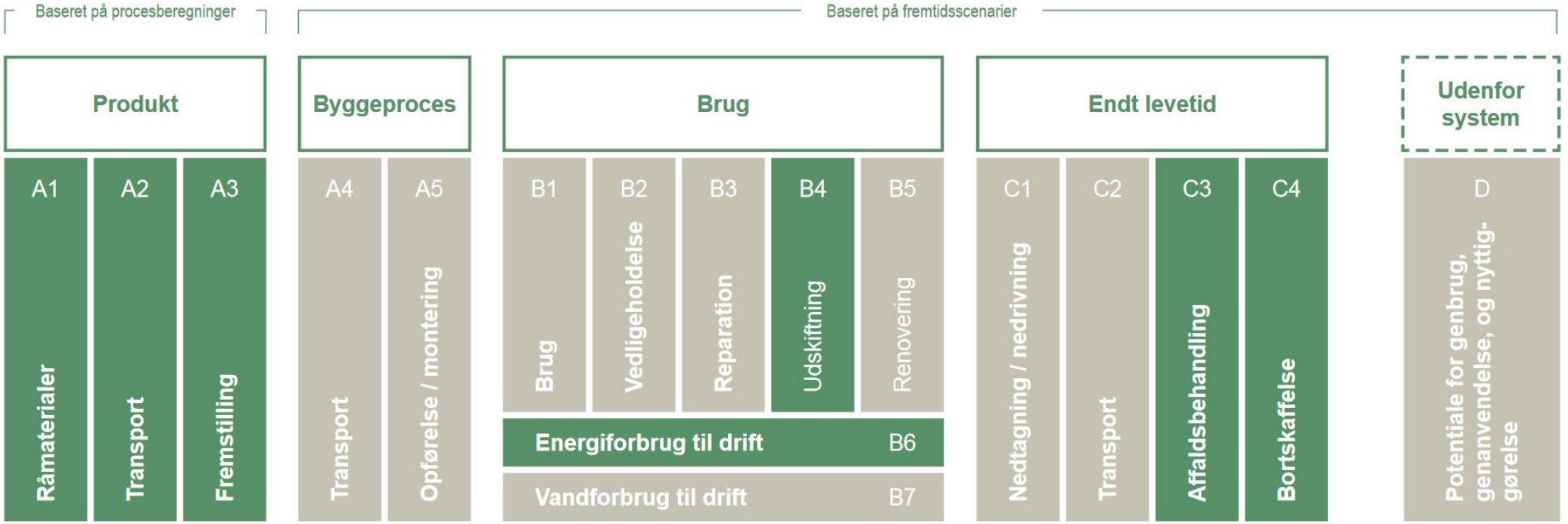
Materials


Fundament
Terrændæk
Dæk
Ydervæg, bærende konstruktion
Ydervæg, overflade
Indervæg
Vinduer
Tag, bærende konstruktion
Tag, overflade
Enf01
Enf02
Enf03
Enf04
Enf05
Enf06
Enf07
Enf08
Enf09
Enf10
Enf11
Beton og cement-holdige materialer
Træ
Metal
Tegl
Tagpap

Fases included





Reference study period
Calculated in the reoprt for 50 and 80 years

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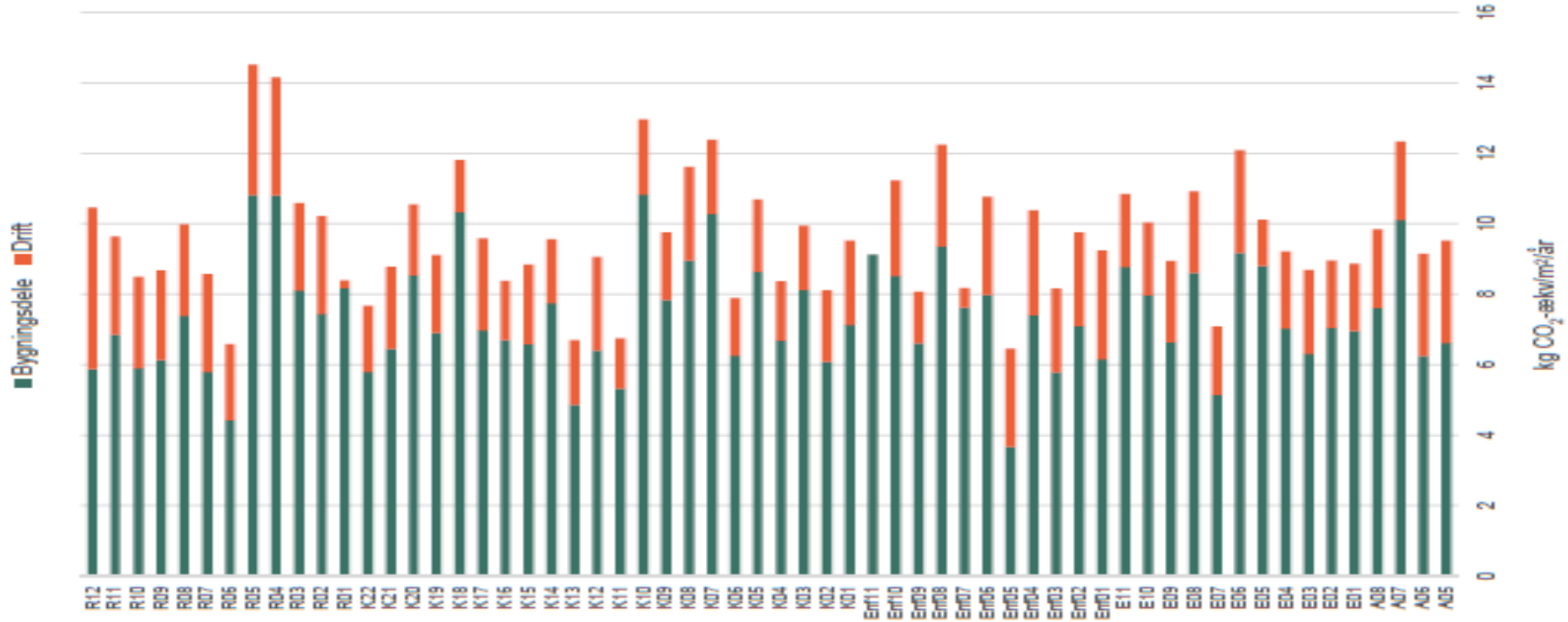
Results for RSP 50 years
Embodied and Operational



