



**DEVELOPMENT OF LCABYG FOR THE DANISH  
BUILDING SECTOR  
DRIVERS FOR THE DEVELOPMENT AND APPLICATION  
OF THE TOOL**

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# Why, how, when?

**2014**

The Danish Government:  
Political strategy for buildings  
with  
Vision for a Voluntary Sustainability  
Class in the Building Code



**2015**

National LCA-tool LCAbyg launched  
in April 2015  
+  
Several publications

**Introduction**  
to LCA of Buildings

Trafik og Byggestyrelsen

2016



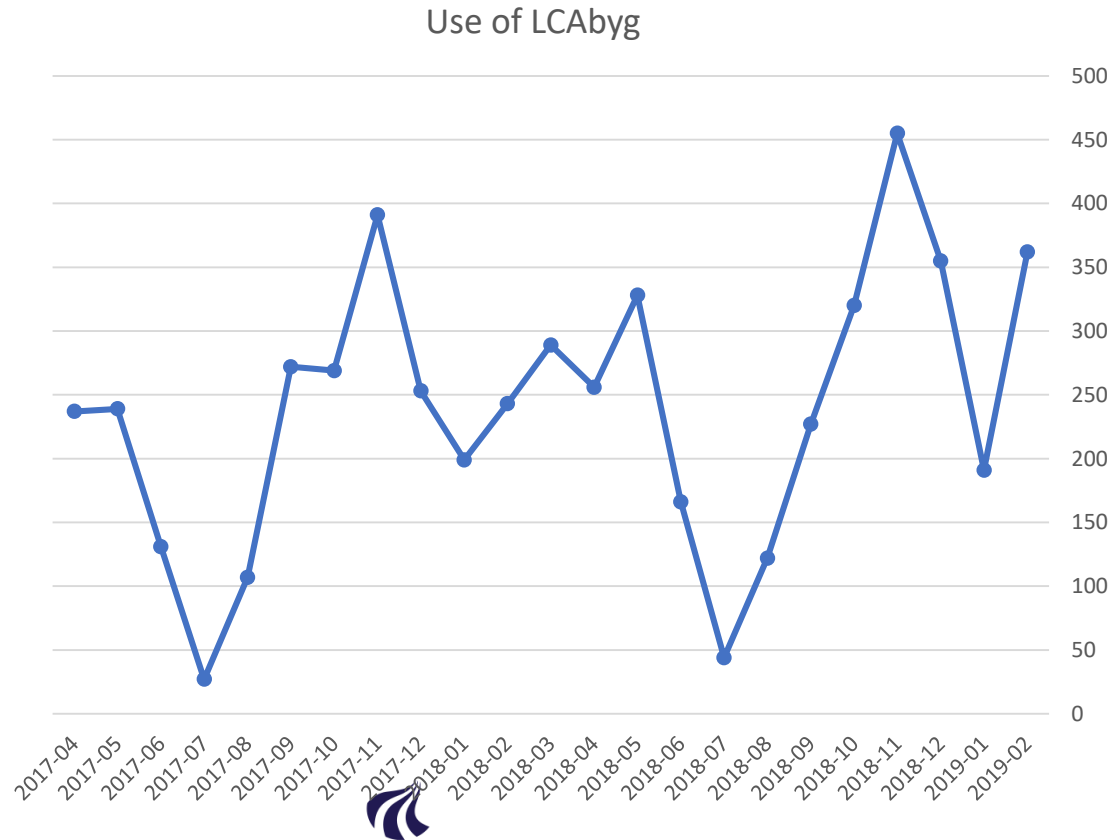
# In brief

- Developed by The Danish Building Research Institute for the Danish Transport, Construction and Housing Authority
- National freely available tool developed for the Danish building sector
- First version launched in April 2015
- New beta version in January 2019 with focus on early design stages
- Over 3000 users, about 300-500 users each month



