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

- 考測算過時 結婚 總總 精神 解释

VERE

#### HARPA BIRGISDOTTIR



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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



. Trafik- og Byggestyr



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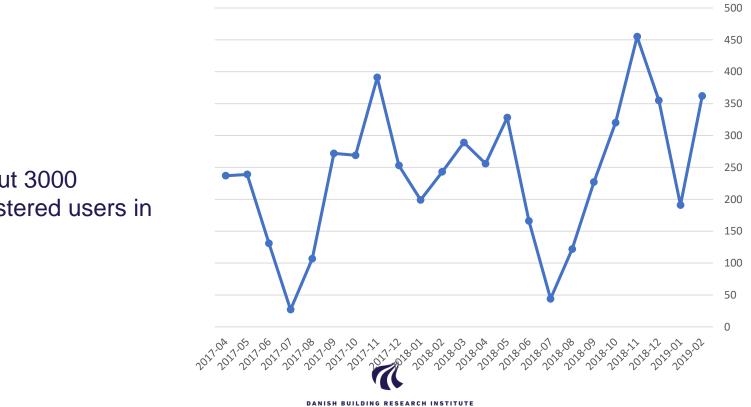
# In brief

- 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



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#### It is being used



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Use of LCAbyg

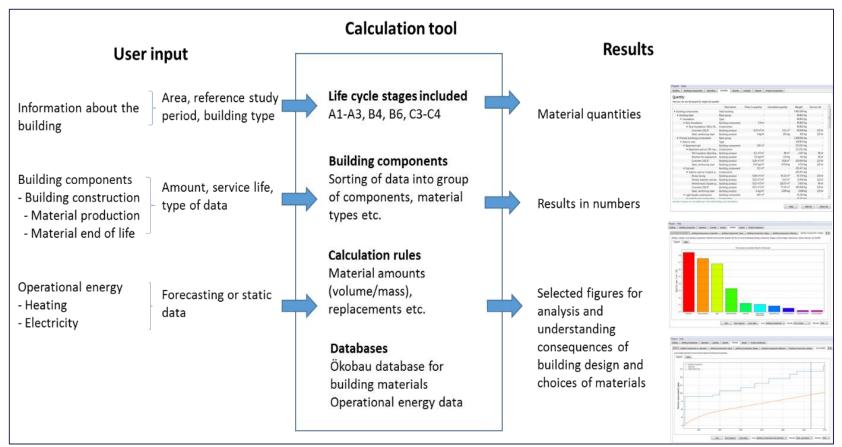
About 3000 registered users in total

#### 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

	ructure Tree structure															
-	u can add building compon ng components	ents in the p	project (Alternat	tively use t	he tree structure)											
	Туре	E	Building comp	onent		Construction			Quantity	Unit	nolit	alculated weigh		-		
1 Foundation Strip foundation			Strip foundation (500 x 500 mm)				134	m		80.802	kg	-				
2	Structure	Cond	rete columns		Concrete column (3			336	m		72.778	kg				
3	Structure	Cond	rete beams		Concrete beam (30			360	m		194.940	kg				
4	Storey partition	ey partition Basement floor			Basement flooring w/ EPS insulation (800 mm)				832	m²		660.908	kg			
5	Exterior wall	Base	ment wall		Basement wall w/ B	PS insulation (750	mm)		330	m²		213.051	kg			
6	Exterior wall	End	wall		Exterior wall w/ mi	neral wool insulation	on and brickwo	rk (50	515	m²		291.471	kg 💼		\$	
7	Exterior wall	Light	facade const	truction	Light facade constr	uction w/ steel and	mineral wool	insul	624	m²		35.354	kg	-		
•			111										•			
	Help				Move up		Move	down				Delete rov	1			
Idin	ng products in construction:	Strip tound	lation (500 x 500	U mm)												
	Name	Prod	luct stage		End of life st	age	Quantity	Un	it factor	Se	rvice	life Calcul	ated quantity	-		
1	Concrete C30/37	Concrete	C30/37	Concret	te C30/37, EOL		0,25 m	³/m				120 years	33,5			
2	Steel, reinforcing steel	Steel, rein	nforcing steel	Empty	waste process (for rei	nforcing steel etc.)	3 kg	/m				120 years	402	-		
-					Ш								F.			
•	Choose service life	1	s	how stage		Move up	1	_	Project He		nenta 🔒	Speration Quantity Results	Analysis   Report   Prop	ed comparison		
₹	Choose service life		S	how stage		Move up		-	Mov Building Table strut	luiding comp ture Tree	structure	Database				
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•	Choose service life		S	how stage		Move up			MOL Building Table strue Here you c Construe Filter	luiding comp ture Tree	structure view of ave ding produc	Database			on of	alterna
~	Choose service life		S	how stage		Move up			MON Building Table strur Here you C Constru Filter Source	Building comp Bure Tree an get an ove chons Buil	structure view of ave ding produc	Database liable constructions, building product a stages stance walt •		pariso	on of	alterna
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4	Choose service life		S	how stage		Move up			Mor Building Table strue Table strue Here you o Construe Filter Source	Building comp Sure Tree an get an eve clions Buil	structure view of ava deg produc Type (E) Exterior w Exterior w	Database lable constructions, building product a to Stages denor walt • N	et stapes Com	paris osum boards Edu	Type Unit	anan ing tani ni matai na na tani t
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#### Quick overview of quantities and understand the massflow