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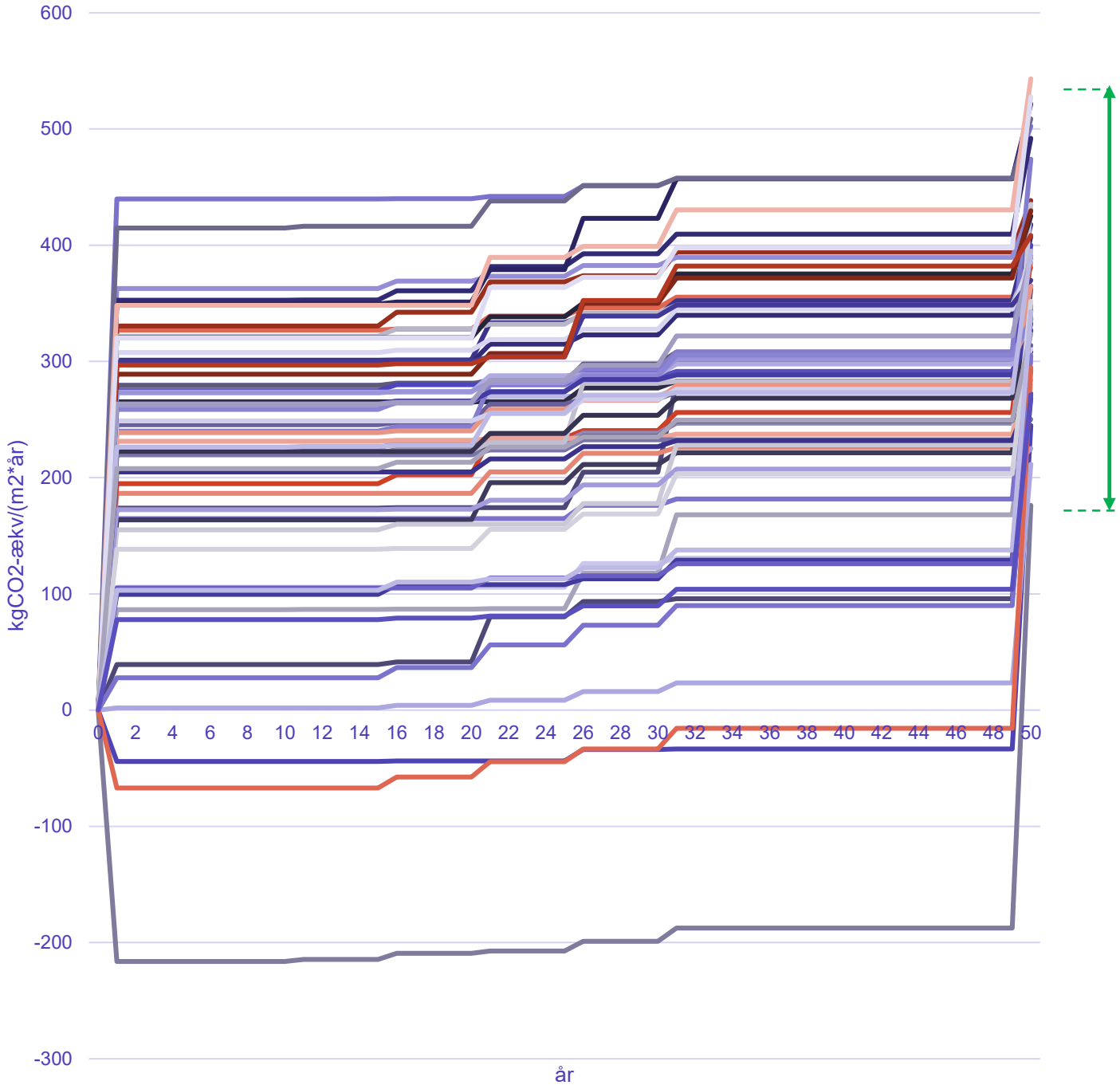
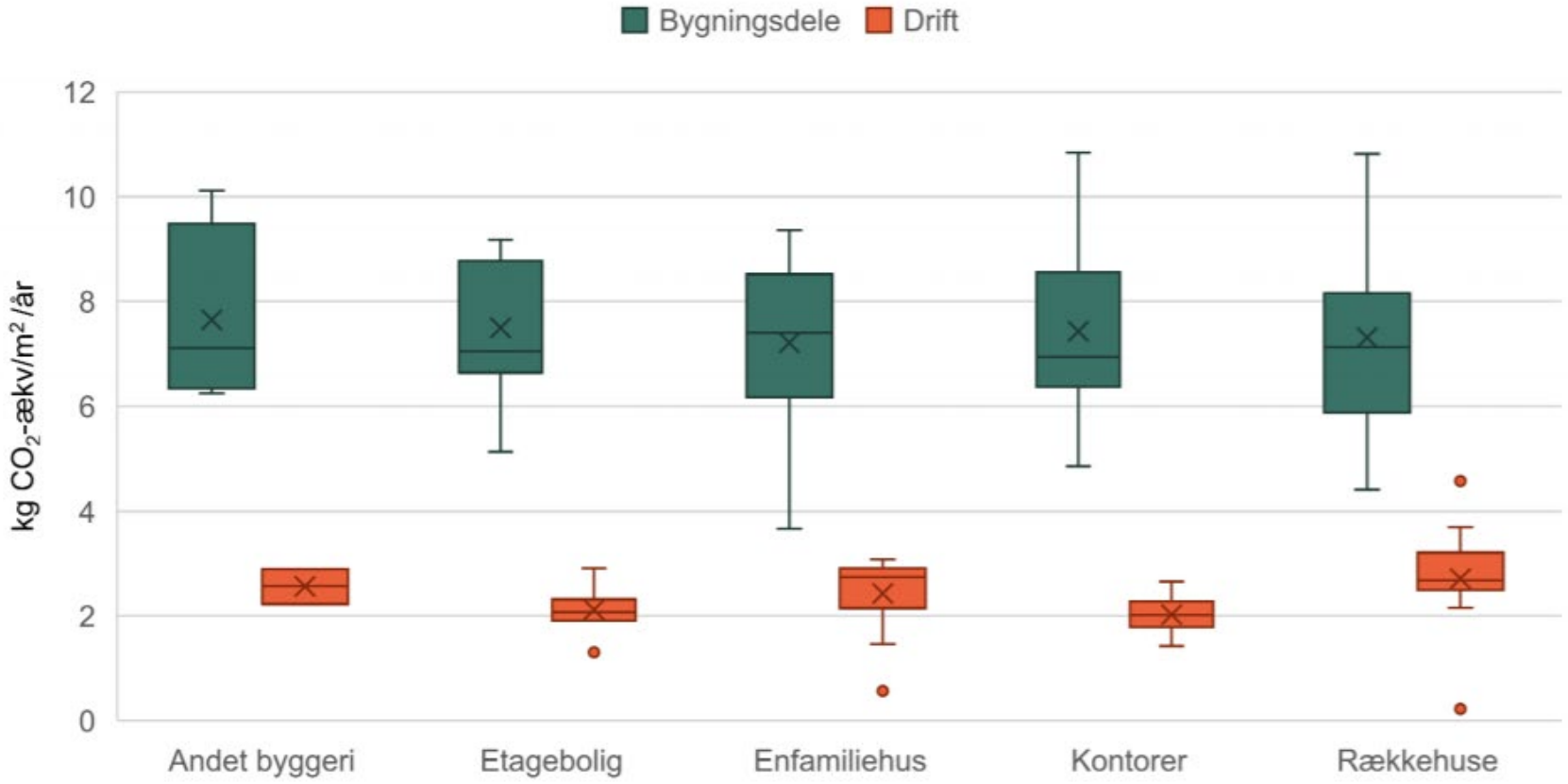
Embodied impacts in a timescale

