Saint-Gobain Student Contest 2022

Life Cycle Assessment lecture – Session 1

Marios Tsikos, One Click LCA

6th December 2021

Getting Started:

How to make this training more productive

We share directly these slides to have as reference.

Ask your questions at the chat during the lecture.

If you get cut off, the training is also **recorded** so just re-join when you can.

AGENDA

- Student contest introduction (5 minutes)

- Introduction to One Click LCA (5 min)
- Life Cycle Assessment, what and why? (30 minutes)
- Theory & Standards (10 minutes)
- Environmental Product Declarations (5 minutes)
- Steering emissions in construction projects (10 minutes)

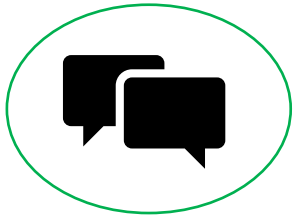
- Demo (35 minutes)
  - General Interface
  - Manual modelling
  - Optioneering
  - Results

- Access to the software and support (10 minutes)

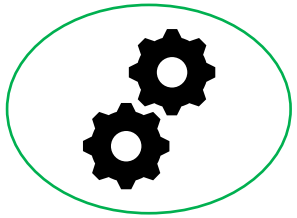
- Q&A and discussion (10 minutes)

ABOUT US

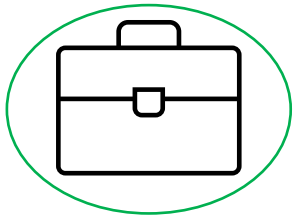
One Click LCA – World-leading carbon and life cycle metrics software



Professional services and Training – EPD verification/publishing, Sustainable policy, life-cycle assessment, life-cycle costing, CSR



Custom Solutions – Branded and white labelled solutions for life-cycle efficiency, best practice tracking, scoring, data collections, environmental impacts assessment, and more



High Impact Research on Decarbonisation – The Embodied Carbon Review of 100+ regulations and global rating systems

One Click LCA

ABOUT ONE CLICK LCA

World-leading Carbon & Life-cycle Metrics Software.

MADE FOR CONSTRUCTION

Buildings and Renovation, Infrastructure, Product EPDs, CSR

COMPLIES WITH 40+ CERTIFICATIONS

BREEAM, LEED, DGNB, HQE/ E+C-, CEEQUAL, etc.

INTEGRATE WITH YOUR DESIGN TOOLS & 40+ DATABASE

Revit, BIM, IFC file. IESVE, other tools.

One Click LCA

ABOUT ONE CLICK LCA

Easy to use tools for construction sustainability metrics and impact reduction

LIIFE CYCLE ASSESSMENT

LIFE CYCLE COSTING

EMBODIED CARBON REDUCTION

EARLY DESIGN OPTIMIZATION

CIRCULARITY ASSESSMENT

EPDs GENERATION

OUR CUSTOMERS

Developed in Finland, trusted by industry experts in 130+ countries

One Click LCA helps to improve your project in every stage

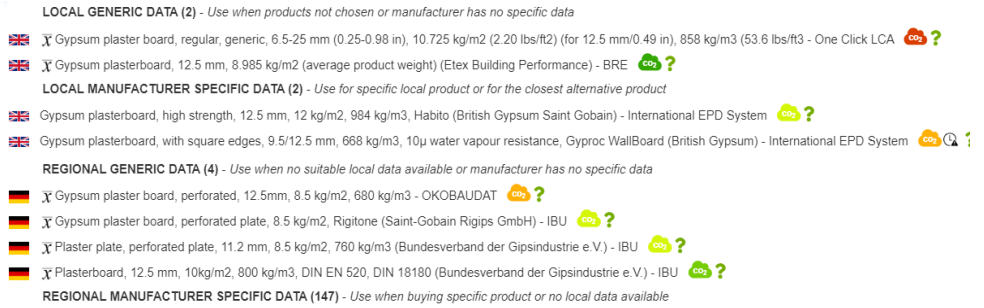
PRE-PROJECT → **DESIGN** → **AS BUILT**

1. BRIEF	2. CONCEPT	3. DESIGN	4. CONST-RUCTION	5. AS BUILT
Set a target	Decide direction	Optimize design	Specify products	Validate result and compare against pears
Site Designer	Carbon Designer			

CARBON HEROES

AUTODESK REVIT

SOLIBRI Model Checker

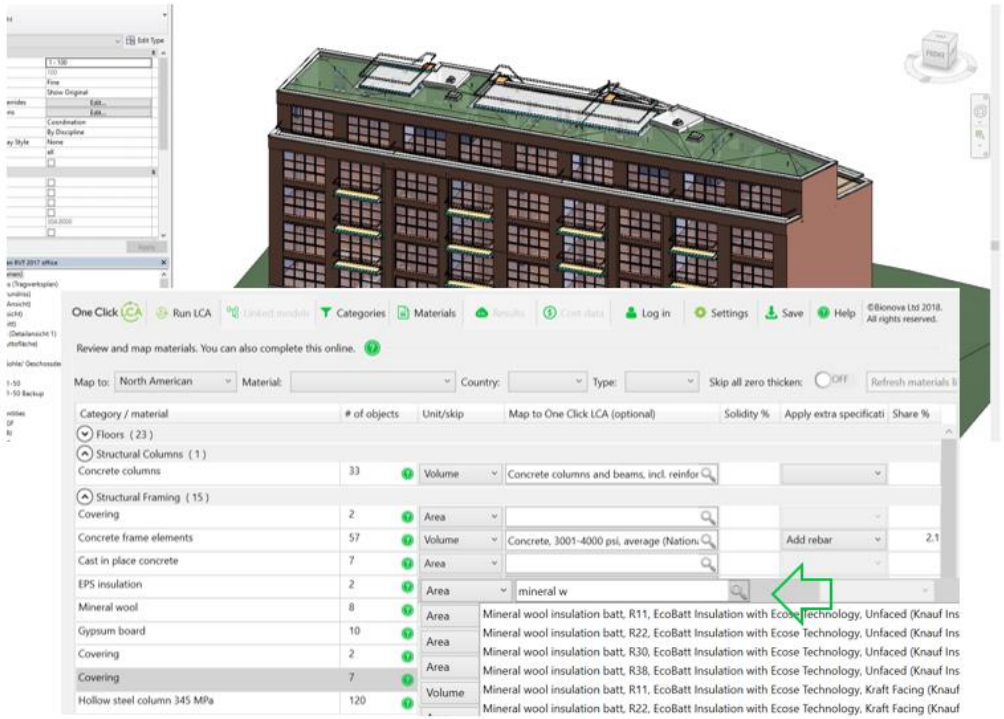


High influence & cost-efficiency: reducing carbon can reduce cost

Some influence & cost savings possible

Limited influence, savings rarely possible

Automation from Design Tools



COMPLAIANCE TOOLS

DesignBuilder

IES

DESIGN

AUTODESK REVIT

GRAPHISOFT ARCHICAD

TEKLA

Rhinoceros

grasshopper

FILE FORMATS

Microsoft Excel

gbXML

BIM MANAGEMENT

Trimble Connect

SOLIBRI Model Checker

simplebim.

One Click LCA

We integrate all qualifying EPDs in the world

Updated → Verified → Enhanced → Classified

QA process approved by BRE

North America

Environmental Product Declaration
CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION
GREEN BUILDING COUNCIL BRASIL
NSF
ASTM INTERNATIONAL
QUARTZ
Environmental Product Declaration
NRMCA CERTIFIED EPD
earthsure
SCSglobal SERVICES
Athena Sustainable Materials Institute
FPInnovations

Europe

ECO PLATFORM EPD EN 15804 VERIFIED
epd
inies
ÖKOBAUDAT
EPD ITALY
impact
AENOR
PEP ecopassport
EPD THE INTERNATIONAL EPD® SYSTEM
EPD IRELAND
cenia
dap habitat
bre
ift ROSENHEIM
ZAG
IBU
dapc
GBCe
MRPI
Bau-EPD
epddanmark
BOUWKWALITEIT

Australasia

EPD® AUSTRALASIA
Building Products Life Cycle Inventory
AusLCI

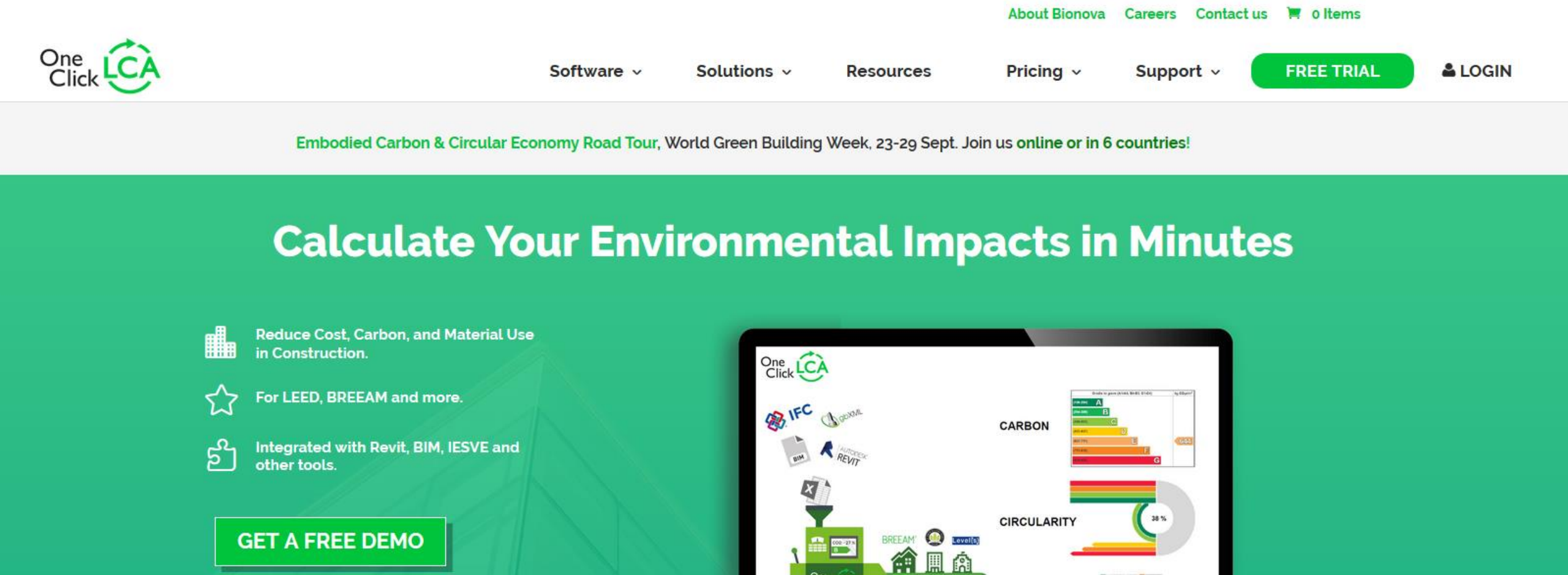
Global

Generic data: Localized for the whole world

ecoinvent

All systems at: https://www.oneclicklca.com/support/faq-and-guidance/documentation/compliancy-and-certifications/

Life Cycle Assessment & Embodied Carbon - What do they mean and Why they matter?



A1 - A3 Product stage

A1 Raw material extraction
A2 Transport to manufacturing site
A3 Manufacturing

A4 - A5 Construction stage

A4 Transport to construction site
A5 Installation / Assembly

B1 - B5 Use stage

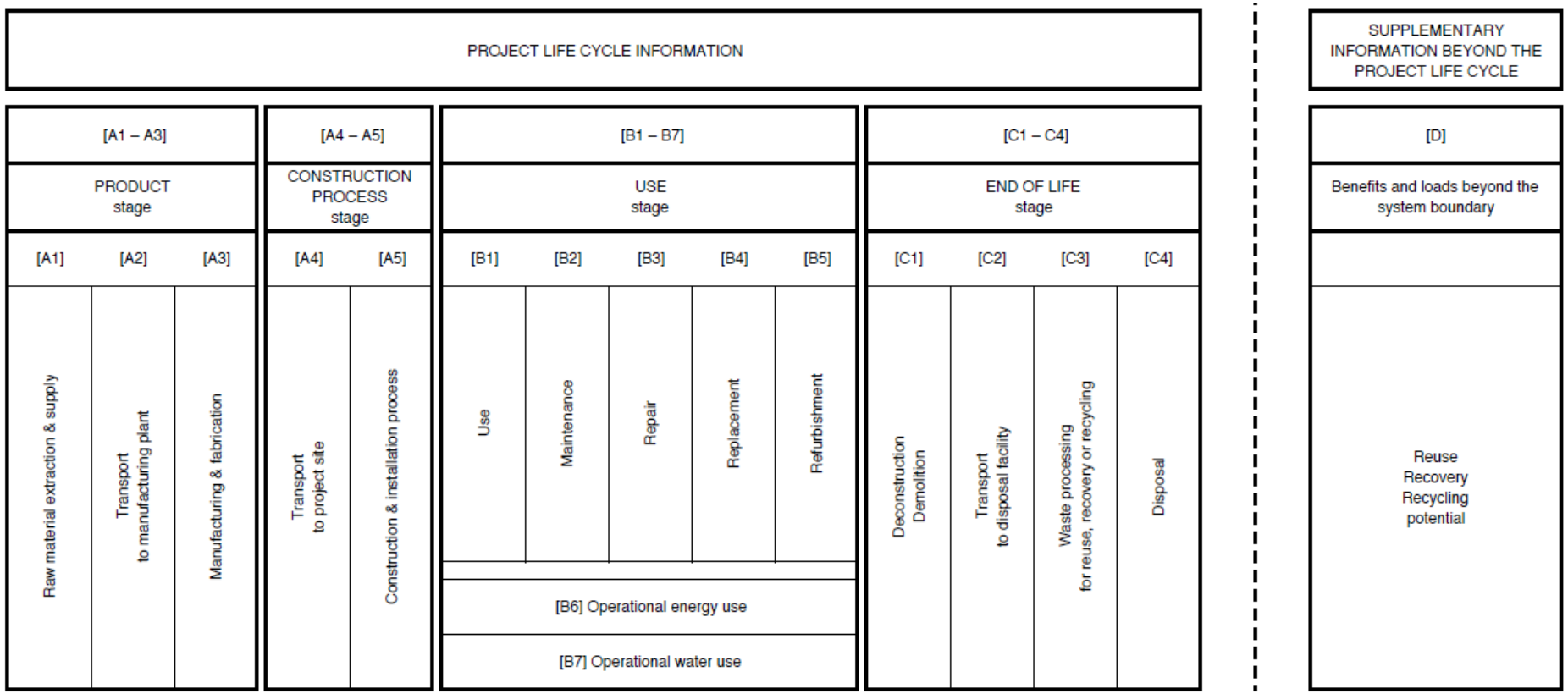
B1 Use
B2 Maintenance
B3 Repair
B4 Replacement
B5 Refurbishment
B6 Operational energy use
B7 Operational water use