# It is being used

About 3000  
registered users in  
total

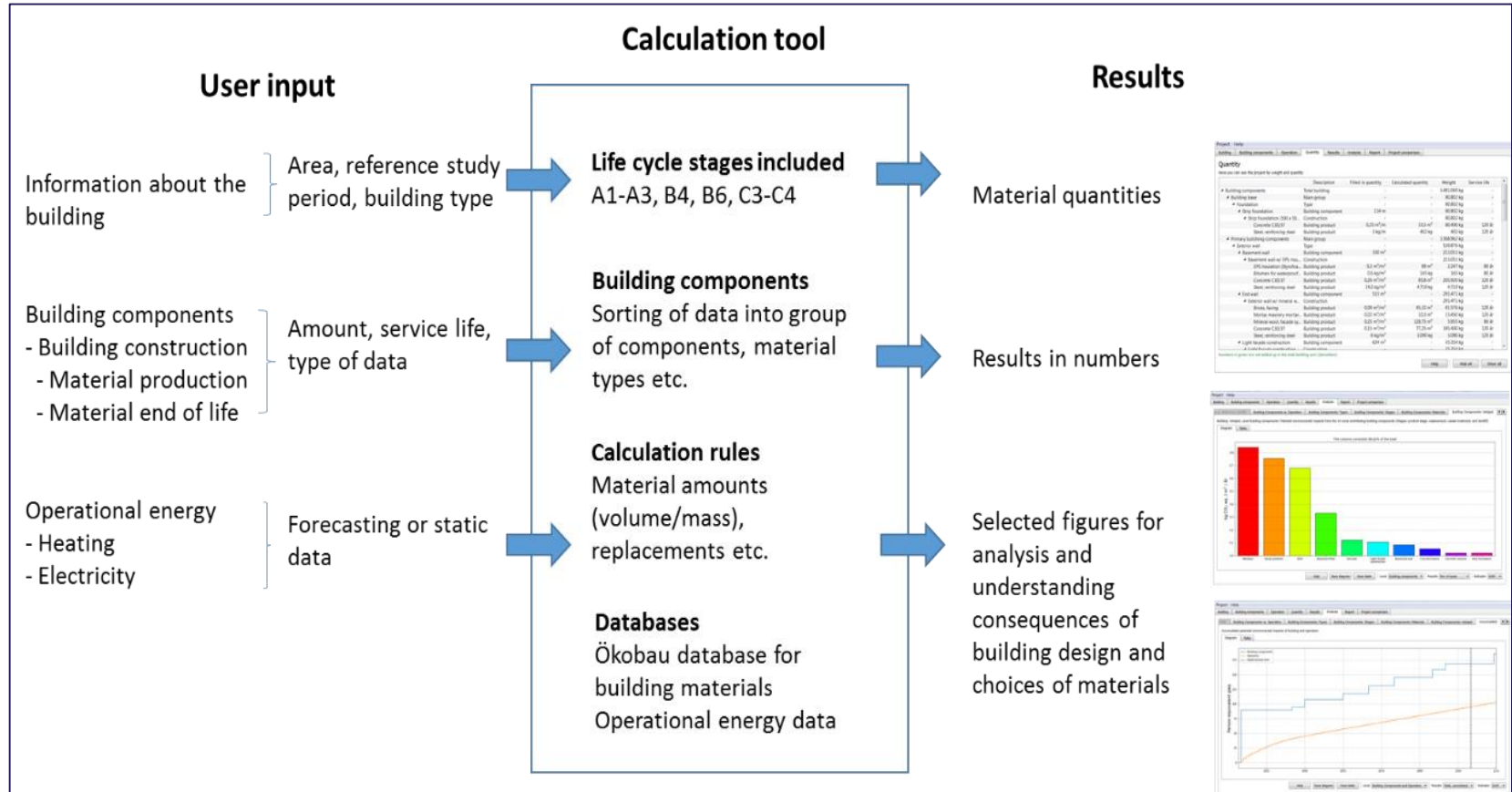


## **CONDITIONS**

Short time to develop a robust tool for  
different users in Denmark



# Classical tool structure



## **FOKUS in the tool development:**

- Transparency
- Understand
- Learn
- Improve



# Comparing and choosing between alternatives

Project Help

Building components

Table structure | Tree structure | Database

Here you can add building components in the project (Alternatively use the tree structure)