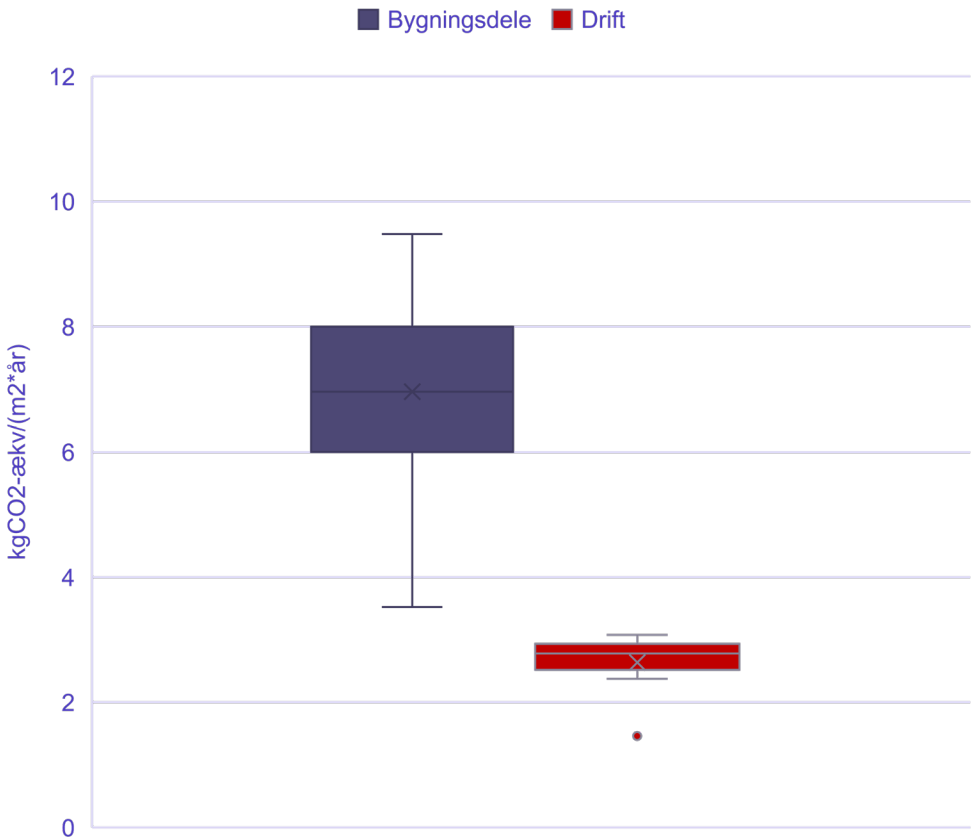
After 50 years:
Lowest: 150
Highest: 550