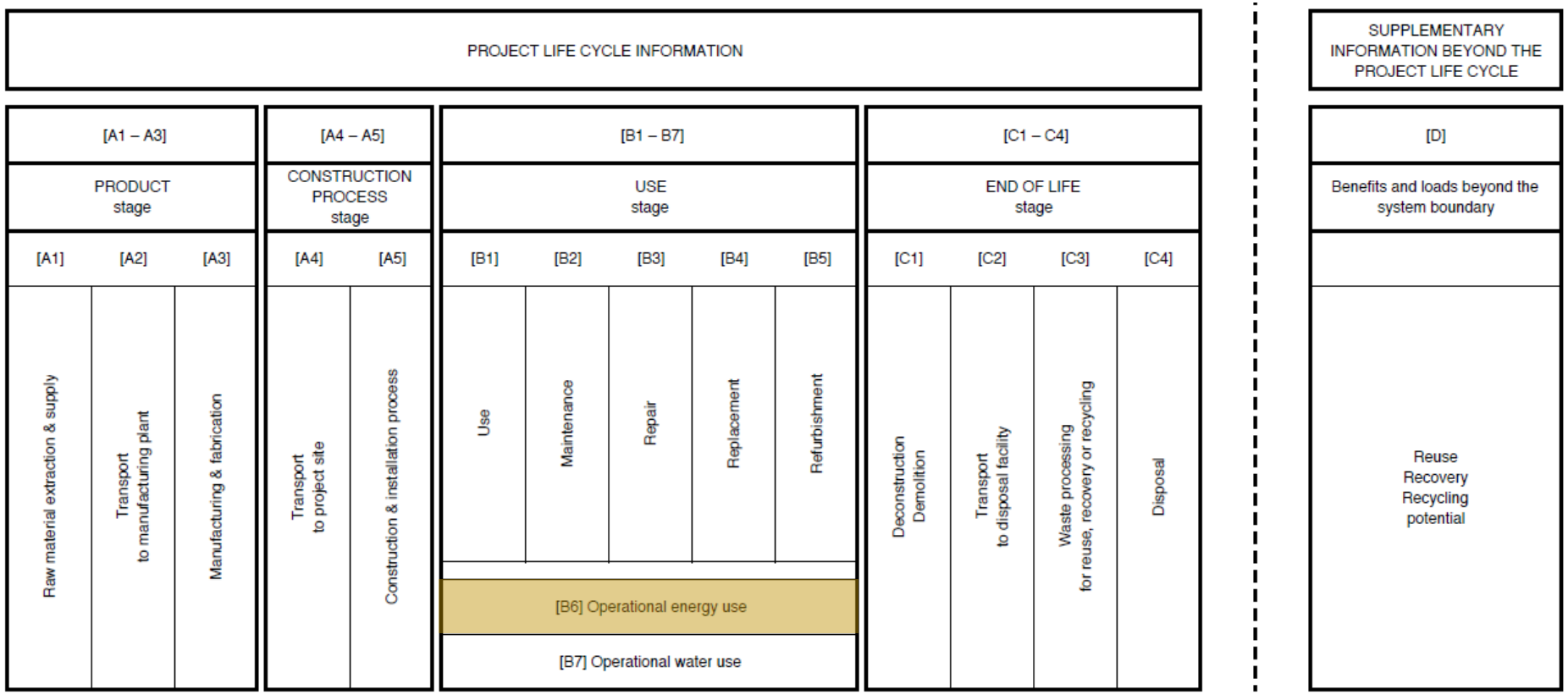
C1 - C4 End of life stage

C1 Deconstruction & demolition
C2 Transport
C3 Waste processing
C4 Disposal

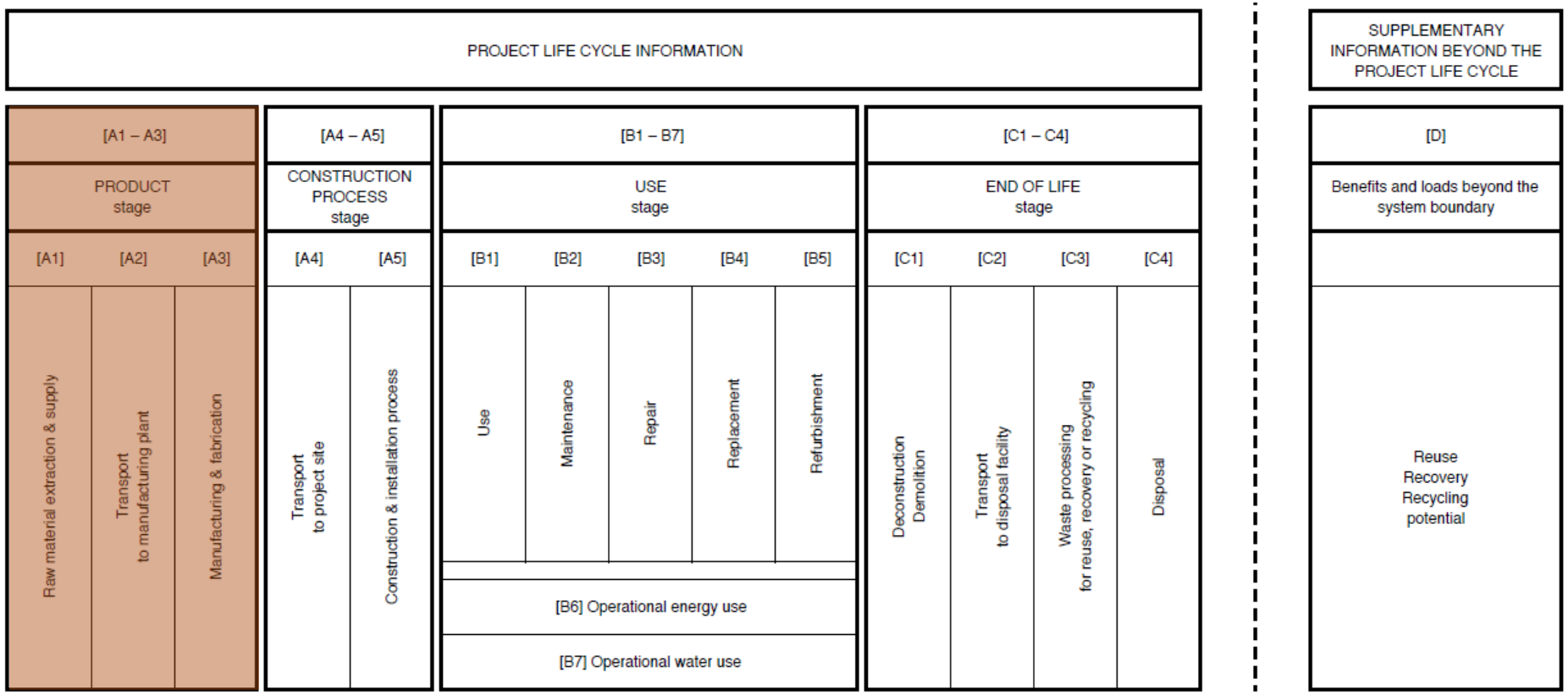
D - Benefits and loads beyond system boundary

Reuse, recovery and/or recycling potentials, expressed as net impacts and benefits

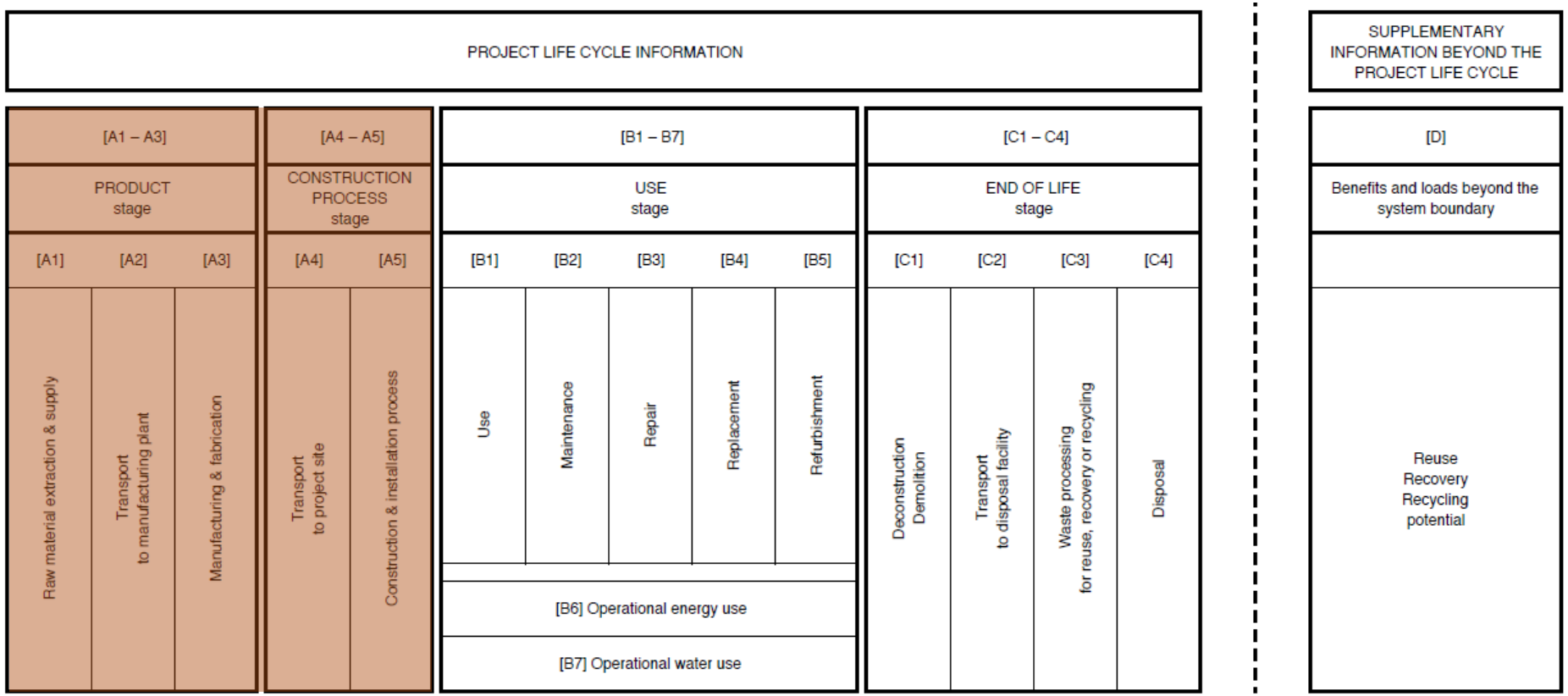

PROJECT LIFE CYCLE INFORMATION
SUPPLEMENTARY INFORMATION BEYOND THE PROJECT LIFE CYCLE
[A1 – A3]
PRODUCT stage
[A1]
Raw material extraction & supply
[A2]
Transport to manufacturing plant
[A3]
Manufacturing & fabrication
[A4 – A5]
CONSTRUCTION PROCESS stage
[A4]
Transport to project site
[A5]
Construction & installation process
[B1 – B7]
USE stage
[B1]
Use
[B2]
Maintenance
[B3]
Repair
[B4]
Replacement
[B5]
Refurbishment
[B6] Operational energy use
[B7] Operational water use
[C1 – C4]
END OF LIFE stage
[C1]
Deconstruction Demolition
[C2]
Transport to disposal facility
[C3]
Waste processing for reuse, recovery or recycling
[C4]
Disposal
[D]
Benefits and loads beyond the system boundary
Reuse
Recovery
Recycling
potential



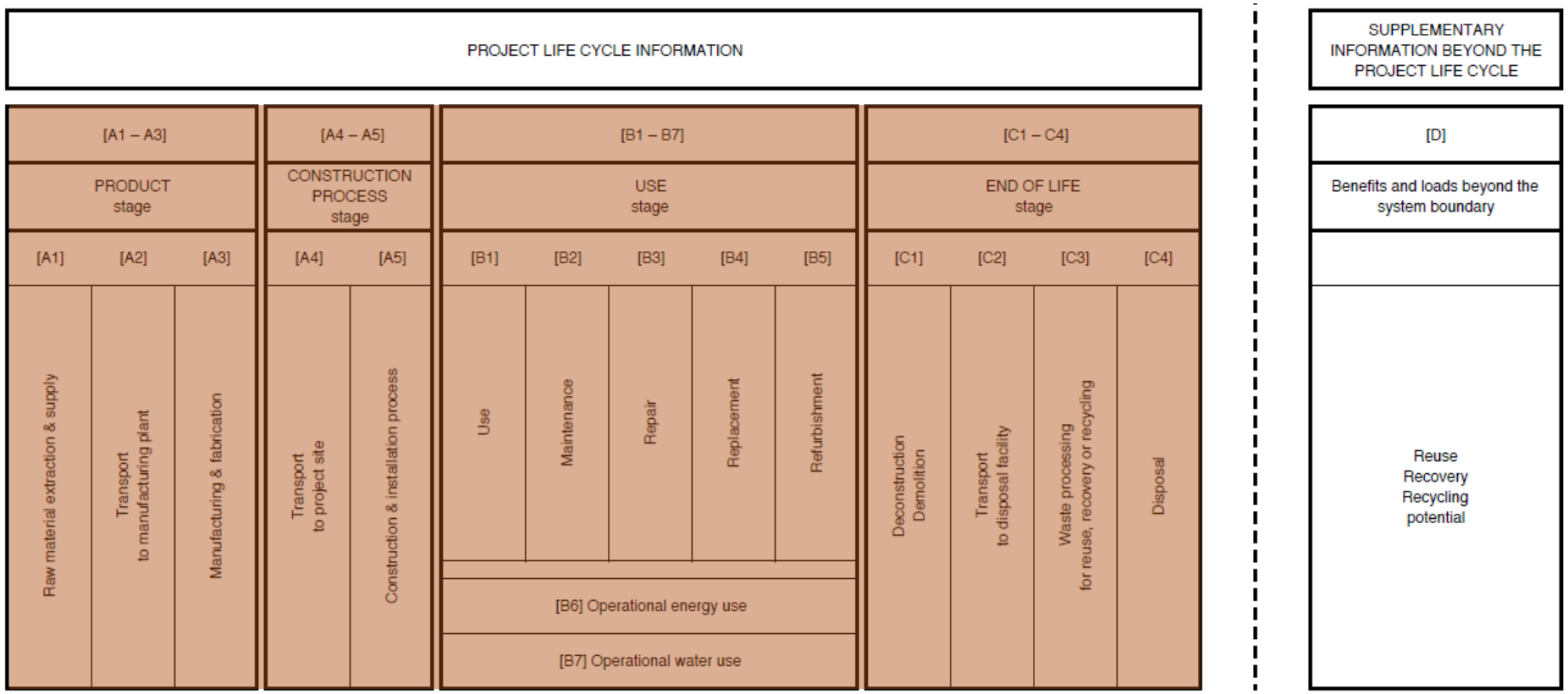
What most regulations focus on at the moment