Building components

Type	Building component	Construction	Quantity	Unit	nolit	calculated weigh
1	<input checked="" type="checkbox"/> Foundation	Strip foundation	Strip foundation (500 x 500 mm)	134	m	80.802 kg
2	<input checked="" type="checkbox"/> Structure	Concrete columns	Concrete column (300 x 300 mm)	336	m	72.778 kg
3	<input checked="" type="checkbox"/> Structure	Concrete beams	Concrete beam (300 x 750 mm)	360	m	194.940 kg
4	<input checked="" type="checkbox"/> Storey partition	Basement floor	Basement flooring w/ EPS insulation (800 mm)	832	m <sup>2</sup>	660.908 kg
5	<input checked="" type="checkbox"/> Exterior wall	Basement wall	Basement wall w/ EPS insulation (750 mm)	330	m <sup>2</sup>	213.051 kg
6	<input checked="" type="checkbox"/> Exterior wall	End wall	Exterior wall w/ mineral wool insulation and brickwork (50...	515	m <sup>2</sup>	291.471 kg
7	<input checked="" type="checkbox"/> Exterior wall	Light facade construction	Light facade construction w/ steel and mineral wool insul...	624	m <sup>2</sup>	35.354 kg

Help | Move up | Move down | Delete row

Building products in construction: Strip foundation (500 x 500 mm)

Name	Product stage	End of life stage	Quantity	Unit factor	Service life	Calculated quantity
1 Concrete C30/37	Concrete C30/37	Concrete C30/37, EOL	0,25	m <sup>3</sup> /m	120 years	33,5
2 Steel, reinforcing steel	Steel, reinforcing steel	Empty waste process (for reinforcing steel etc.)	3	kg/m	120 years	402

Choose service life | Show stage | Move up | Move down

### Comparison of alternatives

Project Help

Building components

Table structure | Tree structure | Database

Here you can get an overview of available constructions, building product and stage

Constructions | Building products | Stages

Filter: Source: All | Type: Exterior wall

Comparison	Name	Type	Unit
<input checked="" type="checkbox"/>	Exterior wall on wooden frame with pine boards, mineral wool and gypsum boards	Exterior wall	m <sup>2</sup>
<input checked="" type="checkbox"/>	Exterior wall w/ mineral wool insulation and brickwork (108 mm)	Exterior wall	m <sup>2</sup>
<input checked="" type="checkbox"/>	Exterior wall w/ mineral wool insulation and brickwork (130 mm)	Exterior wall	m <sup>2</sup>

Details: Comparison

Alternative	GWP (kg CO2e/m <sup>2</sup> )	GPP (kg CO2e/m <sup>2</sup> )	PHE (kg CO2e/m <sup>2</sup> )
(1) [1] Exterior wall on wooden frame with pine boards, mineral wool and gypsum boards	~10	~15	~100
(2) [2] Exterior wall w/ mineral wool insulation and brickwork (108 mm)	~25	~20	~100
(3) [3] Exterior wall w/ mineral wool insulation and brickwork (130 mm)	~30	~15	~120

Help | Import | Export | Delete



# Quick overview of quantities and understand the massflow

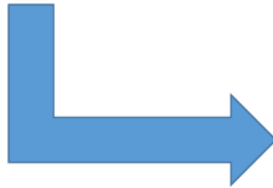
Project Help

Building Building components Operation **Quantity** Results Analysis Report Project comparison

## Quantity

Here you can see the project by weight and quantity

	Description	Filled in quantity	Calculated quantity	Weight	Service life
▲ Building components	Total building	-	-	3.481.069 kg	-
▷ Building base	Main group	-	-	80.802 kg	-
▷ Primary building components	Main group	-	-	3.368.962 kg	-
▷ Completions	Main group	-	-	30.863 kg	-
▷ Installations	Main group	-	-	442 kg	-



Numbers in green are not added up in the total building sum (demolition)

Project Help

Building Building components Operation Quantity **Results** Analysis Report Project comparison