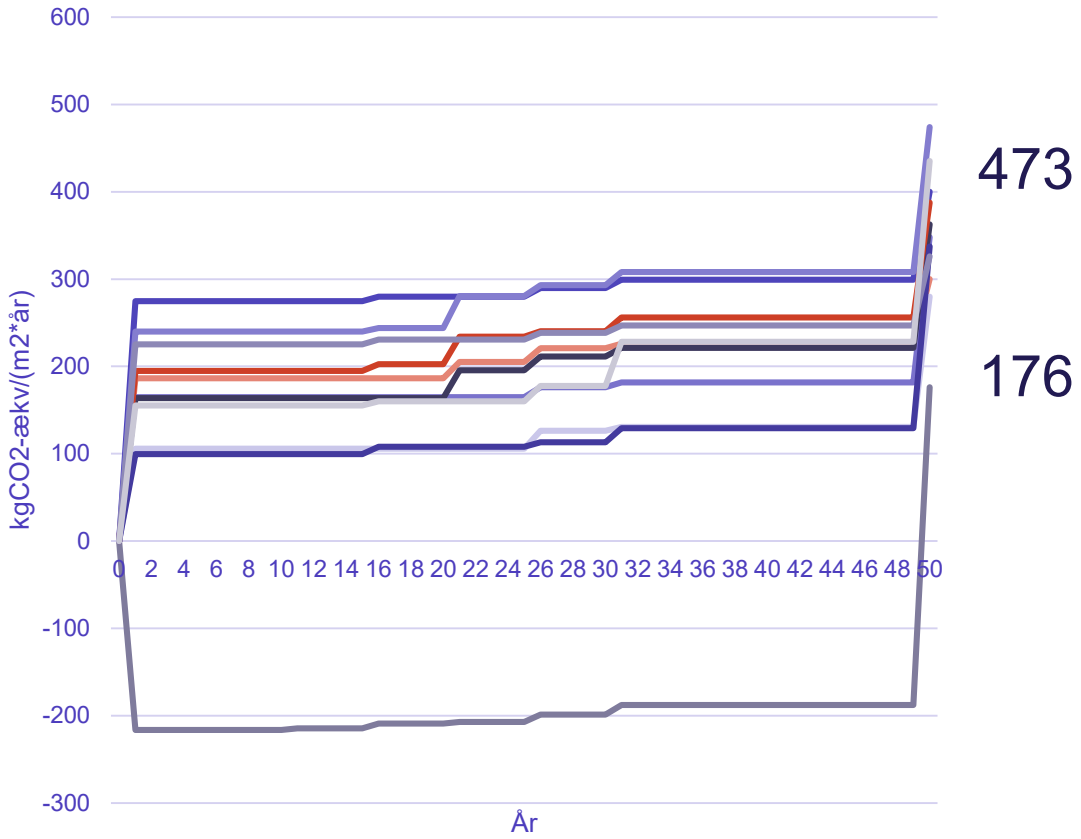


Results for building types

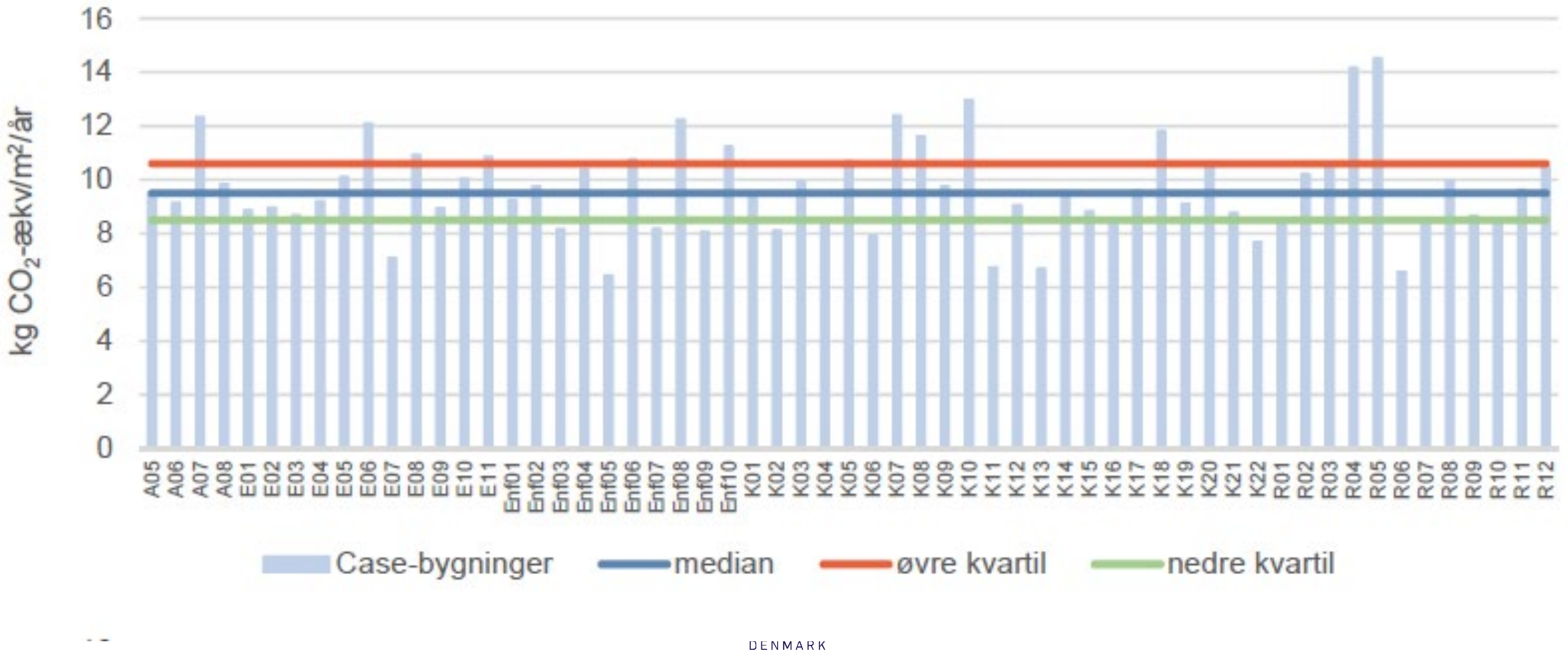


Example - Single family houses





Calculation of reference values - 50 years RSP



ZERO EMISSION NEIGHBOURHOODS IN SMART CITIES

The Research Council of Norway

NTNU

SINTEF

GHG emission values for Norwegian buildings

Marianne Kjendseth Wiik, SINTEF

marianne.wiik@sintef.no

29th May 2020

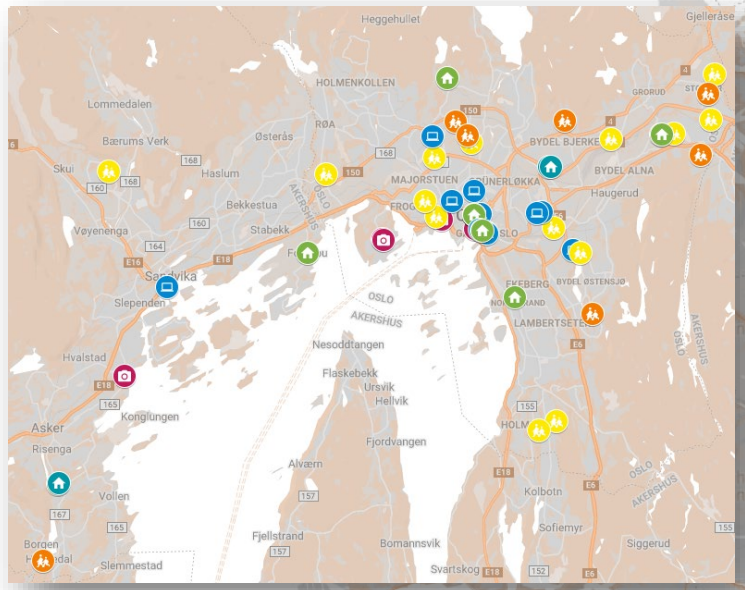

NTNU

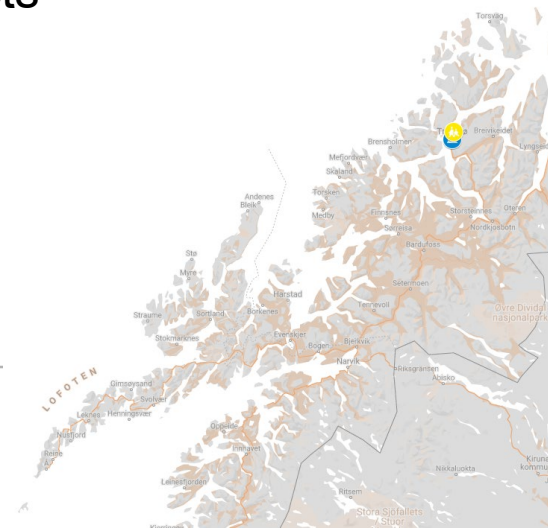
Empirical data from 130+ buildings

- 36 schools
- 25 offices
- 1 library, 4 museums
- 15 nurseries
- 33 houses, 1 hotel
- 6 care homes
- 2 swimming pools, 1 sports hall

1 neighbourhood
Whereby 14 er refurbishment proejcts

Over 1 million m^2 heated floor area
Over 49.000 users





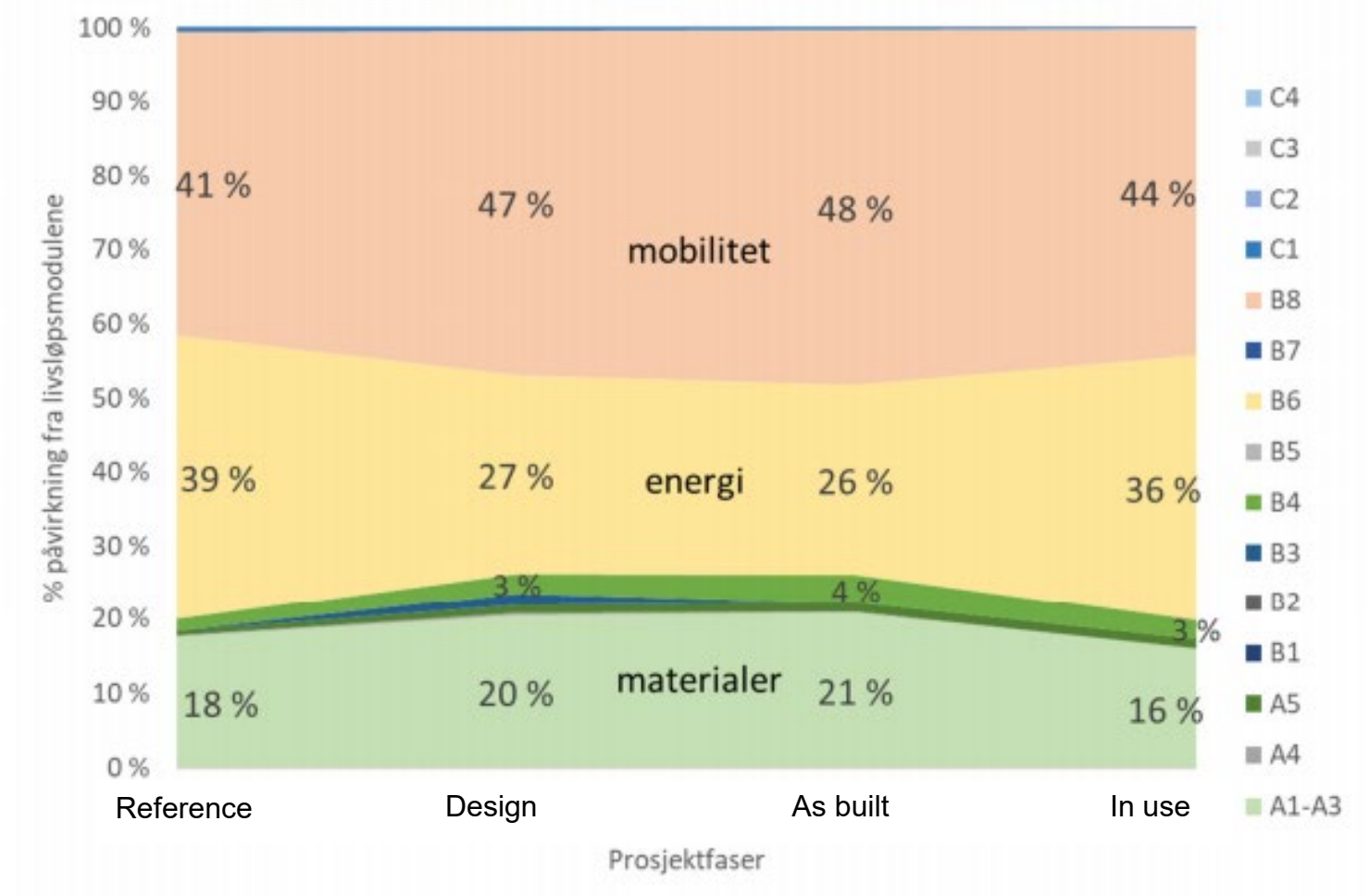
ZERO EMISSION NEIGHBOURHOODS IN SMART CITIES

Limitations and uncertainties

1. Building typology and size
2. Project phases (reference, design, as built or in use)
3. Life cycle modules (A1-C4, D)
4. Building parts (21-79)
5. Methods (ISO 14044, EN 15978, NS 3720)
6. Tools (KGR.no, ZEB tool, OneClickLCA)
7. Data sources (EPD, Ecoinvent, Gabi)
8. Type of construction