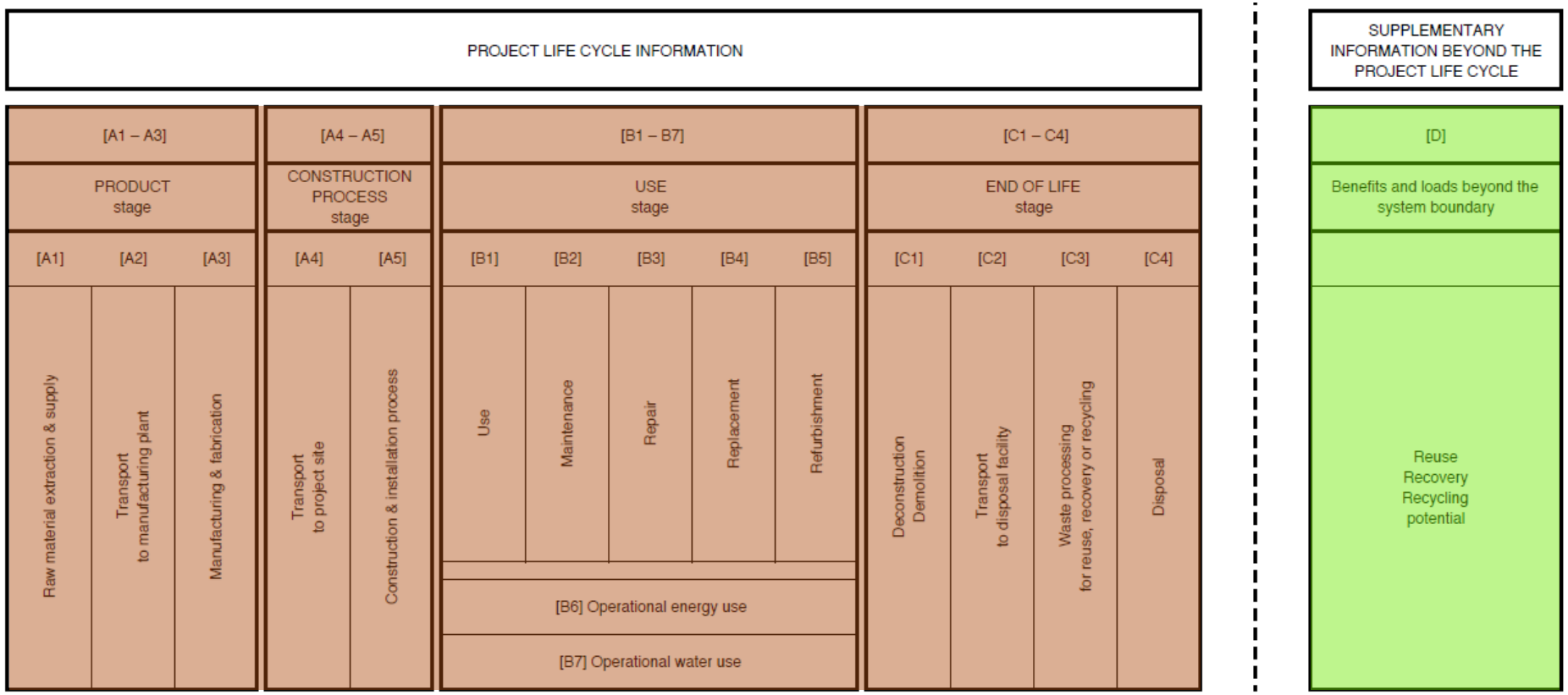
Cradle to gate



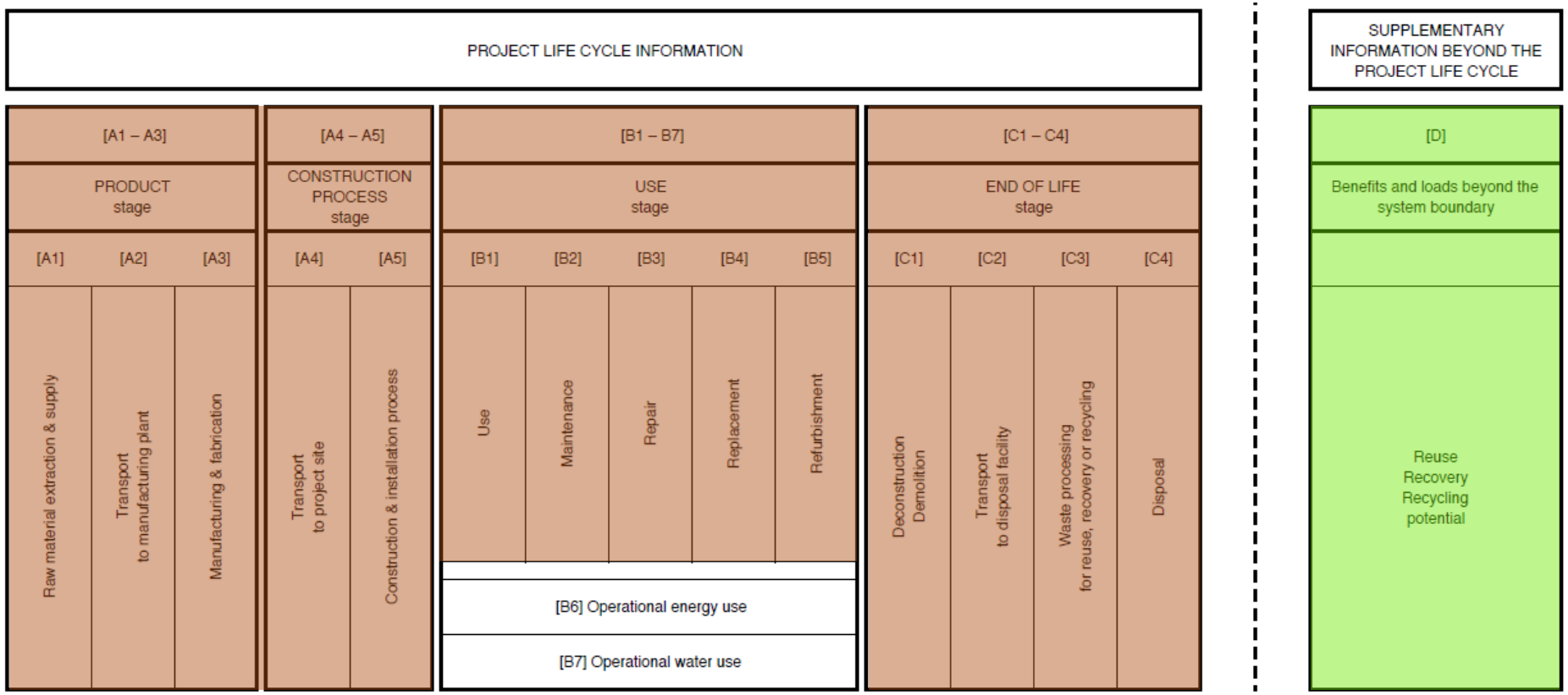
Cradle to practical completion



Cradle to Grave



Cradle to Cradle



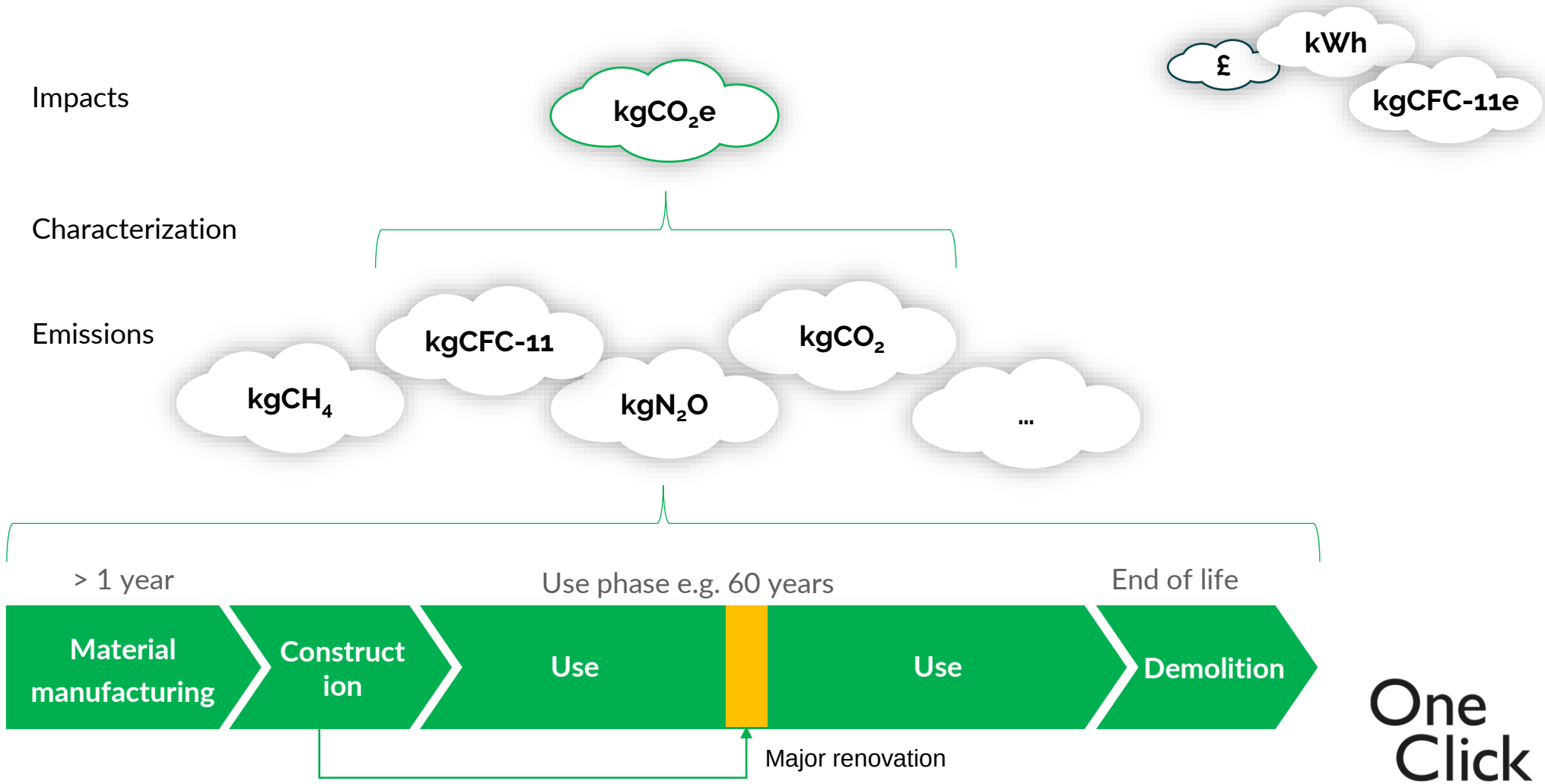
Embodied Carbon Assessment

LCA outputs are environmental indicators

Each indicator describes a particular category of environmental impacts. The impacts are expressed as quantities of a matter that has the potential to cause such impacts – but they do not represent the actual harm (final impact, e.g. endpoint) eventually caused. For instance, global warming potential represents the amount of CO2e gases released. But the final impact is the acceleration to the polar melt, for instance.

- **Global Warming Potential** describes how much a product contributes to climate change. When LCA concerns only this impact category, it's called the carbon footprint.
- **Acidification** describes how much product acidifies the environment, resulting e.g. acid rain.
- **Eutrophication** describes flow of nutrients to ecosystems, resulting e.g. to algae growth.
- **Ozone Depletion** describes damage caused to the Ozone Layer in the stratosphere.
- **Tropospheric Ozone** describes the quantity of summer smog causing gases emitted.
- **Depletion of fossil resources** describes how much fossil resources are withdrawn.

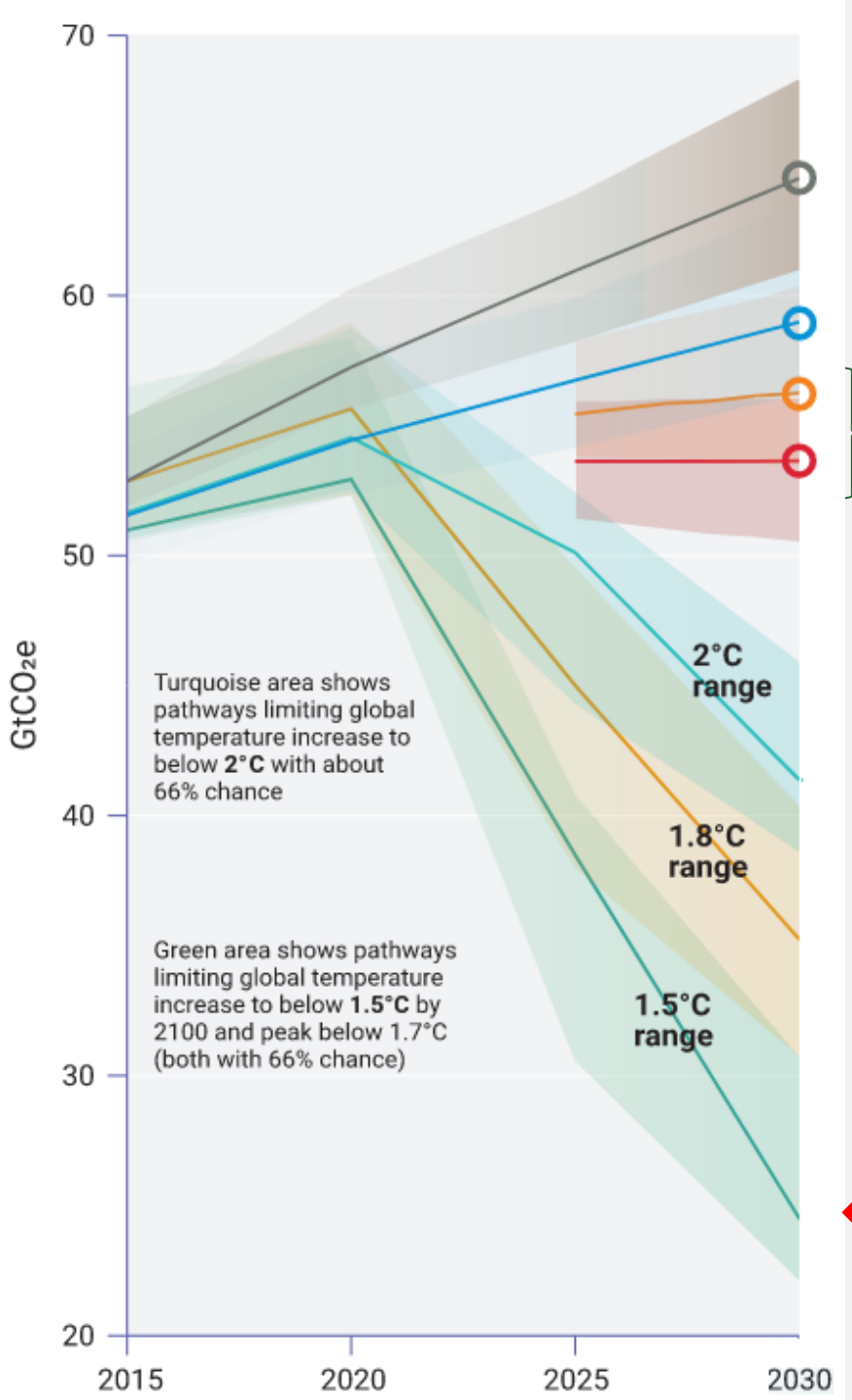
Characterization



LCA characterization methods

Impact assessment methodology defines the target units and emission characterization factors. European standards require using CML (Charactaration Factor). North American data is normally in TRACI method.