## Quantity

Here you can see the project by weight and quantity

	Description	Filled in quantity	Calculated quantity	Weight	Service life
▲ Building components	Total building	-	-	3.481.069 kg	-
▲ Building base	Main group	-	-	80.802 kg	-
▲ Foundation	Type	-	-	80.802 kg	-
▲ Strip foundation	Building component	134 m	-	80.802 kg	-
▲ Strip foundation (500 x 50...	Construction	-	-	80.802 kg	-
Concrete C30/37	Building product	0,25 m <sup>3</sup> /m	33,5 m <sup>3</sup>	80.400 kg	120 år
Steel, reinforcing steel	Building product	3 kg/m	402 kg	402 kg	120 år
▲ Primary building components	Main group	-	-	3.368.962 kg	-
▲ Exterior wall	Type	-	-	539.876 kg	-
▲ Basement wall	Building component	330 m <sup>2</sup>	-	213.051 kg	-
▲ Basement wall w/ EPS insu...	Construction	-	-	213.051 kg	-
EPS insulation (Styrofoa...	Building product	0,3 m <sup>3</sup> /m <sup>2</sup>	99 m <sup>3</sup>	2.247 kg	80 år
Bitumen for waterproof...	Building product	0,5 kg/m <sup>2</sup>	165 kg	165 kg	80 år
Concrete C30/37	Building product	0,26 m <sup>3</sup> /m <sup>2</sup>	85,8 m <sup>3</sup>	205.920 kg	120 år
Steel, reinforcing steel	Building product	14,3 kg/m <sup>2</sup>	4.719 kg	4.719 kg	120 år
▲ End wall	Building component	515 m <sup>2</sup>	-	291.471 kg	-
▲ Exterior wall w/ mineral w...	Construction	-	-	291.471 kg	-
Bricks, facing	Building product	0,09 m <sup>3</sup> /m <sup>2</sup>	45,32 m <sup>3</sup>	81.576 kg	120 år
Mortar masonry mort...	Building product	0,02 m <sup>3</sup> /m <sup>2</sup>	10,3 m <sup>3</sup>	15.450 kg	120 år
Mineral wool, facade sy...	Building product	0,25 m <sup>3</sup> /m <sup>2</sup>	128,75 m <sup>3</sup>	5.955 kg	80 år
Concrete C30/37	Building product	0,15 m <sup>3</sup> /m <sup>2</sup>	77,25 m <sup>3</sup>	185.400 kg	120 år
Steel, reinforcing steel	Building product	6 kg/m <sup>2</sup>	3.090 kg	3.090 kg	120 år
▲ Light facade construction	Building component	624 m <sup>2</sup>	-	35.354 kg	-
▲ Light facade construction	Construction	-	-	35.354 kg	-

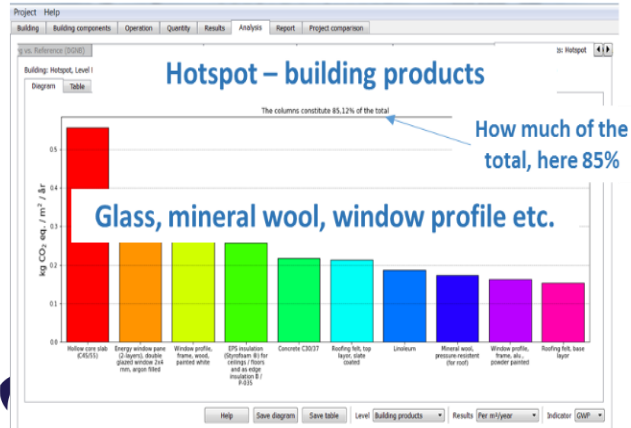
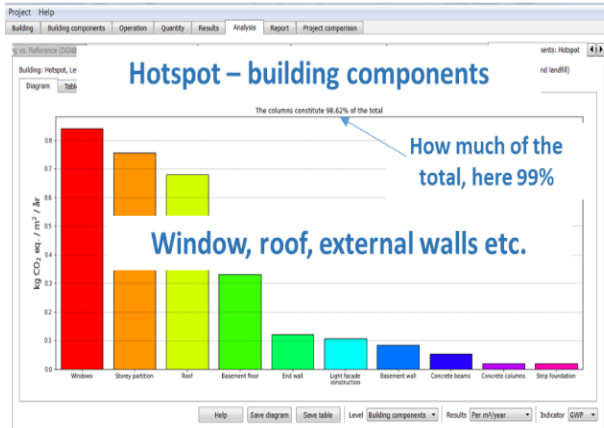
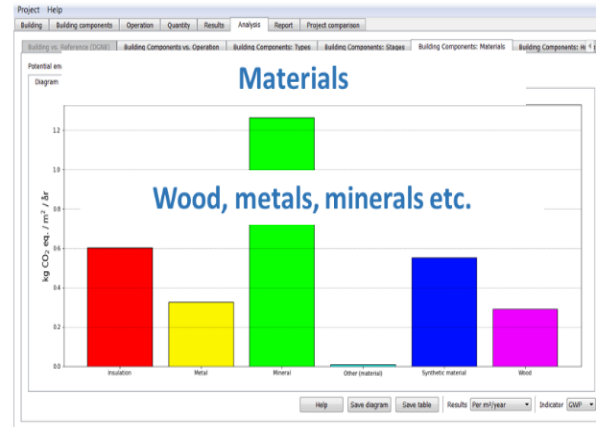
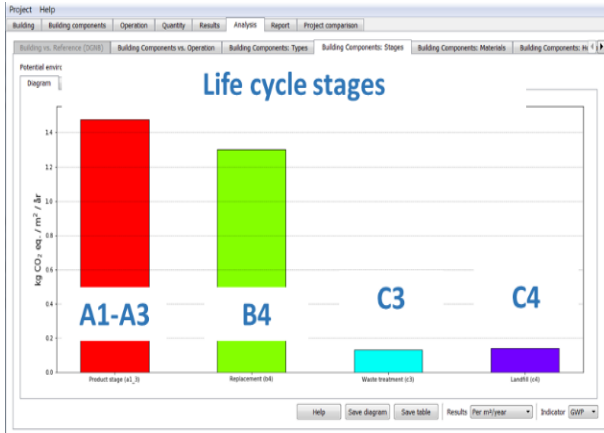
Numbers in green are not added up in the total building sum (demolition)