9uilding con ▷ Building I ▷ Primary b ▷ Completi	the project by weigh											
<ul> <li>Building I</li> <li>Primary b</li> <li>Completi</li> </ul>	nponents	Description										
<ul> <li>Primary b</li> <li>Completi</li> </ul>	nponents	Description	Filled in qu	antity	Calculated q	uantity	Weig	ht	Service lif	e		
Completi		Total building		-		-	3.481.0	69 kg		-		
<ul> <li>Primary b</li> <li>Completi</li> </ul>	base	Main group		-		-	80.8	02 kg		-		
Completi	<ul> <li>Primary buildning components</li> <li>Main gro</li> </ul>					-	3.368.9	-				
					- 30.863 kg							
		Main group						42 kg				
Installation	ons	Main group		-		-	4	42 Kg		-		
			Project Help									
			Building Build	ding component	ts Operation	Quantity	Results	Analysis	Report	Project comparison		
			Quantity Here you can see	the project by	weight and quantit							
					Description		Filled in quantity		Calculated quantity	Weight	Service life	
			<ul> <li>Building components</li> </ul>		Total build			-		3.481.069 kg	-	
			Building base		Main group			-	-	80.802 kg	-	
			4 Foundation		Type			134 m		80.802 kg 80.802 kg		
			<ul> <li>Strip foundation</li> <li>Strip foundation (500 x 50</li> </ul>		Building component Construction			134 m		80.802 kg 80.802 kg	-	
			_	Concrete		Building p			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 buildning components		Main group			-		3.368.962 kg	-	
			◢ Exteri			Туре			-	-	539.876 kg	-
bers in areen	are not added up in	the total building sum (demo	<ul> <li>Basement wall</li> </ul>			Building component			330 m <sup>2</sup>		213.051 kg	-
berb in green	are not added up in	the total ballang sam (denie	# Basement wall w/ EPS insu			. Construction			-	-	213.051 kg	-
				EPS insul	lation (Styrofoa	Building p	roduct		0,3 m <sup>3</sup> /m <sup>2</sup>	99 m <sup>3</sup>	2.247 kg	80 år
				Bitumen	for waterproof	Building p	roduct		0,5 kg/m <sup>2</sup>	165 kg	165 kg	80 år
				Concrete	e C30/37	Building p	roduct		0,26 m <sup>3</sup> /m <sup>2</sup>	85,8 m <sup>3</sup>	205.920 kg	120 år
					nforcing steel	Building p			14,3 kg/m <sup>2</sup>	4.719 kg	4.719 kg	120 år
				d wall			omponent		515 m <sup>2</sup>	-	291.471 kg	-
			4		II w/ mineral w	Constructi			-		291.471 kg	
				Bricks, fa		Building p			0,09 m <sup>3</sup> /m <sup>2</sup>	45,32 m <sup>3</sup>	81.576 kg	120 år
					nasonry mortar				0,02 m <sup>8</sup> /m <sup>2</sup>	10,3 m <sup>3</sup>	15.450 kg	120 år
					wool, facade sy				0,25 m <sup>3</sup> /m <sup>2</sup> 0,15 m <sup>3</sup> /m <sup>2</sup>	128,75 m <sup>3</sup> 77,25 m <sup>3</sup>	5.955 kg 185.400 kg	80 år 120 år
				Concrete Stool roi	nforcing steel	Building p Building p			0,15 m <sup>-</sup> /m <sup>-</sup> 6 kg/m <sup>2</sup>	77,25 m <sup>-</sup> 3.090 kg	185.400 kg 3.090 kg	120 ar 120 år
			4.15	aht facade co	2		omponent		624 m <sup>2</sup>	5.090 kg	35.354 kg	120 al
					aconstruction	Constructi	omponent		024111	-	35.354 kg	