LCA impact indicator units	CML 2002	TRACI 2.1	ReCiPe
Global warming potential	**CO_2e**	CO_2e	CO_2e
Ozone depletion potential	**CFC-11-eq**	CFC-11-eq	CFC-11-eq
Acidification potential (land)	**SO_2e**	SO_2e	SO_2e
Eutrophication potential (fresh water)	**PO_4^3e**	N eq	P eq
Formation of tropospheric ozone(photochemical oxidant formation)	**C_2H_4e**	NO_xeq	kg NMVOC
Depletion of non-renewable energy resources	**MJ**	MJ	Kg oil eq



2010 Policies Scenario

Current policies Policies Scenario

Current targets

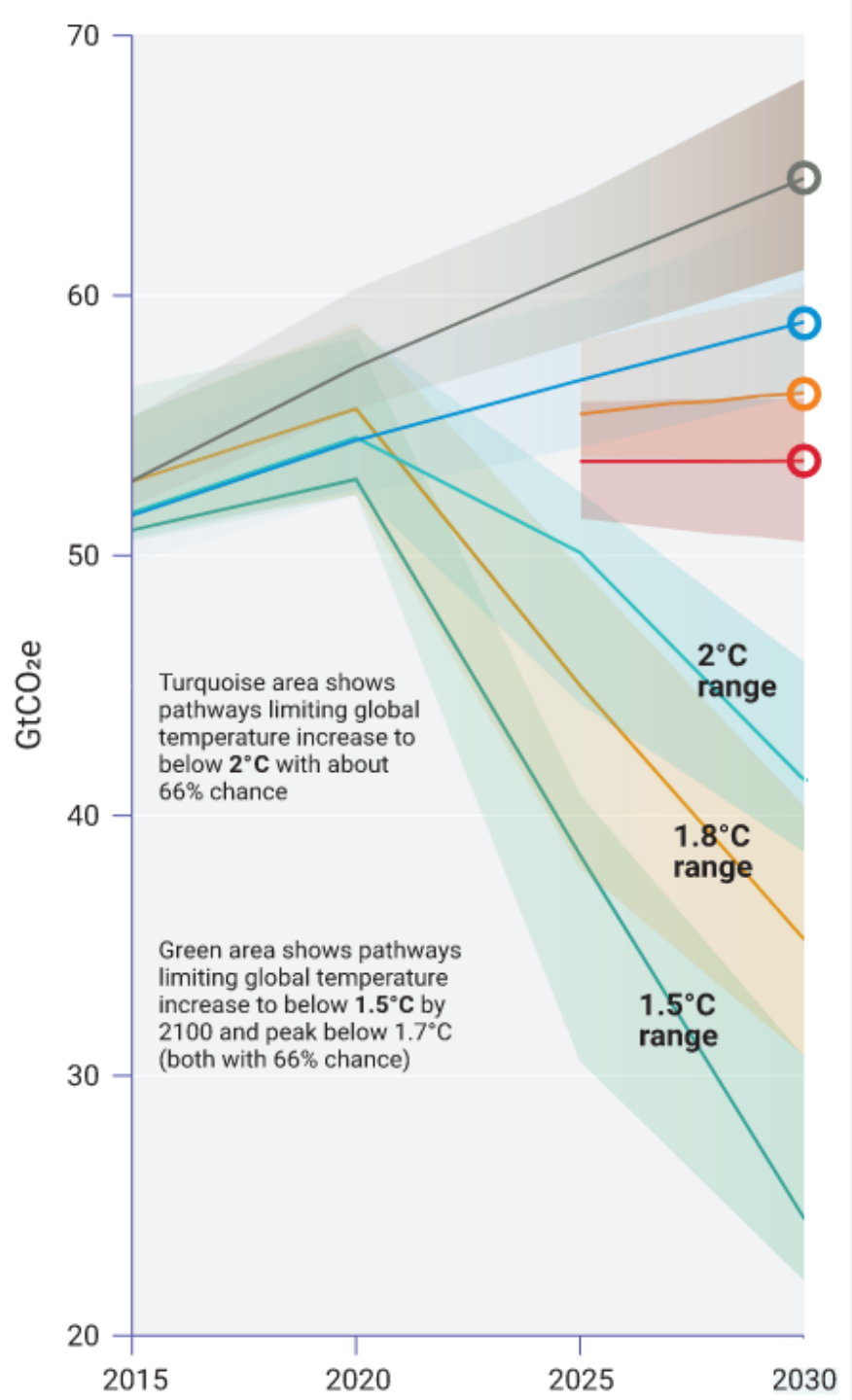
Predicted global GHGs

Current level 53 GtCO2e /a

Emissions on 2030 with current actions 55 – 60 GtCO2e/a

25-30 GtCO2e/a

Source: UN EP Emission Gap Report 2020.



Restricting clobal warming to 1,5 degrees requires approx. **35 GtCO2e of additional emission reduction measures**

Source: UN EP Emission Gap Report 2020.

Buildings are responsible for 39% of global carbon emissions:

28% from operational emissions

11% from materials and construction

SOURCE: BRINGING EMBODIED CARBON UPFRONT

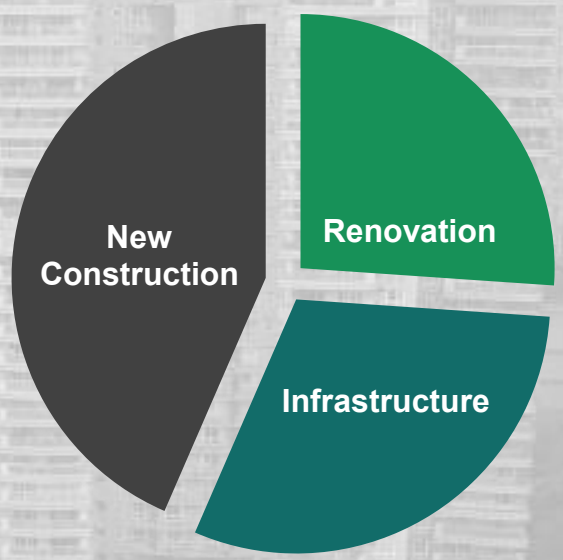
One Click LCA

Cities will double by 2060, creating 150-250 gigatons of embodied carbon from construction materials

CITIES GROW

230 BILLION M²

BY 2060



GENERATING

150-250 GIGATONS

EMBODIED CARBON

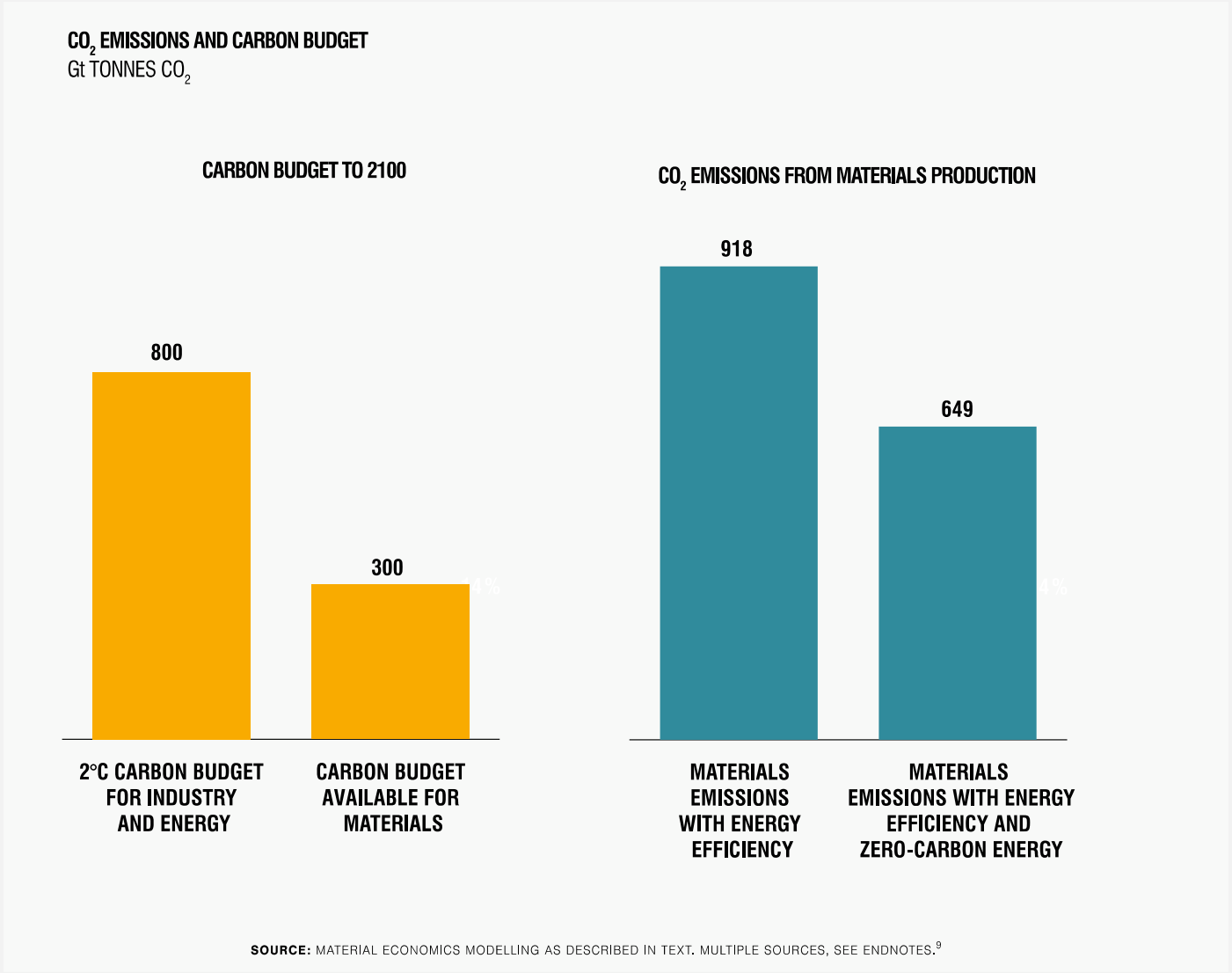
This is equivalent to 3-5 years of global carbon emissions, or…

BUILDING A NEW YORK CITY EVERY 34 DAYS UNTIL 2060

Emissions from material manufacturers alone risk exceeding the 2-degree emission scenario

Aim, 2 degrees

Full carbon budget for industry and power generation & budget for 4 main materials (Steel, plastics, concrete, aluminium)

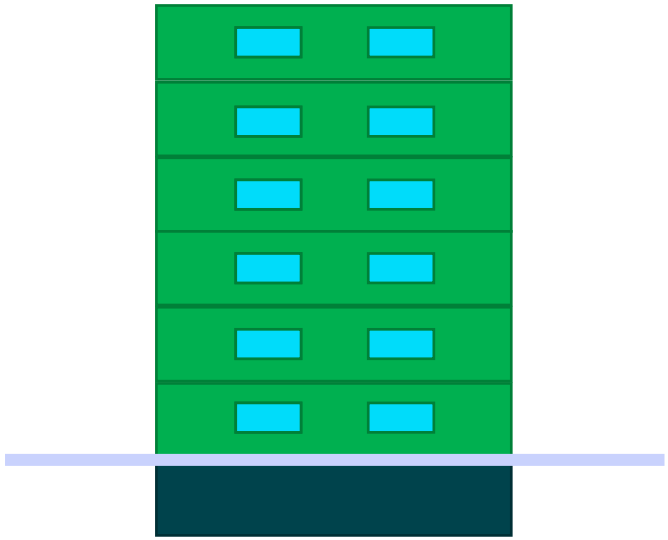


Current state

Emissions of materials with reduction of energy emissions

Source: The Circular Economy a Powerful Force for Climate Mitigation (SITRA, 2018)

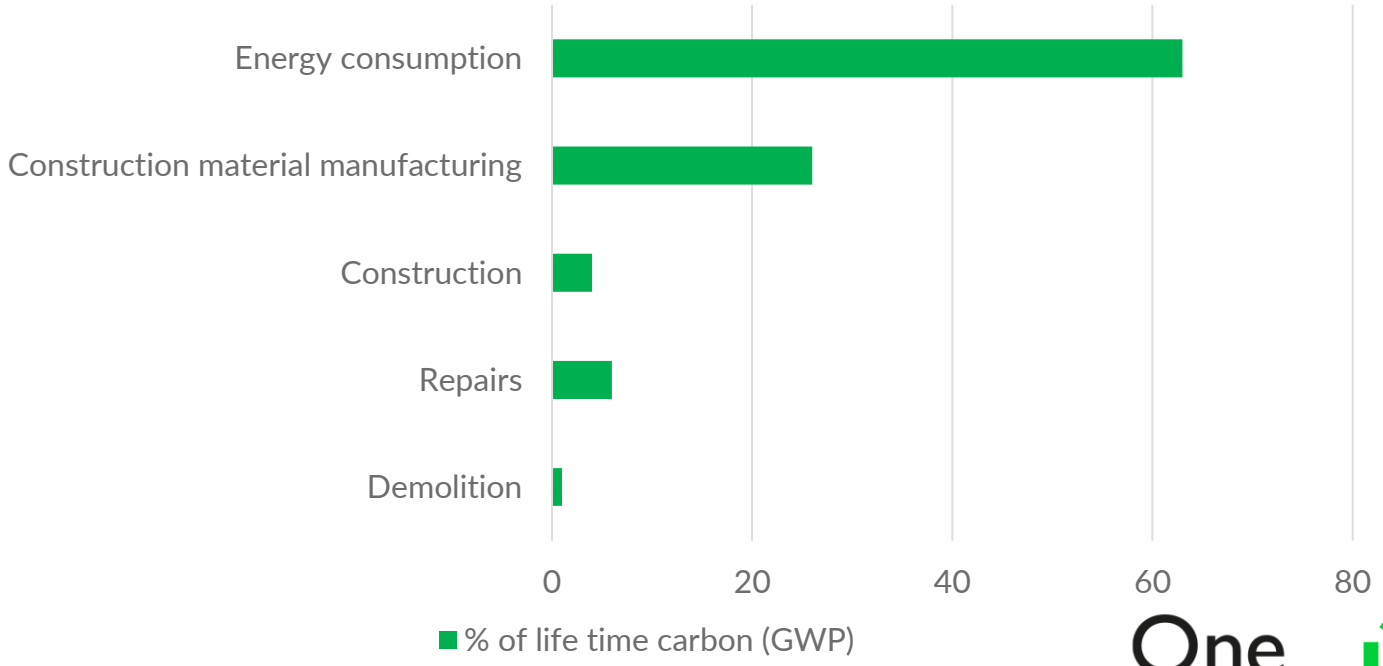
Where do the climate impacts come from?