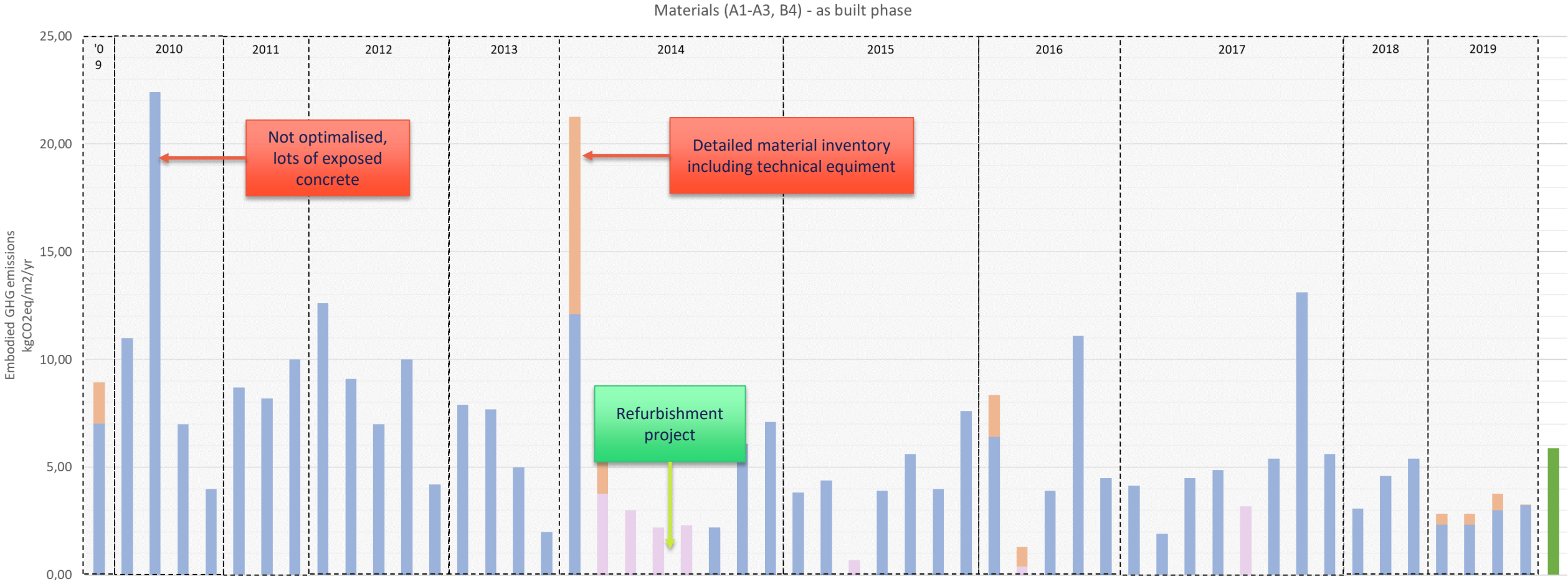
Functional unit is harmonised

GHG emissions per life cycle module

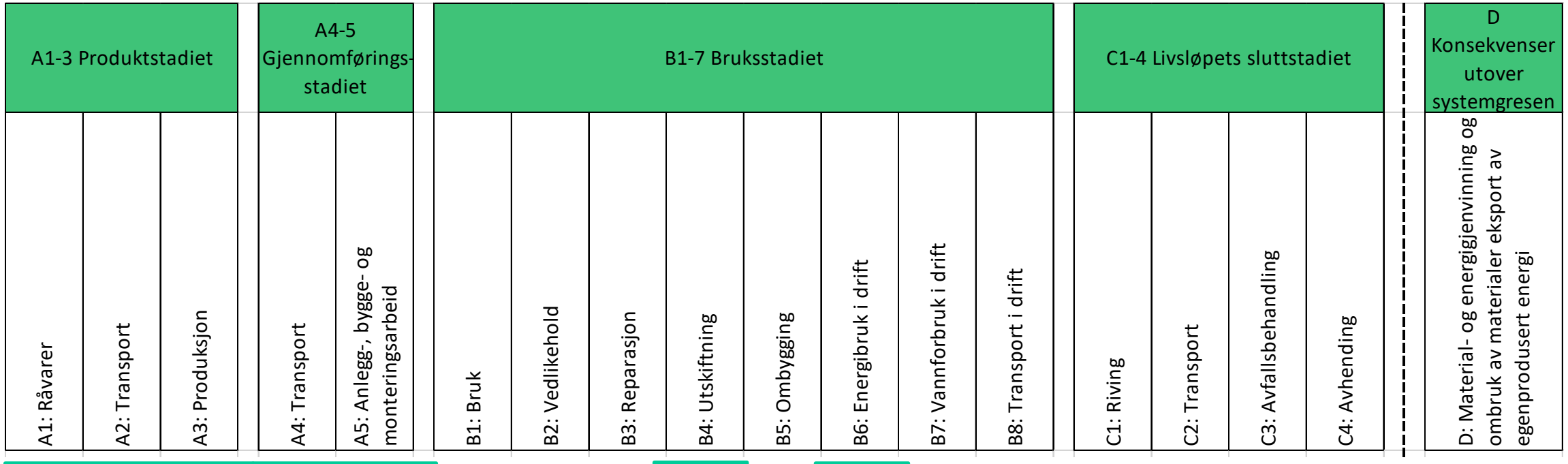


- Mobility, energy use and material use are the largest drivers of high embodied emissions.
- Nearly zero energy buildings use more high carbon emission materials (e.g. metals, minerals and plastic in technical installations with more frequent replacements).
- The user is important. There is an increase in energy use in the operational phase.
- Largest influence for emission reduction is in the design phase.

A1-A3 and B4 - Materials


Materials (A1-A3, B4) - as built phase
Embodied GHG emissions kgCO2eq/m2/yr
25,00
20,00
15,00
10,00
5,00
0,00
'09
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Not optimalised, lots of exposed concrete
Detailed material inventory including technical equiment
Refurbishment project