Help

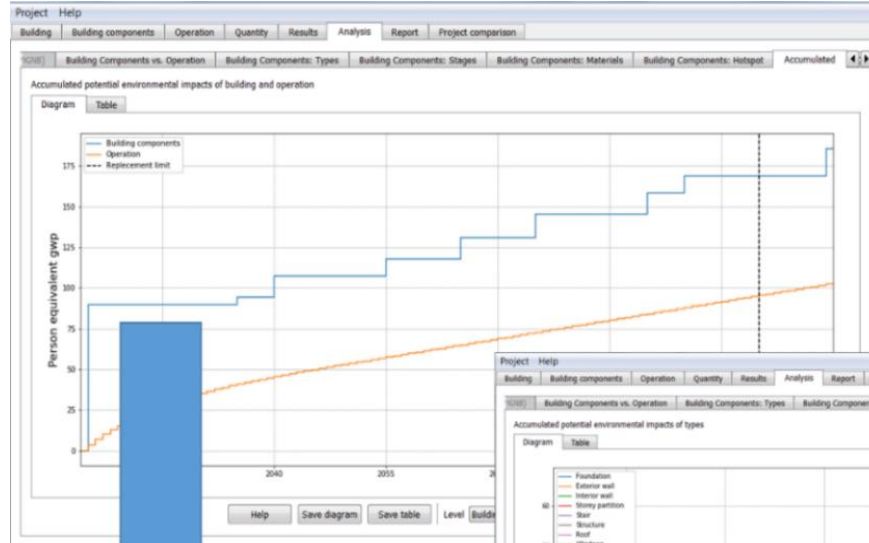
Hide all

Show all

# Analysis with pre-defined figures



# Last but not least: Understanding **WHEN**, **HOW MUCH** and **WHY**

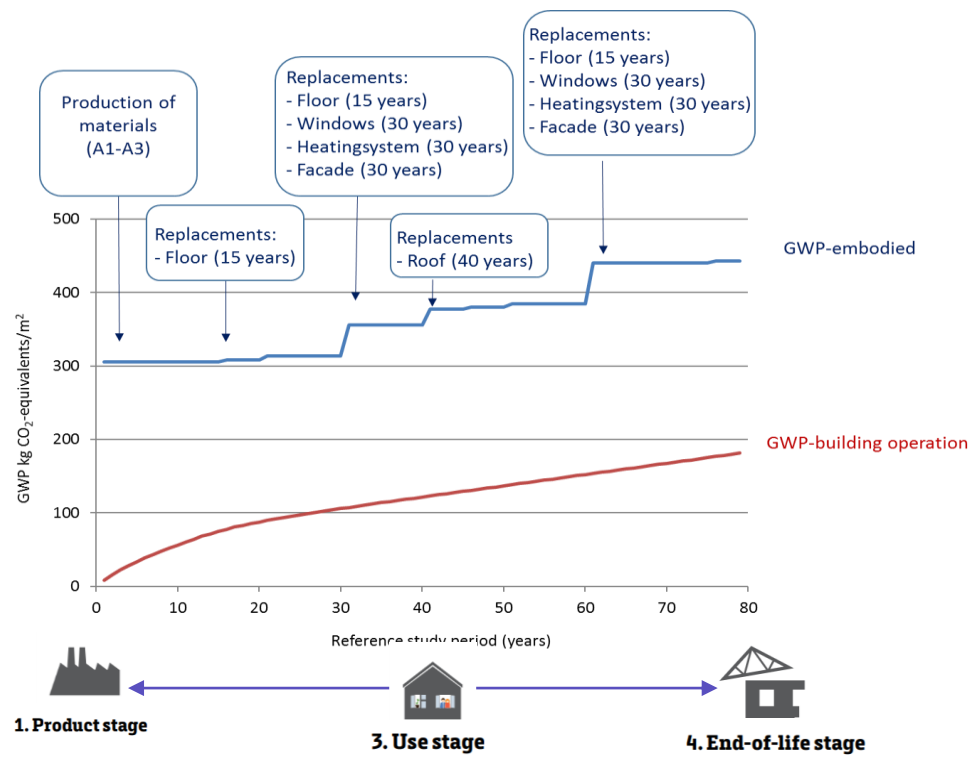
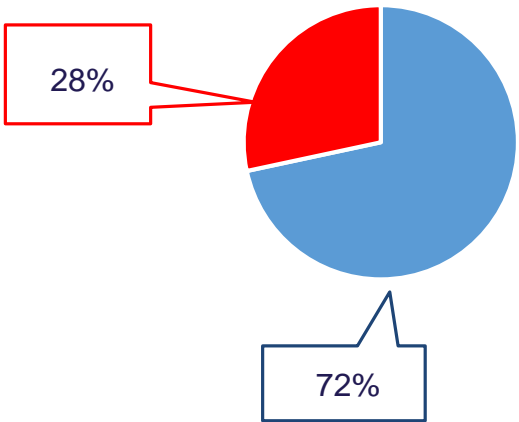