- 6 floors + cellar
- Floor area 2 500 m^2
- 50 years life time

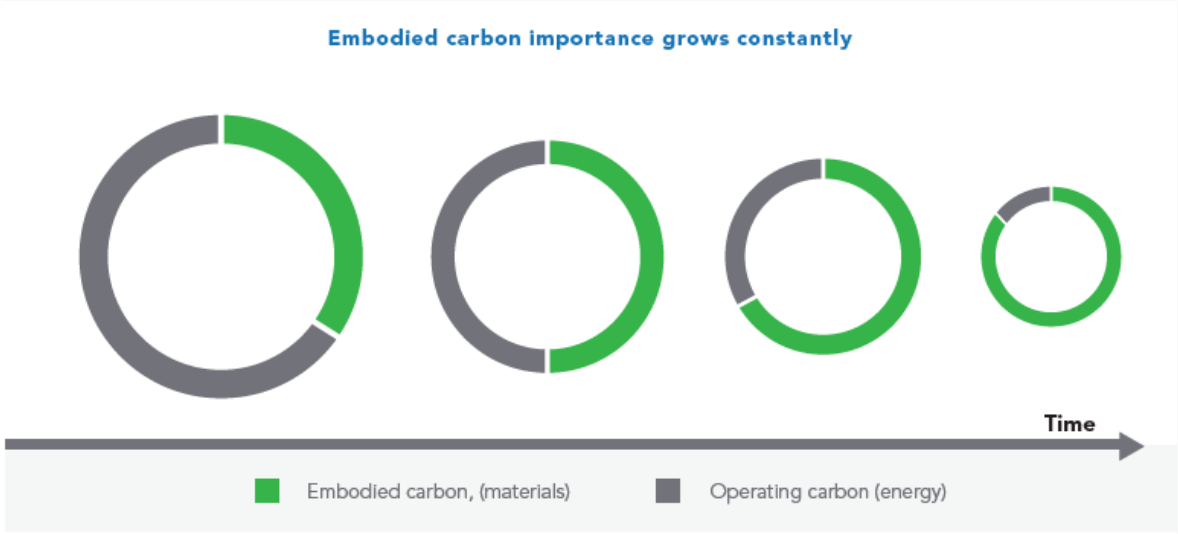
Life cycle carbon of average apartment building

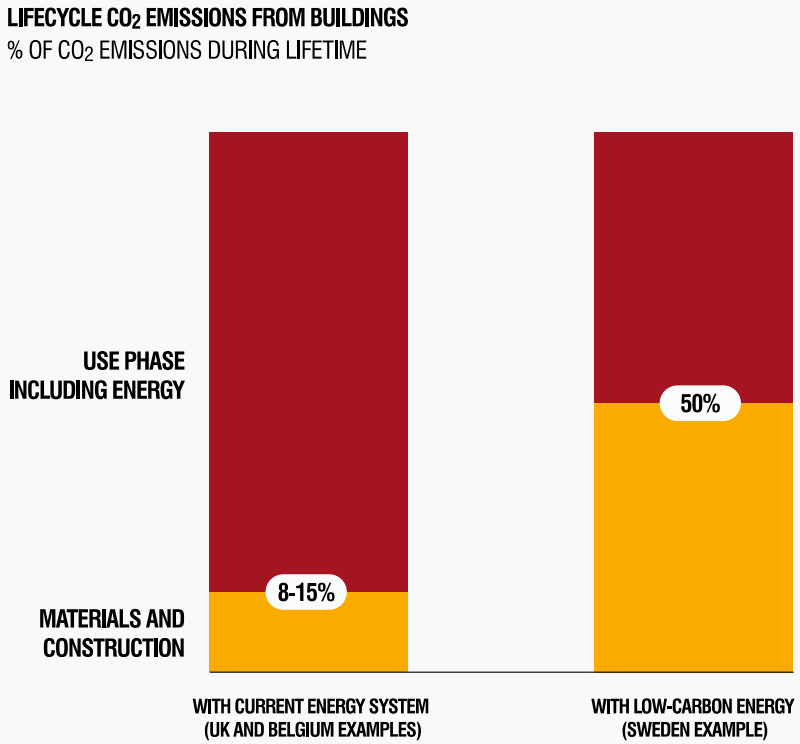
Laskelmat: Ruuska & Häkkinen: ”The significance of various factors for GHG emissions of buildings.” International Journal of Sustainable Engineering, 2014



How emissions are created during building life cycle?

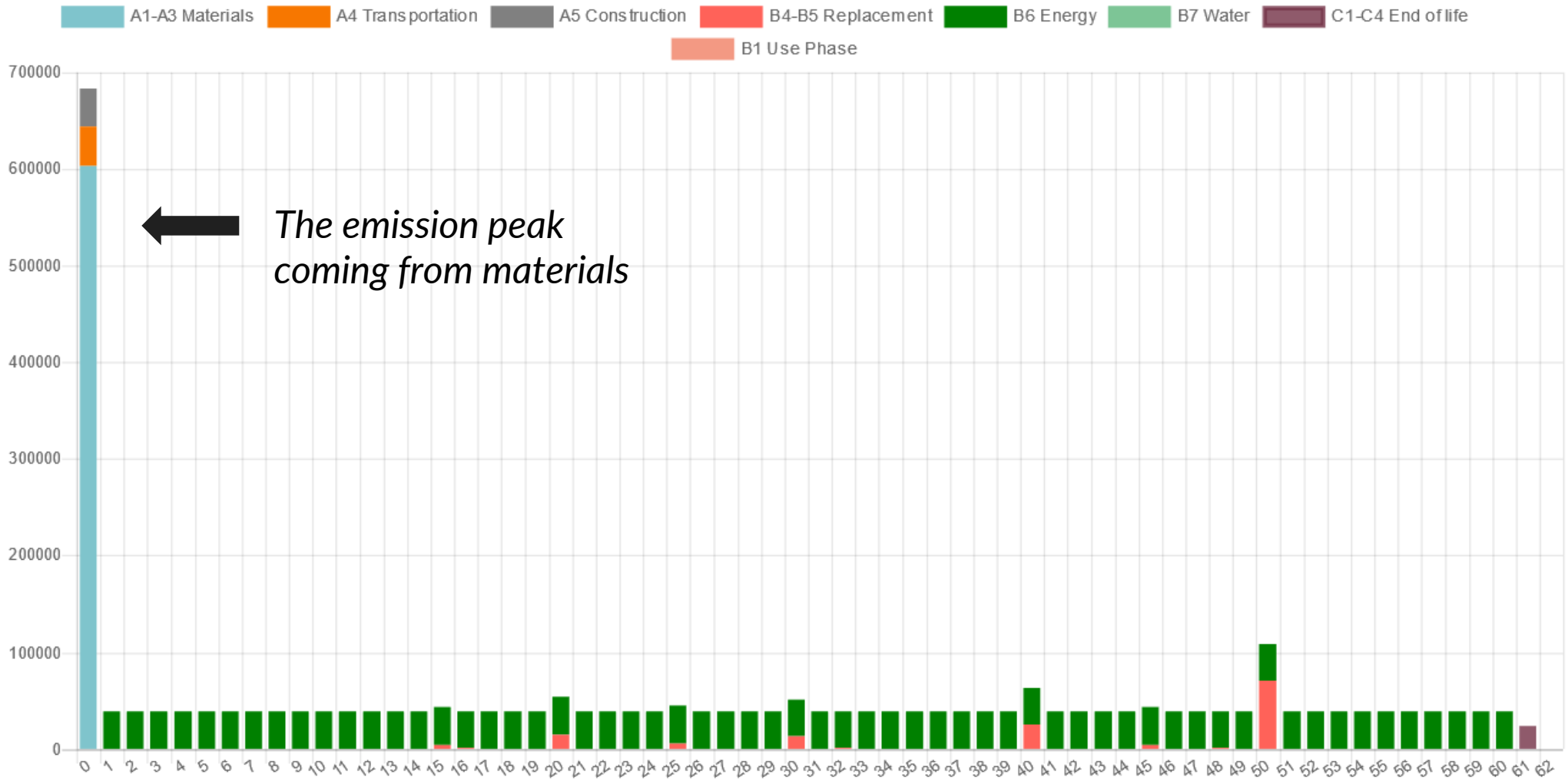
- Energy efficiency and cleaner production reduce the emissions from operational energy
- Material emissions already exceed emissions of operating energy within a 50-year time frame, for some countries





Source: Embodied carbon review – Embodied carbon reduction in 100 + regulatory and rating systems globally www.embodiedcarbonreview.com

Emissions over time

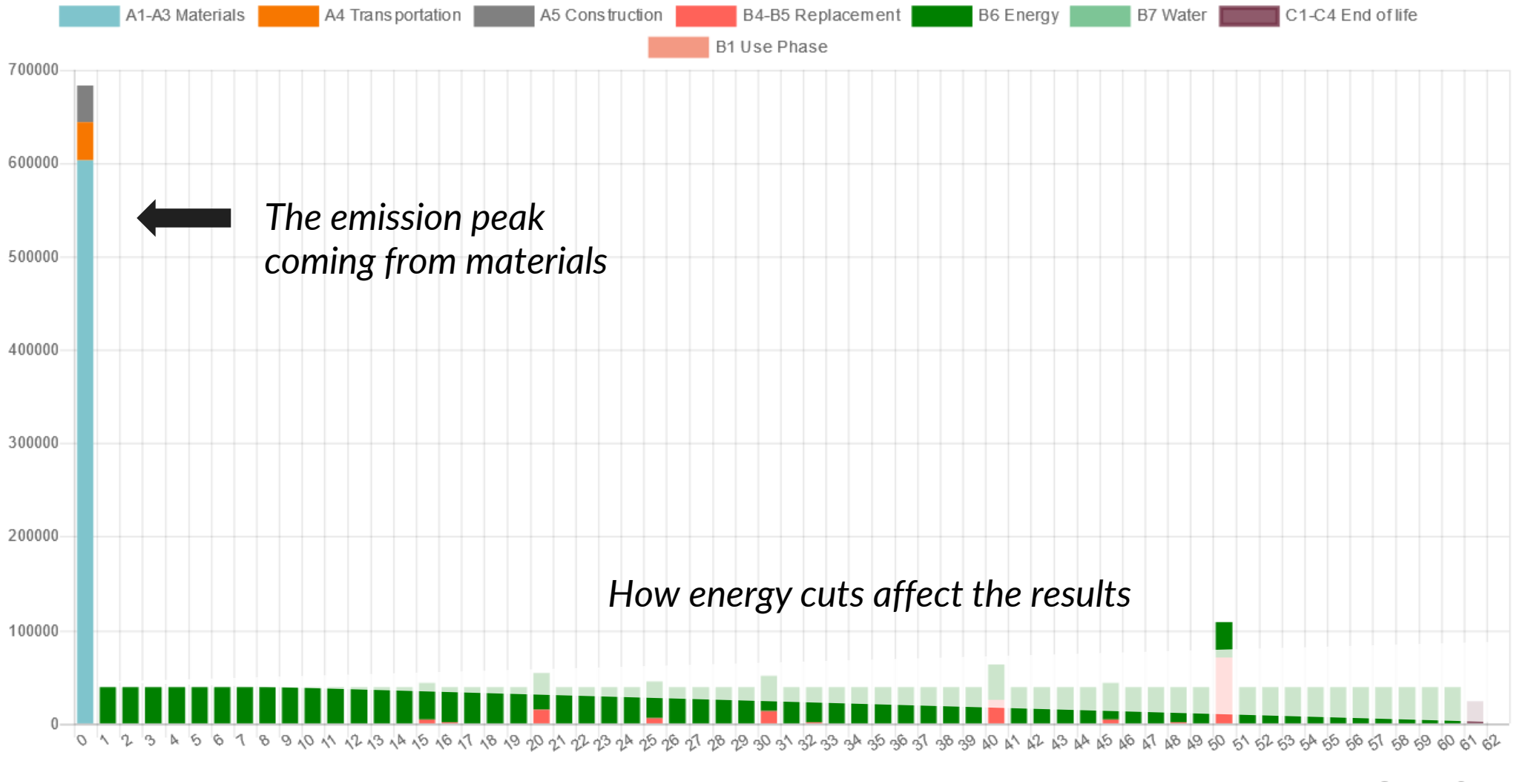


The emission peak coming from materials

Helene, Level(s) pilot

Click LCA

Emissions over time



The emission peak coming from materials

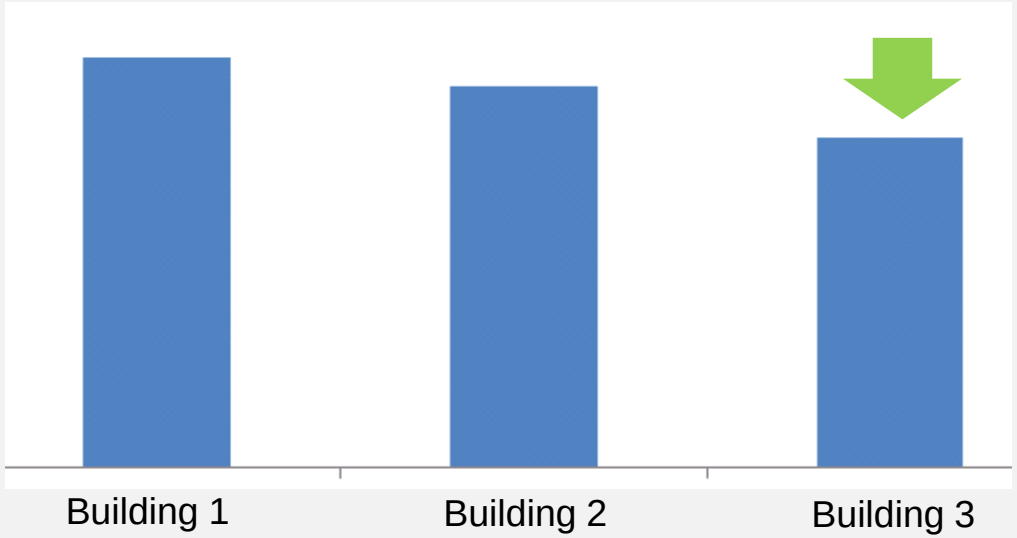
How energy cuts affect the results

Helene, Level(s) pilot

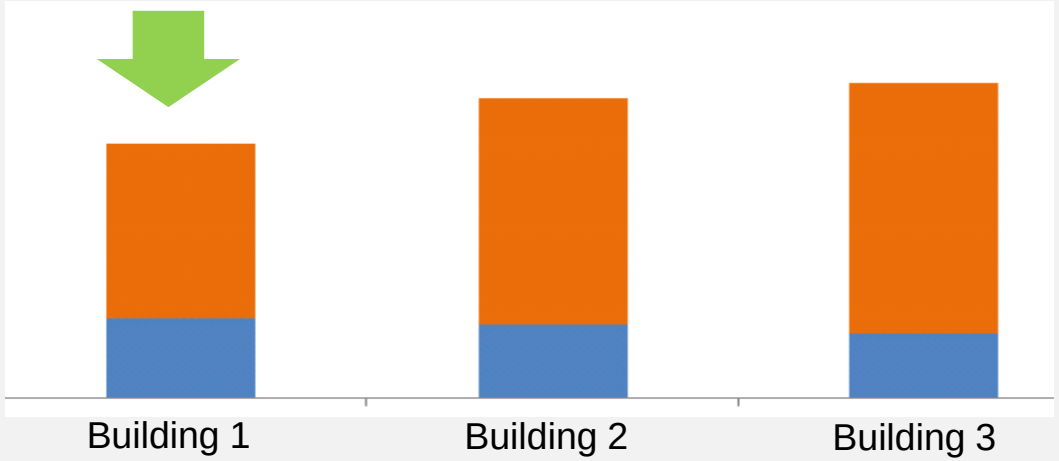
Click LCA

Life Cycle perspective helps to avoid sub-optimization

A) Building materials and construction

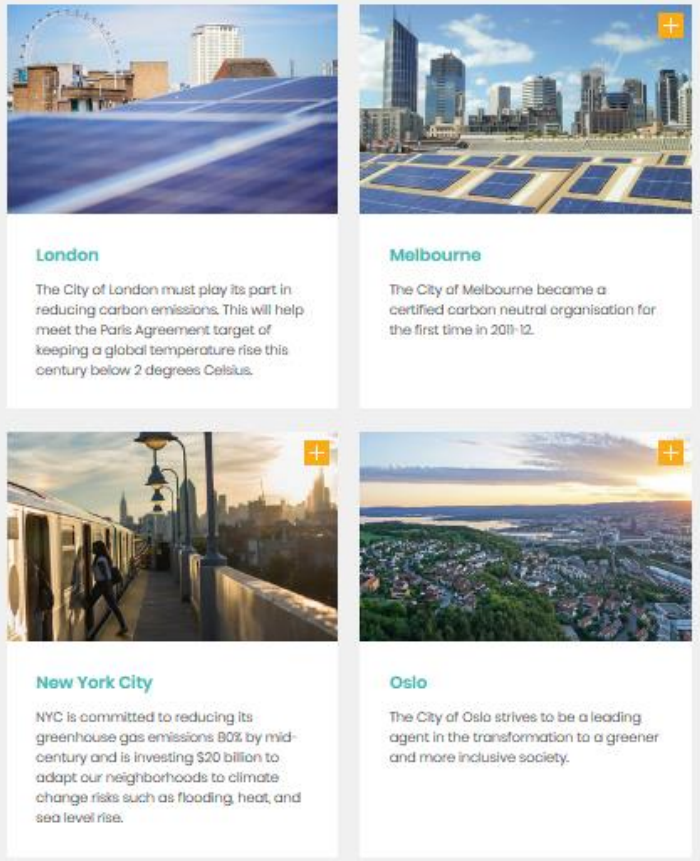


B) Total Lifecycle, Materials, Construction, Power, Replacement, End of Life



***Sources**: Case study: Carbon footprint (kgCO2e / m2) of three ARA apartment blocks over a 50 year life cycle © Bionova Ltd*

Growing demand for low carbon construction



STATSBYGG

Stasbygg will work for a climate-neutral property portfolio, deliver zero-emission buildings and contribute to reduced climate footprint for the state. (2016-20)

Group target of achieving net-zero carbon emissions by 2045, with a 50 percent reduction by 2030.