Important with a whole life cycle perspective

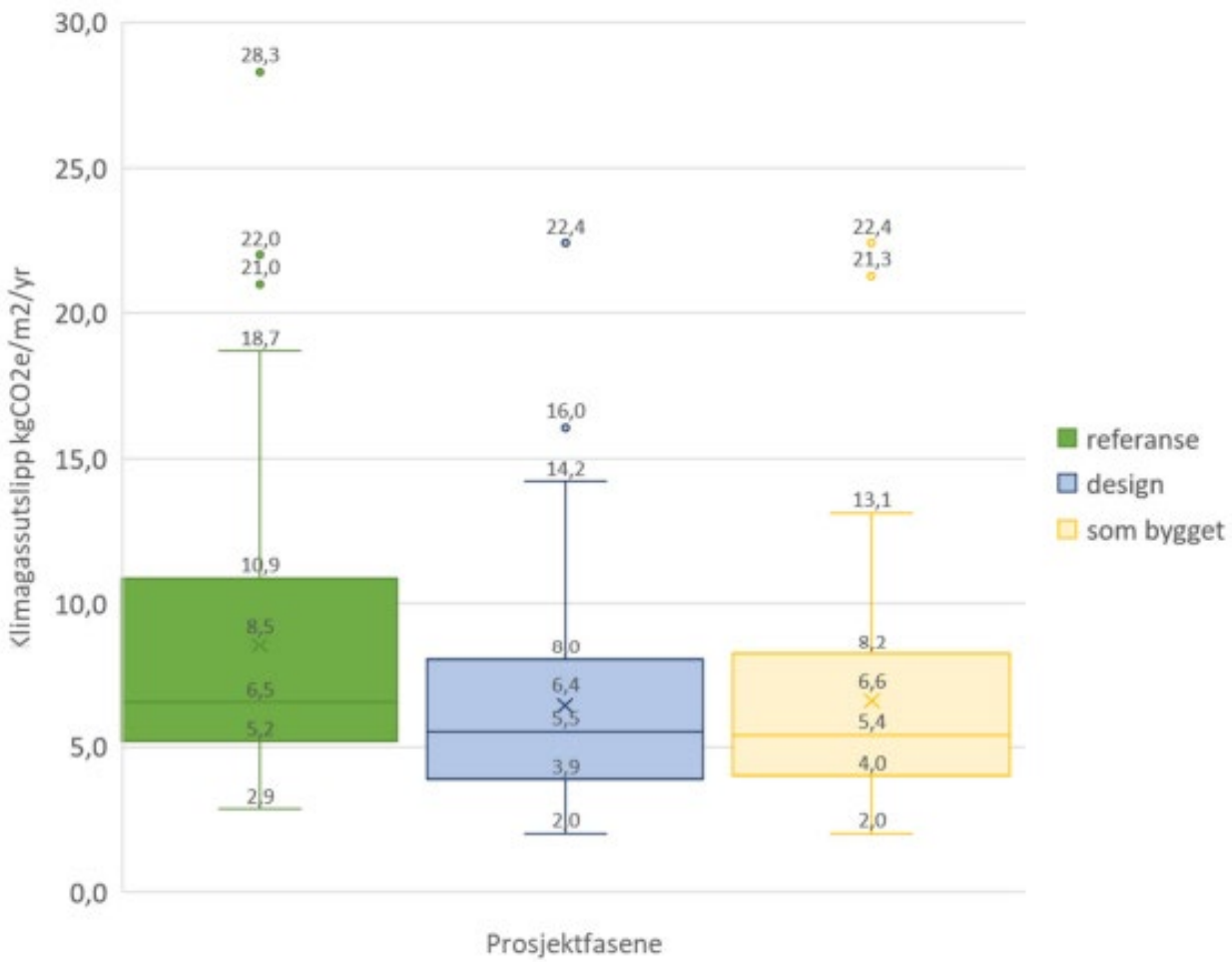


https://www.sintef.no/projectweb/utslippsfrie-byggeplasser/

ZERO EMISSION NEIGHBOURHOODS IN SMART CITIES

FME FORSKNINGSSENTER FOR MILJØVENNLIG ENERGI

Results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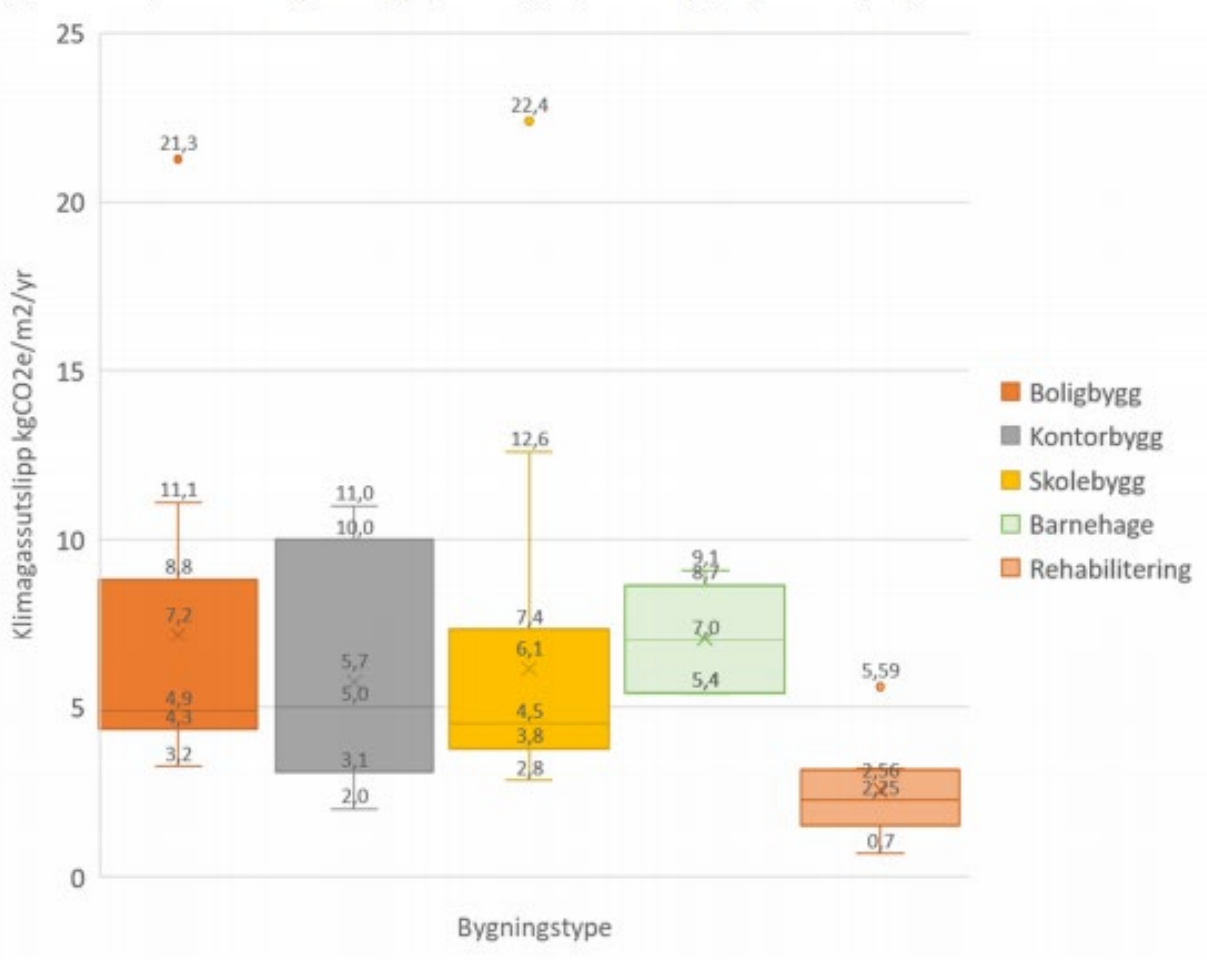
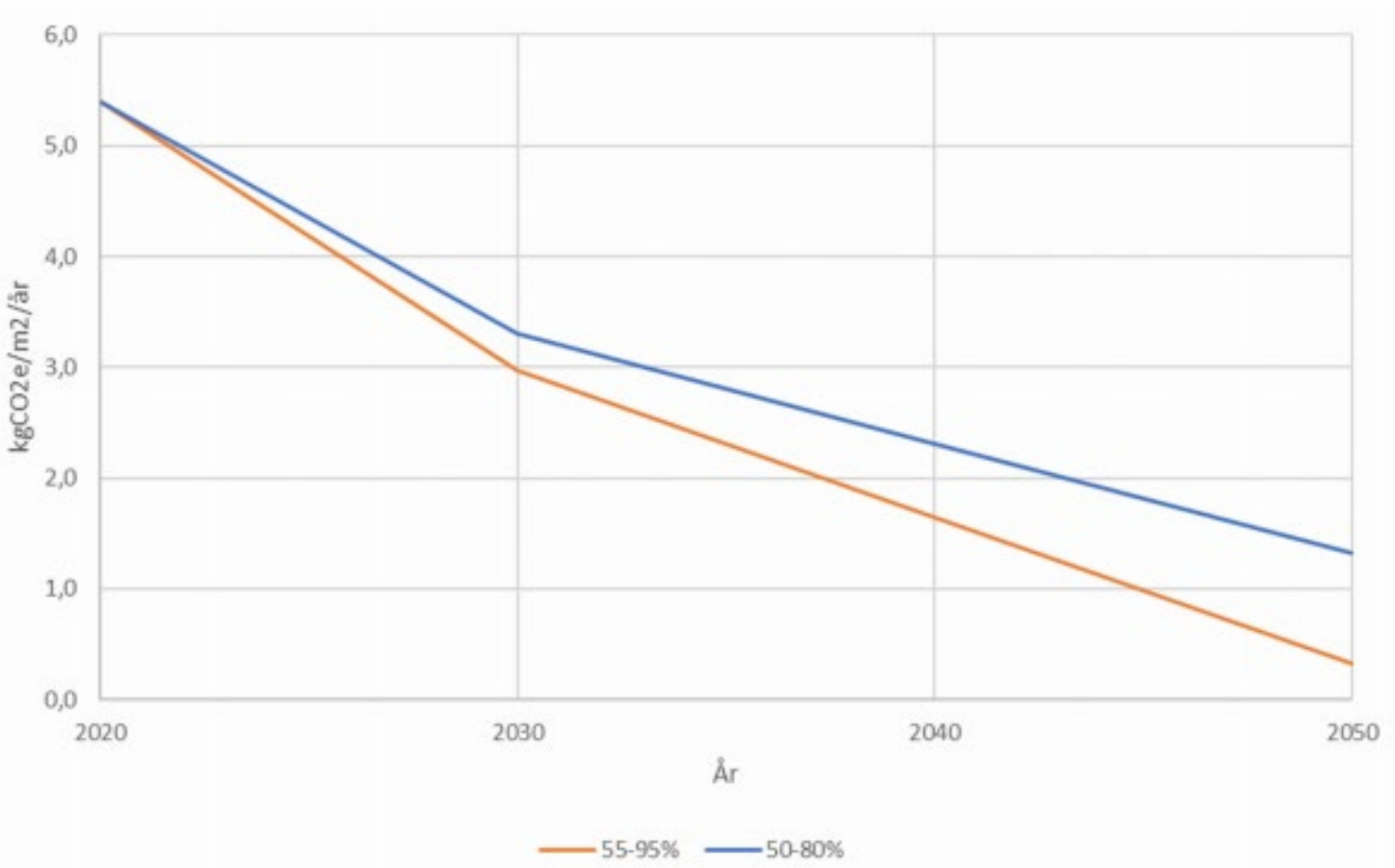
25,0
20,0
15,0
10,0
5,0
0,0
Klimagassutslipp kgCO2e/m2/yr
28,3
22,0
21,0
18,7
10,9
8,5
6,5
5,2
2,9
22,4
16,0
14,2
8,0
6,4
5,5
3,9
2,0
22,4
21,3
13,1
8,2
6,6
5,4
4,0
2,0
referanse
design
som bygget
Prosjektfasene