Embodied

Operational energy



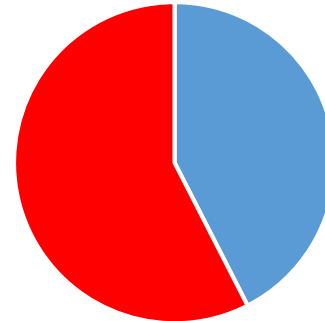
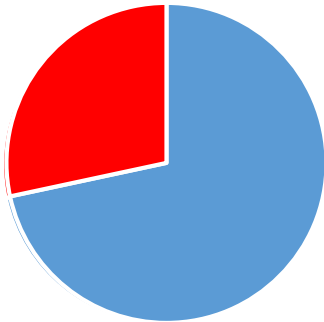
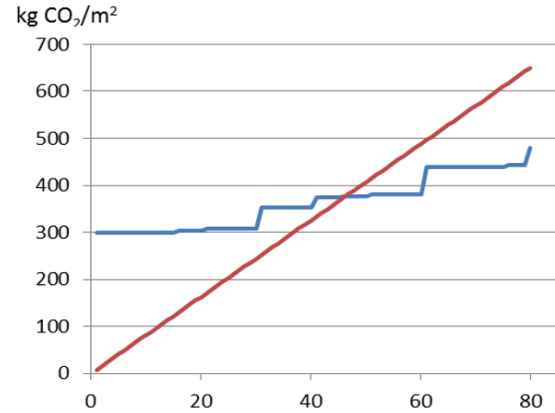
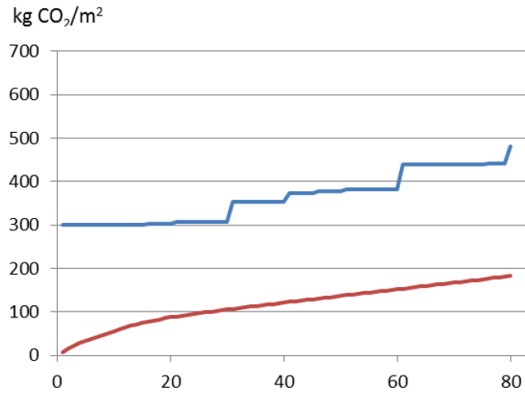
# Whole life carbon assessment for an office building – an example