SKANSKA

YIT

Cut emissions of own projects to half and enable carbon neutral use by 2030

CUT CARBON EMISSIONS ACROSS OUR VALUE CHAIN BY 50 % BY 2030

UNIBAIL RODAMCO WESTFIELD

Cities
Target: Carbon Neutrality
How: City planning / procurement

Investors, construction companies
Target: Competitiveness, property value
How: Low carbon design, certificates

Regulation
Target: State carbon neutrality
Keinot: Legislation

Increasing demand for carbon neutral building

One Click LCA

World GBC: We need to be cutting embodied carbon now

All construction to be
operationally carbon neutral
and create at least
40 % less embodied carbon
by 2030

WORLD GREEN BUILDING COUNCIL

Embodied carbon = CO_2e from manufacturing, transporting, replacing and disposing of materials

Source: https://www.worldgbc.org/embodied-carbon½

One Click LCA

Summary of Industry trends

Certifications Like BREEAM and LEED incrising credits and weighting in material sections

Investestors and developers growing geen agenda and Zero carbon commitments

European commission has released their Level(s) framework for sustainable construction.

Amount of manufacturer EPDs in Europe and also globally increase rapidly. France has regulated EPD's.

Many countries and cities are moving towards building LCA regulation and requirements to achieve their carbon targets.

Over 100 certification schemes and regulations drive the life cycle impacts and the carbon footprint of construction materials

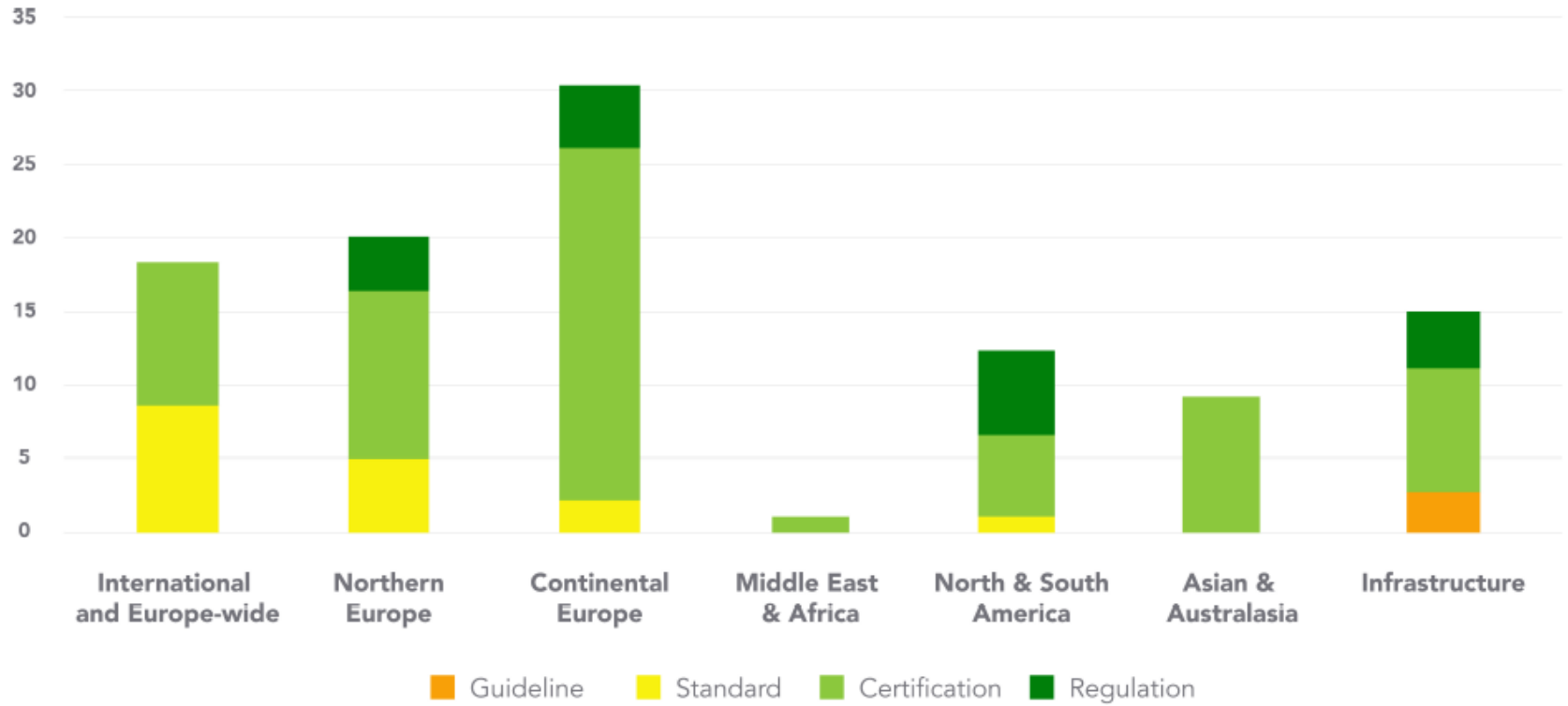


***Illustration**: types of systems addressing embodied carbon by region globally*

Embodied carbon review – Embodied carbon reduction in 100 + regulatory and rating systems a globally www.embodiedcarbonreview.com

Theory & Standards

One Click LCA

Software Solutions Resources Pricing Support FREE TRIAL LOGIN

Embodied Carbon & Circular Economy Road Tour, World Green Building Week, 23-29 Sept. Join us online or in 6 countries!

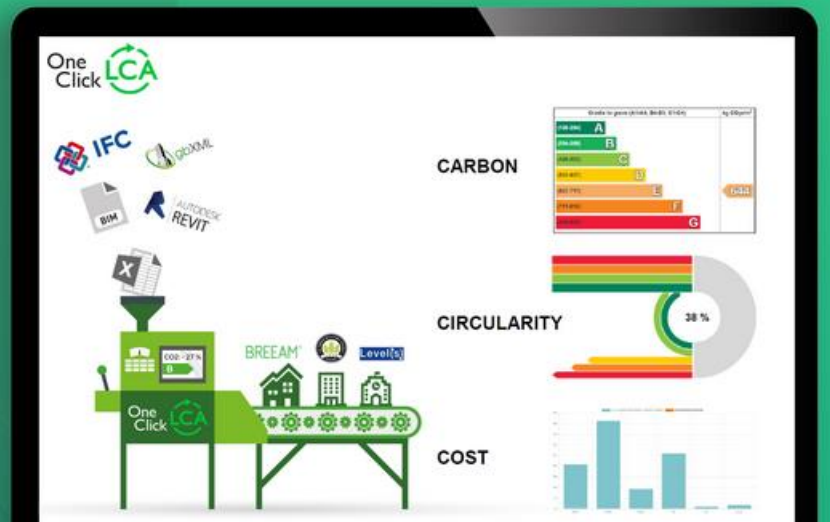
Calculate Your Environmental Impacts in Minutes

Reduce Cost, Carbon, and Material Use in Construction.

For LEED, BREEAM and more.

Integrated with Revit, BIM, IESVE and other tools.

GET A FREE DEMO



LCA follows standards

Cornerstone standards

ISO 14040 and ISO 14044 – fundamentals for LCA; used in all industries and in professional context, almost all the time

Construction works specific standards

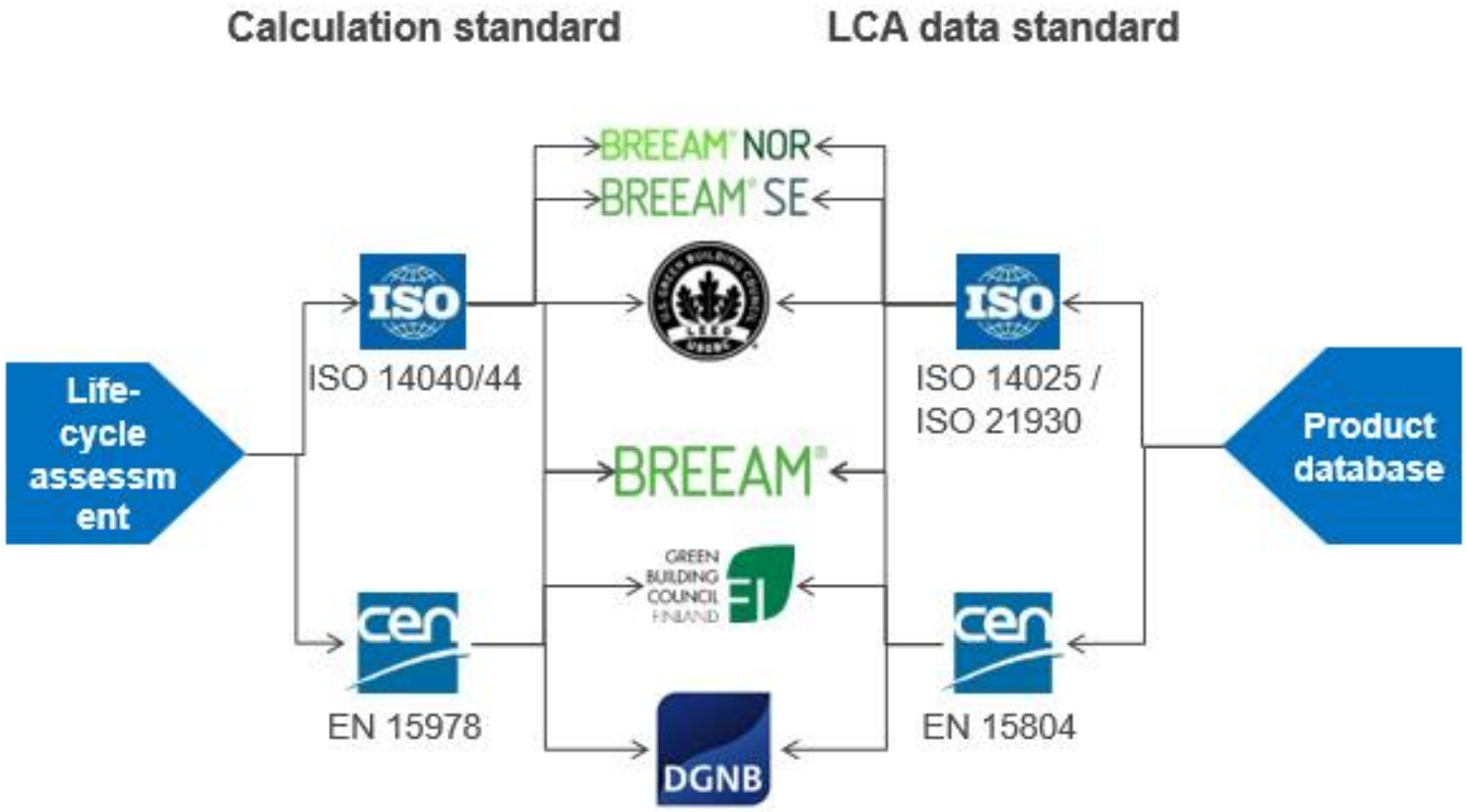
EN 15978 – LCA standard for construction projects
ISO 21929-1 and ISO 21931-1 - hardly used LCA standards in Europe

Environmental Product Declaration standards

ISO 14025 – cornerstone standard for all kinds of EDPs
EN 15804 (EPD data) and EN 15942 (EPD format)
ISO 21930 – hardly used EPD standard in Europe

LCA standards & certifications

All rating systems and methods approve either ISO- or EN-based LCA; or both.



EN 15978 key requirements

Required Service Life is set based on property owner's requirement

- materials must be replaced if they fail to perform for that lifetime

Functional requirements must be clearly documented

- comparison is only possible for comparable performance

Construction products are only comparable at the building level

- No comparison without taking into account the building context
- For example one product might require more maintenance or replacements over life-cycle, or require additional other materials

No forecasting

- You are not allowed to take into account any potential improvements that might happen in the future
- You are not allowed to calculate LCA with the use of market-based green electricity; that's impossible to guarantee

Generic LCA principles

Life-cycle assessment may be done with several different scopes:

- cradle to gate (product before use),
- cradle to grave (product, including use and final disposal) basis,

Note! for construction projects, the natural scope is always cradle to grave.

The construction LCA standards use attributional approach.

Attributional LCA assigns responsibility using allocation methodology and avoids the use of system expansion.

Conduct an LCA following agreed EN & ISO standards or National methodology like RICS

An LCA may be used to identify performance gaps, compare products, make procurement decisions or improve designs, amongst others.

One Click LCA

LEED v4.1

MR Credit - Whole Building Life Cycle Assessment

Intent

To encourage adaptive reuse and optimise the environmental performance of products and materials

Criteria

In LEED, the life cycle assessment is done for six different environmental impact categories. The impacts are expressed as quantities of a matter that has the potential to cause such impacts, but they do not represent the actual harm eventually caused.

LCA impact categories for LEED LCA and their descriptions:

- Global Warming Potential describes how much a product contributes to climate change. When an LCA considers only this impact category, it's called the carbon footprint.
- Ozone Depletion describes the damage caused to the Ozone Layer in the stratosphere.
- Acidification describes how much product acidifies the environment, resulting in acid rain.
- Eutrophication describes the flow of nutrients to ecosystems, resulting in algae growth.
- Tropospheric Ozone describes the quantity of summer smog-causing gases emitted.
- Depletion of non-renewable energy resources describes how many fossil resources are withdrawn.