25
20
15
10
5
0
Klimagassutslipp kgCO2e/m2/yr
21,3
22,4
11,1
8,8
7,2
4,9
4,3
3,2
11,0
10,0
5,7
5,0
3,1
2,0
12,6
7,4
6,1
4,5
3,8
2,8
9,1
8,7
7,0
5,4
5,59
2,56
2,25
0,7
Boligbygg
Kontorbygg
Skolebygg
Barnehage
Rehabilitering
Bygningstype

Suggestions for GHG emission requirements for material use in Norwegian buildings


UN environment programme
Emissions Gap Report 2019


6,0
5,0
4,0
3,0
2,0
1,0
0,0
kgCO2e/m2/år
2020
2030
2040
2050
År
55-95%
50-80%

Recommendations

1. Require EPD documentation for all building materials
2. Require GHG emission calculations for all buildings according to NS 3720 basic
3. Require GHG emission calculations for all buildings according to NS 3720 advanced
4. Report results into a public database to build up a national database og empirical data
5. Use the empirical data to develop reference values for each life cycle module based on the national data
6. Introduce requirements for maximum allowed GHG emissions for buildings based on these reference values
7. Tighten GHG emission requirements annually to reach national / Paris agreement goals

Recommendations

- Reduce area and therefore need for materials
- Consider refurbishment instead of demolishing and building new
- Choose low carbon materials e.g. low carbon concrete, recycled steel and aluminium, recycled plaster, wood-based products or prefabricated components
- Choose material with EPD documentation
- Build lighter e.g. hollow core slabs, strip foundations, building integrated systems
- Choose local materials for reduced transport emissions
- Choose robust materials with a longer service life
- Require emission free construction sites by asking for electric construction machinery

https://fmezen.no/wp-content/uploads/2020/05/ZEN-Report-no-24_Klimagasskrav-til-materialbruk-i-bygninger.pdf

Thank you!

FORSKNINGS-
SENTER FOR
MILJØVENNLIG
ENERGI

SKANSKA

LCA – possibilities and challenges

Jeanette Sveder Lundin, Skanska Sweden

SKANSKA

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Trends

- **Politics –** Sweden as a permanent exhibition
- **Economy** –new business models.
- **Social** – Greta-effect.
- **Technology** – New materials and ways to use them.