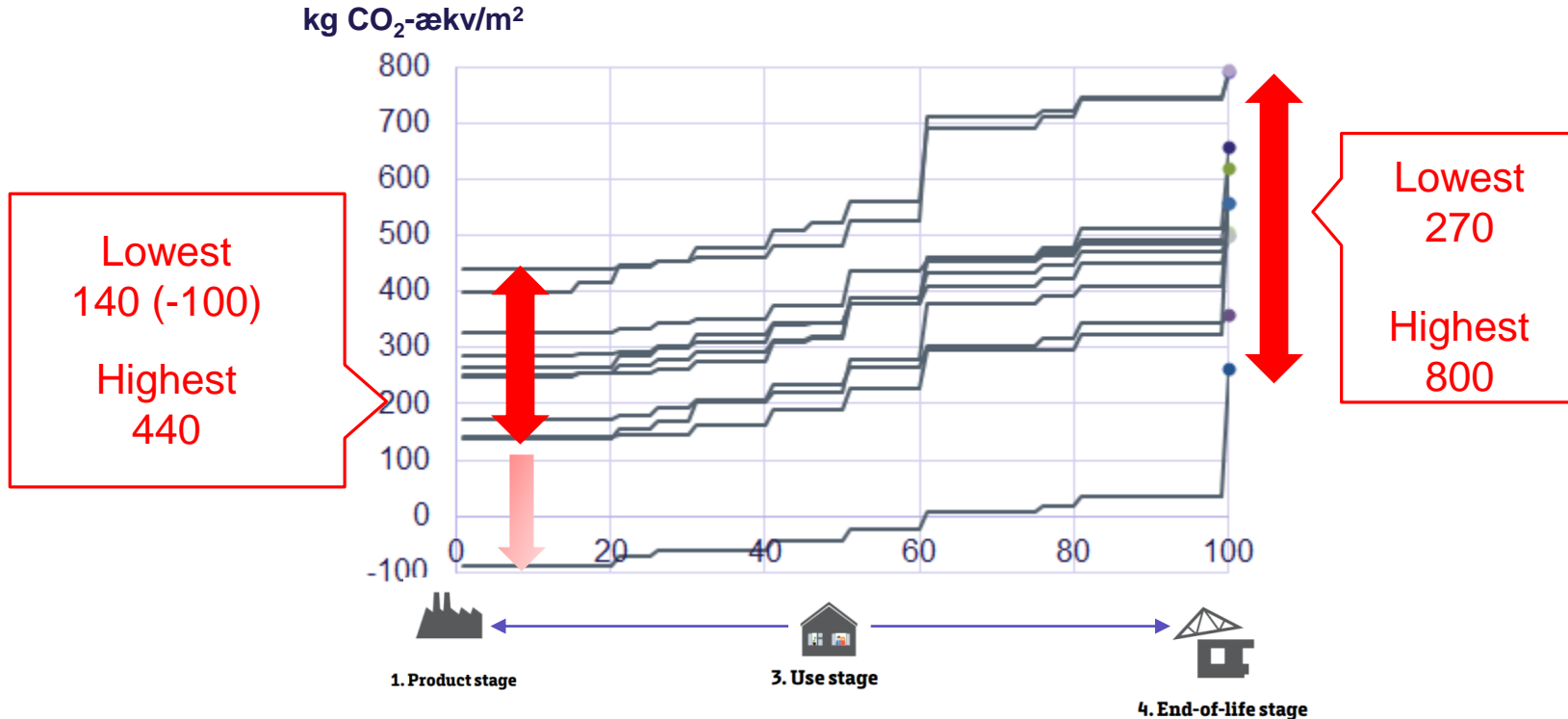
**Not regulated**

**Regulated**

# Consequences of using static versus forecasting - and how results are presented!



# There is a large potential to reduce the embodied impacts



# Our goals have been to:

- Increase building designer's **awareness**
- Let them **understand** where, in the building life cycle, reductions can be achieved
- Significant to focus on **simplifying** the process
- Finding ways of **communicating complex LCA results** to the users
- Perform **comparisons** of different construction solutions and material uses within the tool.
- Developing **predefined visualization** of results that were believed to qualify the designer to identify **hotspots** and to **understand** and mitigate the major impacts throughout the building's life cycle.
- Encourage the user to **shuffle around** between the **numerical results** and the **figures** in order to understand