LCA scope & period of analysis

Life-cycle stages included in the LCA for LEED v4 & v4.1

Does not include the operational energy or water use

LEED v4.1 LCA points allocation

Different Paths lead to different points

Paths	Requirements for the path in LEED v4.1	Points
Path 1	Conduct a life cycle assessment of the project's structure and enclosure	1 point
Path 2	Conduct an LCA for structure and enclosure that demonstrates a minimum of 5% reduction in global warming potential and two other impact categories 2 points	2 points
Path 3	Conduct an LCA for structure and enclosure that demonstrates a minimum of 10% reduction in global warming potential and two other impact categories 3 points	3 points
Path 4	Incorporate building reuse and/or salvage materials into the project' s structure and enclosure for the proposed design. Demonstrate reductions compared with a baseline building of at least 20% for global warming potential and at least a 10% reduction in two other impact categories	4 points

https://www.oneclicklca.com/leed-v4-1-lca/

LCA scope & building elements

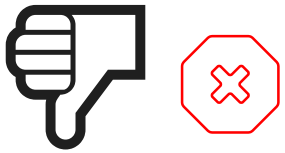
Include

Structural elements

- Foundations, frame, walls, roof system

Building envelope

- Cladding, water-proofing



Exclude

Building technologies

- MEP & systems
- elevators and conveying systems

Finishes

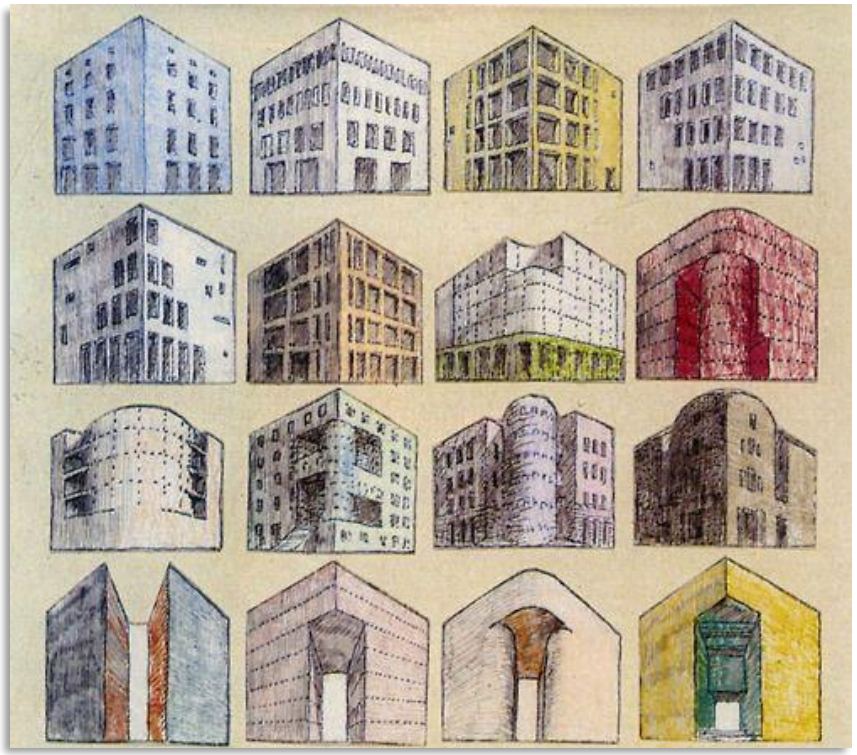
Excavation / site development

Baseline Building:
Prerequisites & Strategies

LCA baseline requirements

The proposed design and baseline building *must* have the same :

1. Size, gross floor area
2. Programmatic function
3. Orientation
4. Location
5. Energy performance



Rob Krier, Corner House

HOW to develop your baseline

Option 1 - Develop your baseline based on energy model

- Proposed model compliant with ASHRAE 90.1 appendix G (LEEDv4: 2010 / LEEDv4.1: 2016)
- Quantity takeoff from energy models

Option 2 – Use proposed building analysis

- One of the most common and efficient strategies
- Calculate the LCA of the proposed building design
- Alternative material / structural options
- Baseline can then be one of the created alternatives
- Quantity take off from BIM models

One Click LCA

HOW to develop your baseline

Option 3 - using early stage or alternative design model as a baseline:

- If you have information or design options in the early design phase
- Calculate an LCA and set it as baseline
- PRO: Able to suggest significant changes

Option 4 - use a benchmark or archetype building (Carbon Designer)

- Use typical local structures for the baseline.
- Ideally use the geometry of the existing project to ensure the equivalence
- Very convenient if you are planning to change the whole structural system
- PRO: New tool for generating easily the baseline

Carbon Designer for Reference Buildings & carbon management in concept phase

Project materials scope

Building parameters

- [x] Foundations and substructure
- [x] Ground Slab
- [x] Structure
- [x] Enclosure
- [x] Finishes
- [x] Services (beta)

Building type, size and number of floors

European reference building v2019.1

Building type

Office buildings

Gross floor area (GFA) 5000 m²

Number of above ground floors 5

+ More options

Energy Section

Scenario

Not applied

Life-Cycle Cost

Choose Life-Cycle Cost tool

Not applied

Cancel | Calculate areas | Create Baseline

Building dimensions

Height	18	m
Width	61	m
Depth	18	m
Internal floor height	3.3	m
Column spacing distance	9	m
simulationTool.loadBearingShare	0	%
Number of staircases	1	
Total number of floors	5	
Shape Efficiency Factor	1.1	
Gross internal floor area (GIFA)	4723	m²

Building structures

Edit areas if necessary.

Foundations and substructure		
Foundation	5000	m²
Frost Insulation	158	m
Ground Slab		
Ground slabs	1000	m²
Structure		
Floor slabs	4000	m²
Columns	432	m
Beams	720	m
Balconies	50	m²
Staircases	18	m
Enclosure		
Underground walls	0	m²
External walls	2108	m²
Cladding	2108	m²
Windows	1000	m²
External doors	20	m²
Roof slab	1000	m²
Roofs	1000	m²
Finishes		
Internal walls	5318	m²
Floor finishes	4724	m²

Developed for the purpose of creating reference buildings on assignment from:

STATSBYGG

One Click LCA

Environmental Product Declarations (EPDs)

One Click LCA

Software Solutions Resources Pricing Support FREE TRIAL LOGIN

Embodied Carbon & Circular Economy Road Tour, World Green Building Week, 23-29 Sept. Join us online or in 6 countries!

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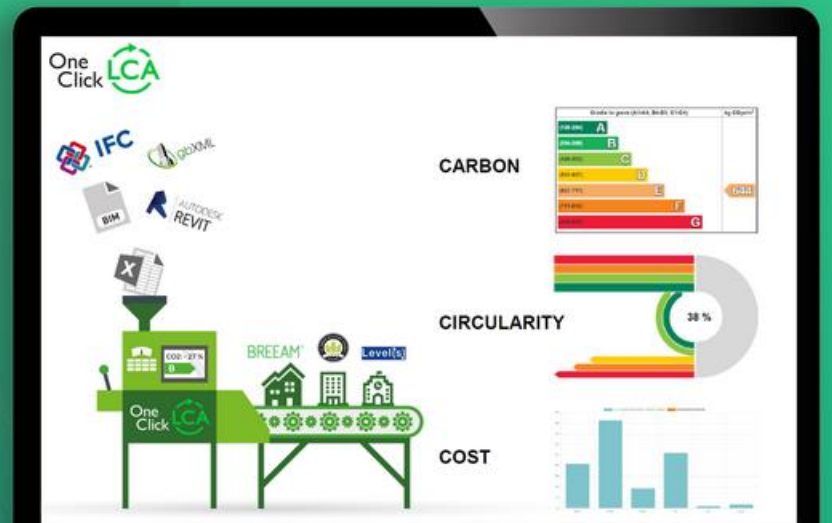


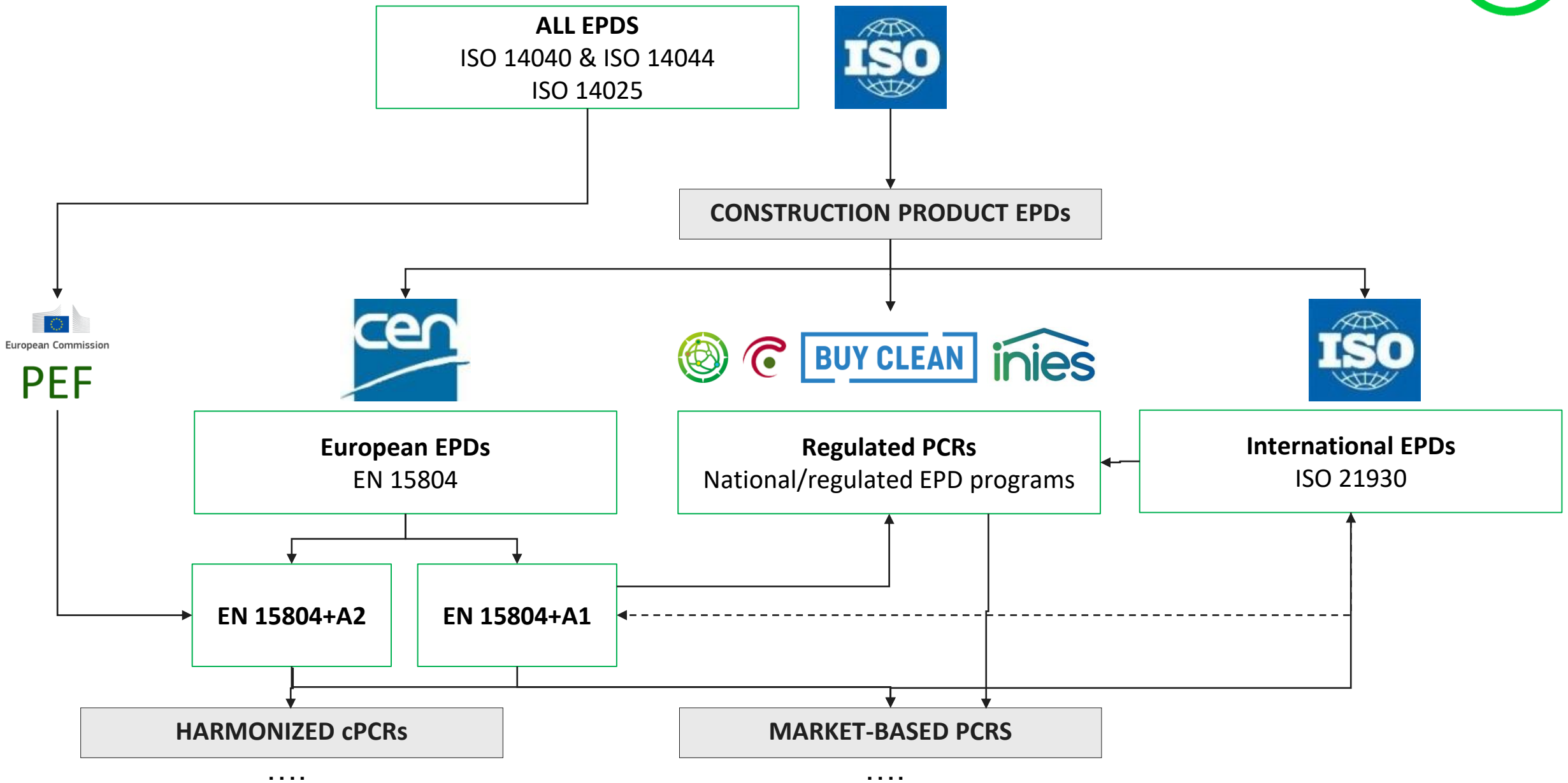
An EPD is an LCA for a product with additional rules for calculation, verification and publication

EPD in a Nutshell

- Based on real data, no forecasting
- Can represent either one product and one factory or many products and many factories
- Often valid for 5 years
- Several kinds of EPDs, that represent different scopes
  - Cradle-to-gate
  - Cradle-to-grave
  - Cradle-to-gate with options
- Offer knowledge on the product's environmental performance. Only similar products that are calculated with same methods can be compared.

The family of EPD standards...

… is growing fast!



Example EPD

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

TULPPA - WET ROOM BOARDS

FINNFOAM OY

PRODUCT DESCRIPTION

Finnfoam Oy's Tulppa is a Finnish-made wet room panel, which functions as both a construction board and waterproofing material. The core of the panel is made from a closed-cell, waterproof and mold-proof Finnfoam (XPS) insulation material and the surface layer consists of strong, special-purpose cement mortar. The Tulppa panel can be used as a base for tiling.

PRODUCT APPLICATION

Tulppa is a horizontally installed wet room panel, which functions as both a construction board and waterproofing material.

DECLARED AND FUNCTIONAL UNIT

Declared unit	1 m²
Mass per declared unit	3.54 kg (with 12.5 mm XPS) 3.80 kg (with 20 mm XPS) 4.15 kg (with 30 mm XPS) 4.85 kg (with 50 mm XPS) 5.90 kg (with 80 mm XPS)

TULPPA WITH 12.5 MM XPS

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Climate change – total	kg CO_2e	2.29E+00	5.07E-01	-1.18E-01	2.68E+00	6.98E-02	5.68E-01	MND	0.00E+00	2.25E-02	2.46E+00	0.00E+00	-9.05E-01
Climate change – fossil	kg CO_2e	2.27E+00	5.07E-01	4.06E-01	3.19E+00	7.04E-02	3.02E-02	MND	0.00E+00	2.25E-02	8.26E-01	0.00E+00	-9.05E-01
Climate change – biogenic	kg CO_2e	1.80E-02	2.70E-04	-5.31E-01	-5.13E-01	5.11E-05	5.38E-01	MND	0.00E+00	1.38E-05	1.63E+00	0.00E+00	-4.33E-04
Climate change – LULUC	kg CO_2e	1.28E-03	1.80E-04	8.00E-03	9.46E-03	2.12E-05	2.73E-06	MND	0.00E+00	7.93E-06	1.46E-05	0.00E+00	-3.75E-05
Ozone depletion	kg CFC11e	1.02E-07	1.15E-07	8.87E-08	3.05E-07	1.65E-08	1.51E-09	MND	0.00E+00	5.15E-09	7.46E-09	0.00E+00	-1.87E-07
Acidification	mol H⁺e	9.80E-03	2.07E-03	2.11E-03	1.40E-02	2.96E-04	8.31E-05	MND	0.00E+00	9.26E-05	3.56E-04	0.00E+00	-8.12E-03
Eutrophication, aquatic freshwater [1]	kg Pe	4.37E-05	4.24E-06	2.02E-05	6.82E-05	5.73E-07	1.29E-07	MND	0.00E+00	1.94E-07	7.60E-07	0.00E+00	-1.77E-06
Eutrophication, aquatic marine	kg Ne	2.08E-03	6.15E-04	4.75E-04	3.17E-03	8.91E-05	3.66E-05	MND	0.00E+00	2.74E-05	1.46E-04	0.00E+00	-7.66E-04
Eutrophication, terrestrial	mol Ne	2.31E-02	6.79E-03	4.78E-03	3.46E-02	9.84E-04	3.87E-04	MND	0.00E+00	3.03E-04	1.50E-03	0.00E+00	-7.49E-03
Photochemical ozone formation	kg NMVOCe	6.72E-03	2.08E-03	1.46E-03	1.03E-02	3.16E-04	1.00E-04	MND	0.00E+00	9.51E-05	4.43E-04	0.00E+00	-2.47E-03
Abiotic depletion, minerals & metals [2]	kg Sbe	1.73E-04	1.37E-05	2.77E-06	1.89E-04	1.20E-06	1.86E-07	MND	0.00E+00	5.61E-07	8.32E-07	0.00E+00	-5.31E-07
Abiotic depletion of fossil resources [2]	MJ	5.02E+01	7.64E+00	1.85E+01	7.63E+01	1.09E+00	1.17E-01	MND	0.00E+00	3.43E-01	6.21E-01	0.00E+00	-1.15E+01
Water use [2]	m^3e deprived	4.80E-01	2.46E-02	2.84E-01	7.88E-01	4.07E-03	-2.00E-03	MND	0.00E+00	1.22E-03	-3.56E-02	0.00E+00	-1.69E-01

[1] The required characterisation method and data are in kg P-eq; to get PO_4e, multiply the result by 3.07.

[2] EN 15804+A2 Disclaimer 2: "The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator."