Listen to science

Color Palette™

SKANSKA

Innovation

WE NEED DATA AND CALCULATION

2015

2030

2045

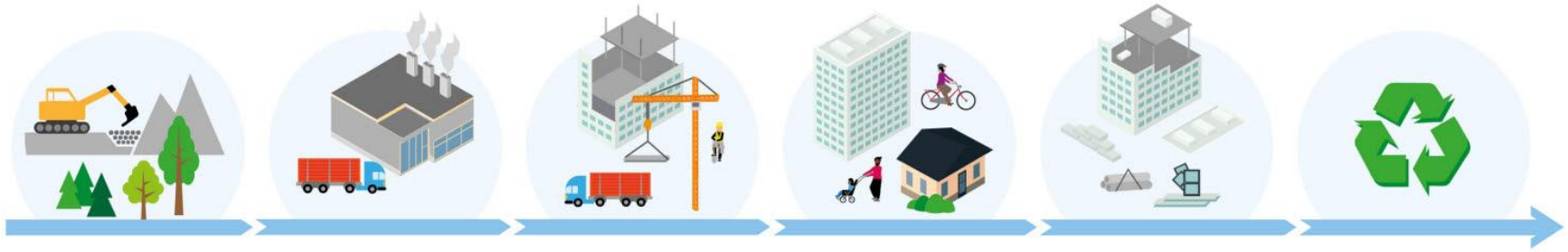
Carbon Neutrality

Roadmap 2045

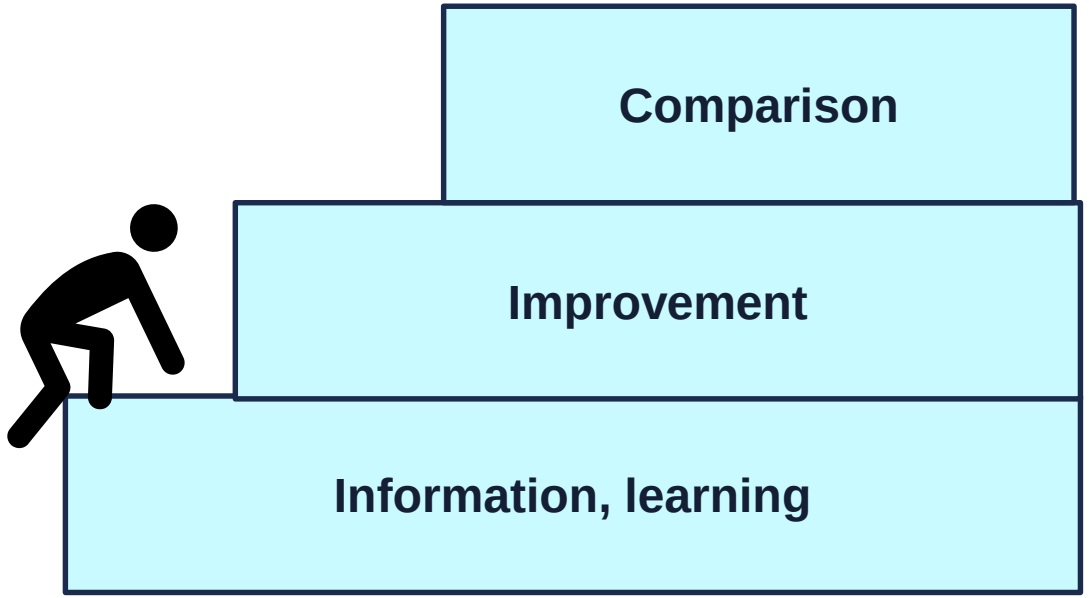
What does it mean to Skanska?

We need to:

- Calculate climate impact in all our business
- Understand the effects of our choices (methods, materials etc.)
- Evaluated suppliers, subcontractors
- Steer towards our goals
- Understand the effects of climate change (climate adaptation)



To understand...

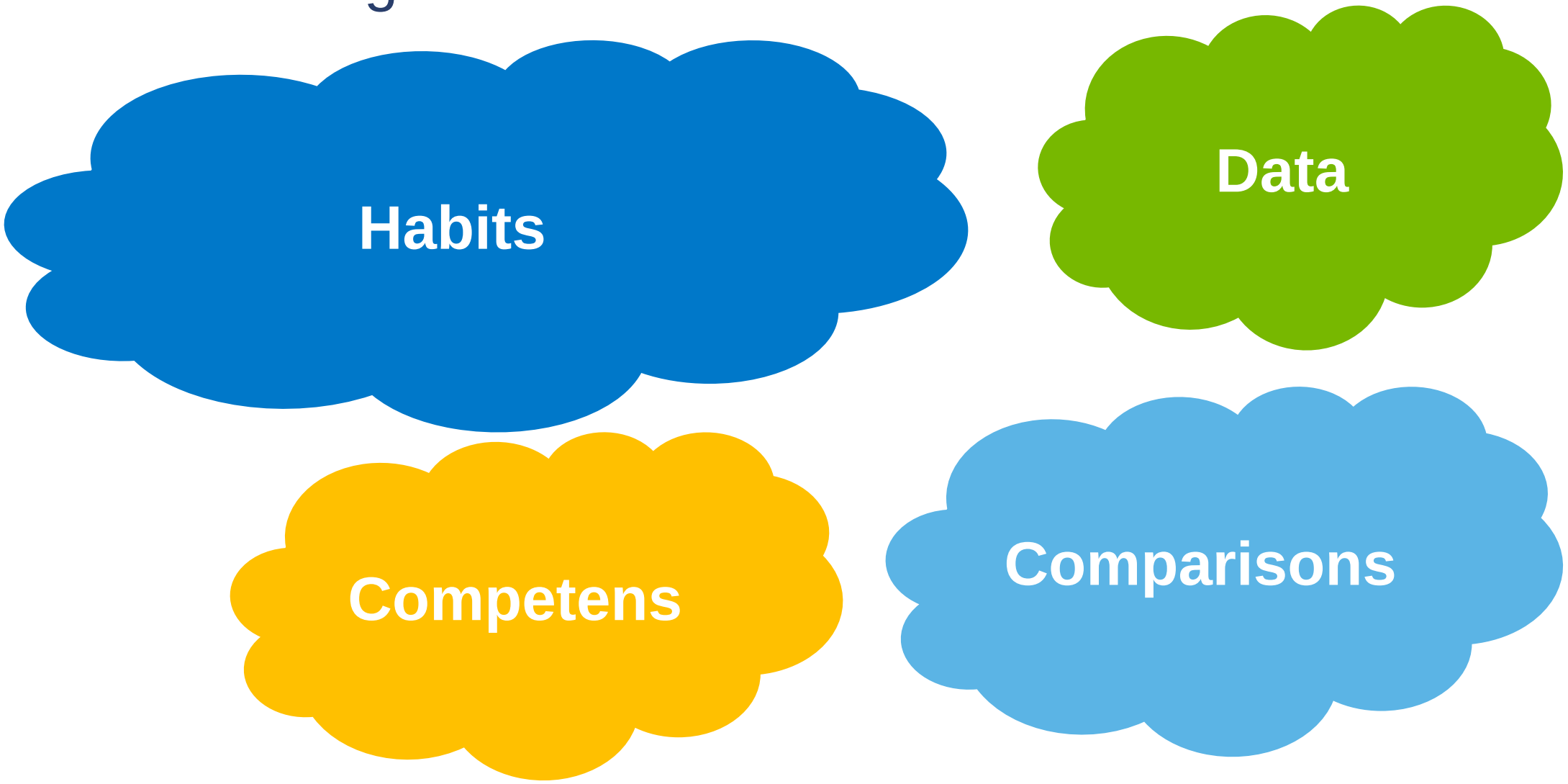


To make it work in practice…..

- Part of the ordinary process
- Part of all other information
- Cost effective

DIGITAL

Challenges



SKANSKA

Common needs:

- Common voice to meet EU suggestions/legislations
- Quality of generic data
- Quality of specific data
- Support initiatives digitalization
- Transparent reference buildings

Q metadata

- Criteria 1: Product granularity
- Criteria 2: Manufacturing representativeness
- Criteria 3: LCI data accuracy

Variation can be calculated

- Criteria 4: Declaration review type
- Criteria 5: Additional significant documentation specifications
- Criteria 6: Q metadata validation

Reference:
Erlandsson M (2018): Q metadata for EPD. Quality-assured environmental Product declarations (EPD) for healthy competition and increased transparency. Smart Built Environment and IVL Swedish Environmental Research Institute, report No C363, December 2018.

SKANSKA

I think……

……If we manged to handle environmental data in our processes, we can handle any data.


What we build today.....
We will use as resources tomorrow

Preliminary program for Nordic climate forum for construction







Danish Transport, Construction and Housing Authority

Anders Jensen

29th. May 2020

Preliminary program
10.00 **Opening words**
10.10 **Status and current issues** from authority
10.25 **Status and current issues** from industry
10.40 **Status and current issues** from academia
10.55 **Coffee break**
11.05 **Nordic ministers** give their greetings – Video
11.15 **Nordic Database** presentation of project
11.40 **Reference values of buildings** presentation of studies
12.05 **Lunch break**
12.50 **Introduction to roundtable discussions**
13.00 **Roundtable discussion 1** – Nordic climate database
13.50 **Coffee break**
14.00 **Insights** from high-level representatives of the European Commission – Video
14.10 **Roundtable discussion 2** – Reference values for construction
15.00 **Insights** from the World Green Building Council - Video
15.10 **Conclusions and way forward**

Please send in your suggestions

Please send in your suggestions for speakers and questions to be answered

Send in your suggestions on:

- Speakers to give a status and highlight current issues
- Speakers to introduce the roundtable discussions
- Questions to discuss at the roundtables

anbr@tbst.dk

Please submit your proposal no later than June 3

QUESTIONS?

THANK YOU

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LinkedIn: Swedish Life Cycle Center
And sign up for newsletter!