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### Analysis with pre-defined figures

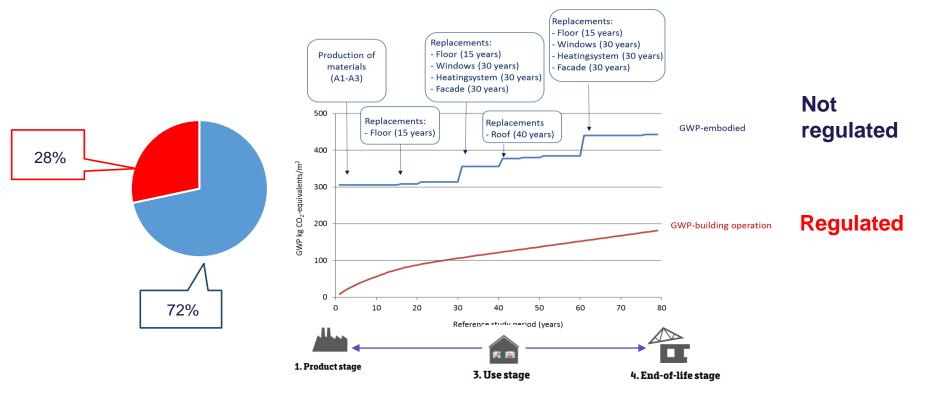


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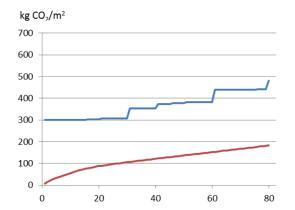
# Last but not least: Understanding WHEN, HOW MUCH and WHY

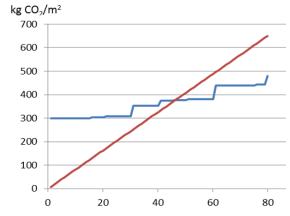


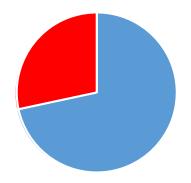
### Whole life carbon assessment for an office building – an example

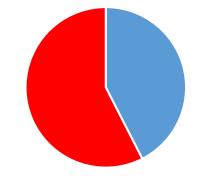


# Consequences of using static versus forecasting - and how results are presented!





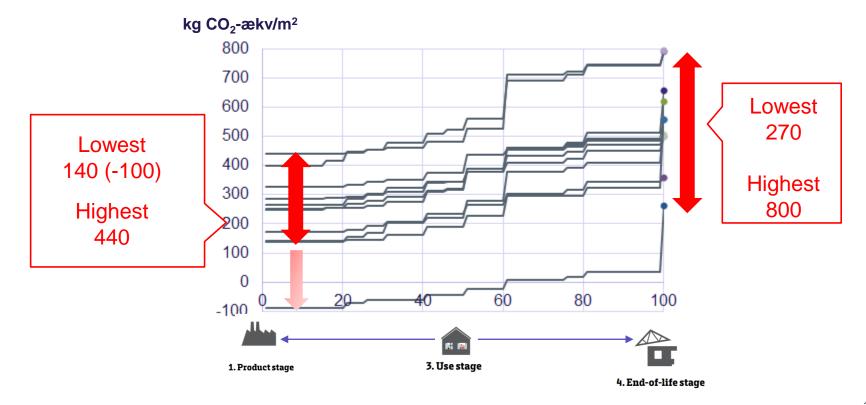






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#### There is a large potential to reduce the embodied impacts



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# asa huilding designer's **awa**

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