Comparing EPDs

DECLARED UNIT

Declared unit	1 m²
Mass per declared unit	500 kg/m²

ENVIRONMENTAL IMPACT DATA

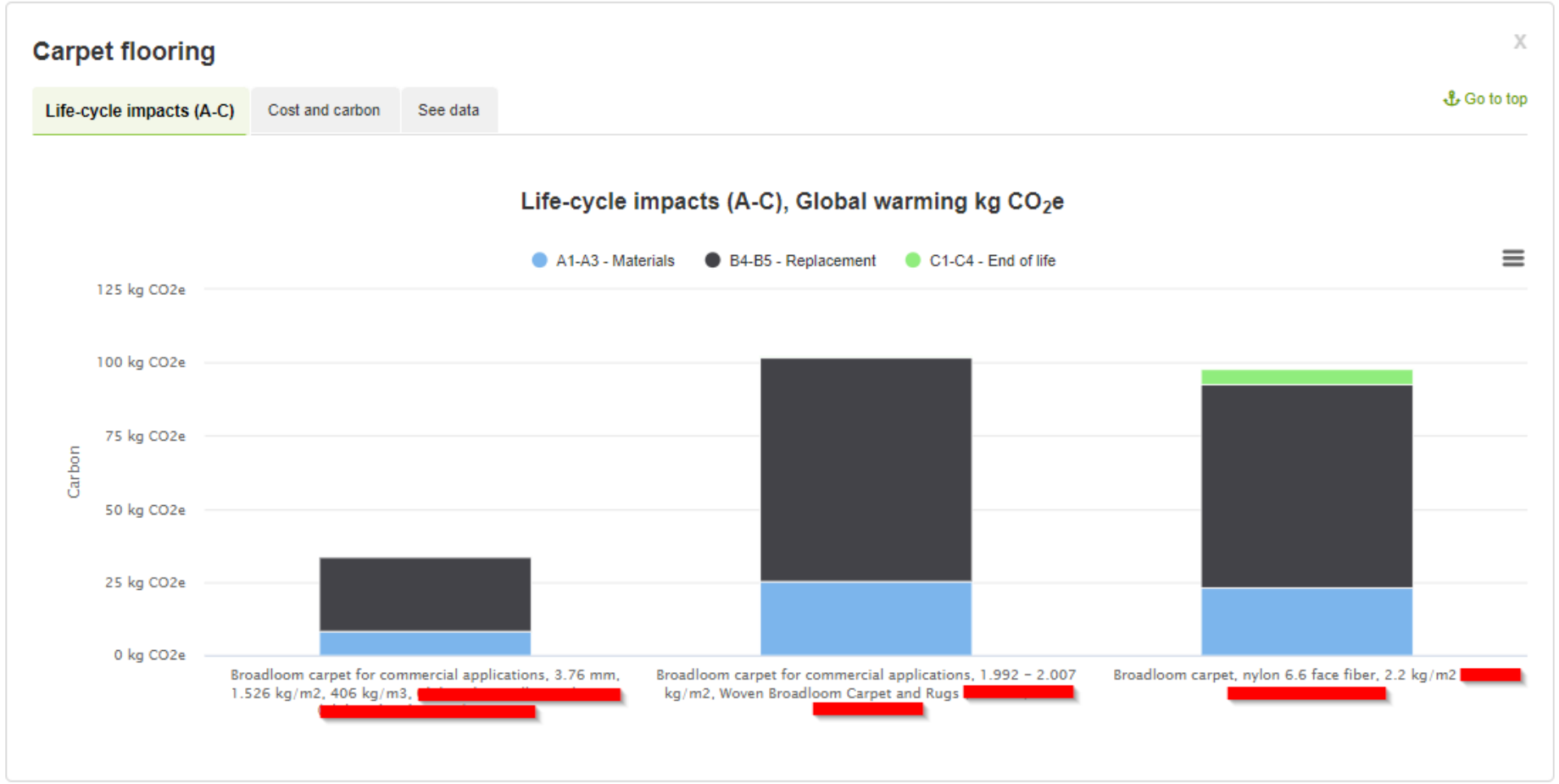
Note: additional environmental impact data may be presented in annexes.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4
GWP – total	kg CO2e	6,58E1	4,89E0	3,86E0	7,45E1	5,49E0	MND	MND	MND	MND	MND
GWP – fossil	kg CO2e	6,48E1	4,89E0	3,69E0	7,33E1	5,54E0	MND	MND	MND	MND	MND
GWP – biogenic	kg CO2e	9,83E-1	2,97E-3	1,49E-1	1,14E0	3,4E-3	MND	MND	MND	MND	MND
GWP – LULUC	kg CO2e	1,78E-2	1,73E-3	1,4E-2	3,36E-2	1,96E-3	MND	MND	MND	MND	MND
Ozone depletion pot.	kg CFC11e										

One Click LCA

Comparing EPDs



Material emission factor sources

EN 15804 EPD

Manufacturer specific or generic tai EPD. Most accurate if product is known

Generic Material values calculated using EN 15804

For example IMPACT, NMD, One Click LCA generic data

Other Embodied carbon data

Generic LCA- sources.
Other than sources as per EN 15804 for example ICE

Where information of EPD that complies with EN 15804 does exist or product unknown?

If product known:

Product EN-EPD

Generic -EPD

Technically or regionally similar products EPD or generic data that complies with EN

If product not known:

Product category EN-EPD

Generic informaiton that complies with EN-standard

Technically or regionally similar products EPD or generic data that complies with EN

Not recomended: to use anything else than EPDs or other data that has been calculated using EN standard.

LEED v4.1
MR EPD credit

Intent

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.

Criteria

Option 1. Environmental Product Declaration (EPD) (1 point)
Use at least 20 different permanently installed products sourced from at least five different manufacturers that meet one of the disclosure criteria below. (10 different permanently installed products from three different manufacturers for CS and Warehouses & Distribution Centres).

Acceptable EPDs are: Product specific Type III EPDs – Internally reviewed (confirm ISO 14071, EN 15804 or 21930) AND Industry – wide Type III EPDs that externally verified and published be program operator (confirm with ISO 14025 and EN 15804 or ISO 21930) as well products confirming to ISO 14044.

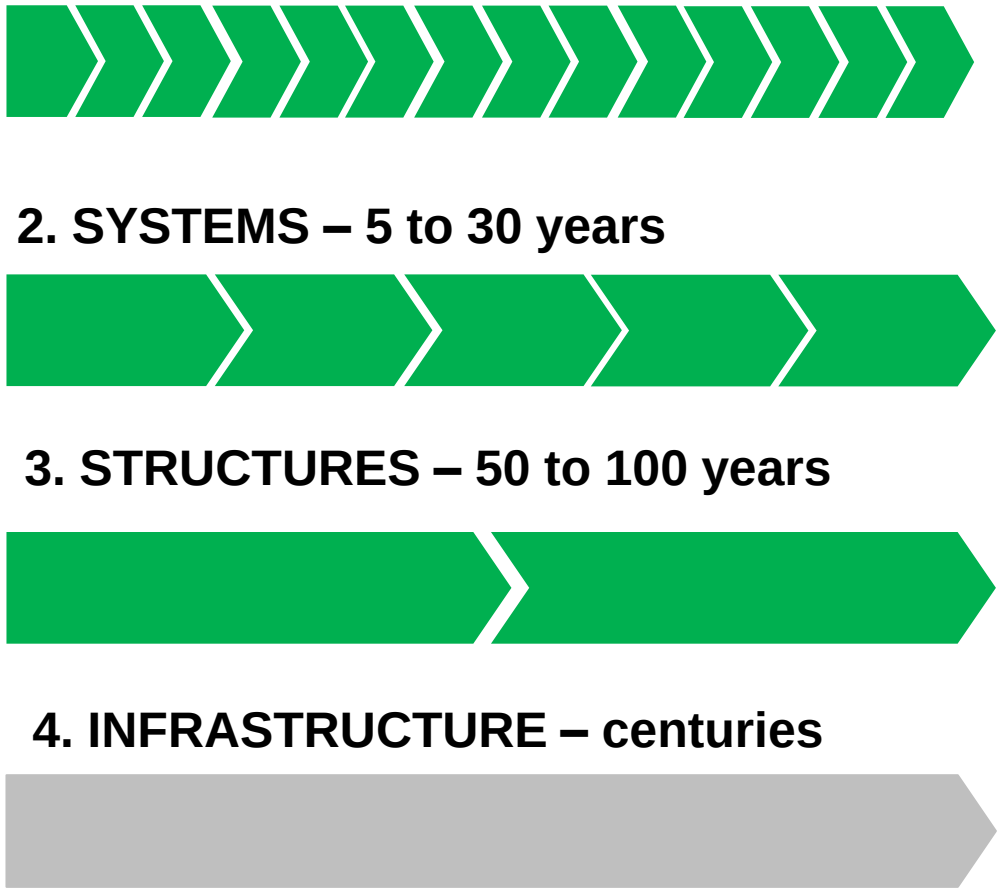
Option 2. Embodied Carbon/LCA Optimization (1 point) → Gives credit if you using materials that are to be verified and published in near future or to reduction reports that show reduction in GWP over baseline (read more about it in LEED standard)

Steering emissions in construction projects

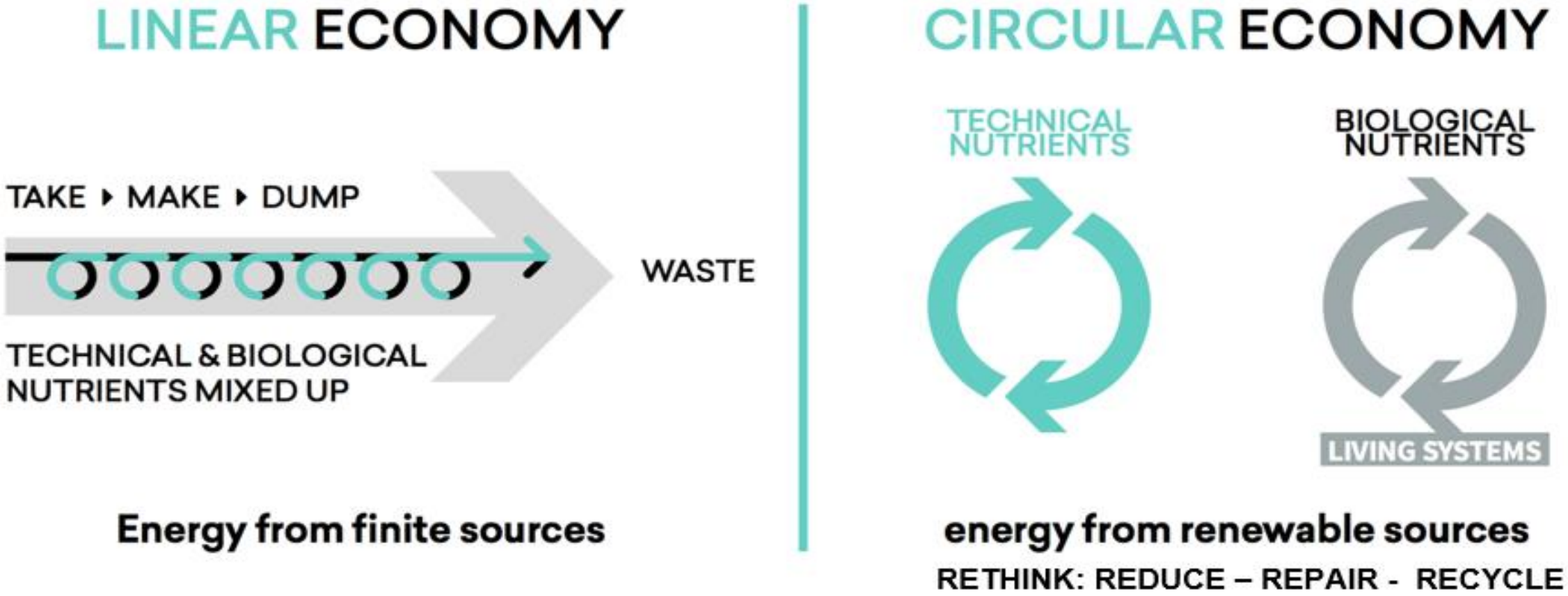
Life-cycle design opportunities for materials

EXAMPLE OF EMBODIED CARBON CYCLE OVER A CENTURY FOR AN OFFICE

YEAR ONE kg CO2e/m2		YEAR 100 kg CO2e/m2
SURFACES 40 kg	1. SURFACES – 3 to 10 years	14 replacements 560 kg
SYSTEMS 80 kg	2. SYSTEMS – 5 to 30 years	5 replacements 400 kg
STRUCTURES 400 kg	3. STRUCTURES – 50 to 100 years	1 rebuild 800 kg
	4. INFRASTRUCTURE – centuries	
TOTAL YEAR ONE 520 kg		TOTAL YEAR 100 1760 kg



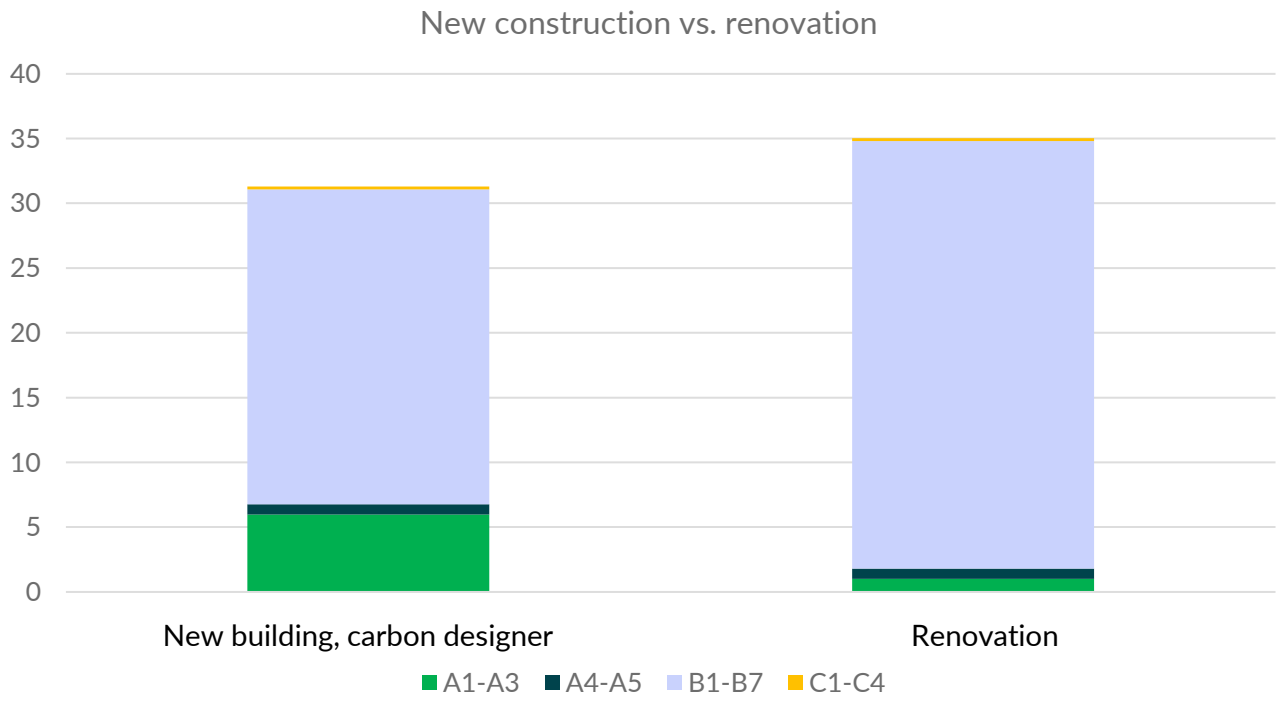
Developing different materials design and sourcing plans for your projects



https://sustainabilityguide.eu/sustainability/circular-economy/

New building vs. Renovation

- All materials that are not replaced are considered as reused → only new materials add emissions
- Energy efficiency is calculated with future energy emissions
- Efficient use of spaces can be counted by using nr. of users or use hours as denominator



Baseline and early stage comparison

One Click LCA Carbon Designer tool

1. Projecrt size | 2. Project type | 3. Geometry (opt.) | 4. Check results | 5. Optimize

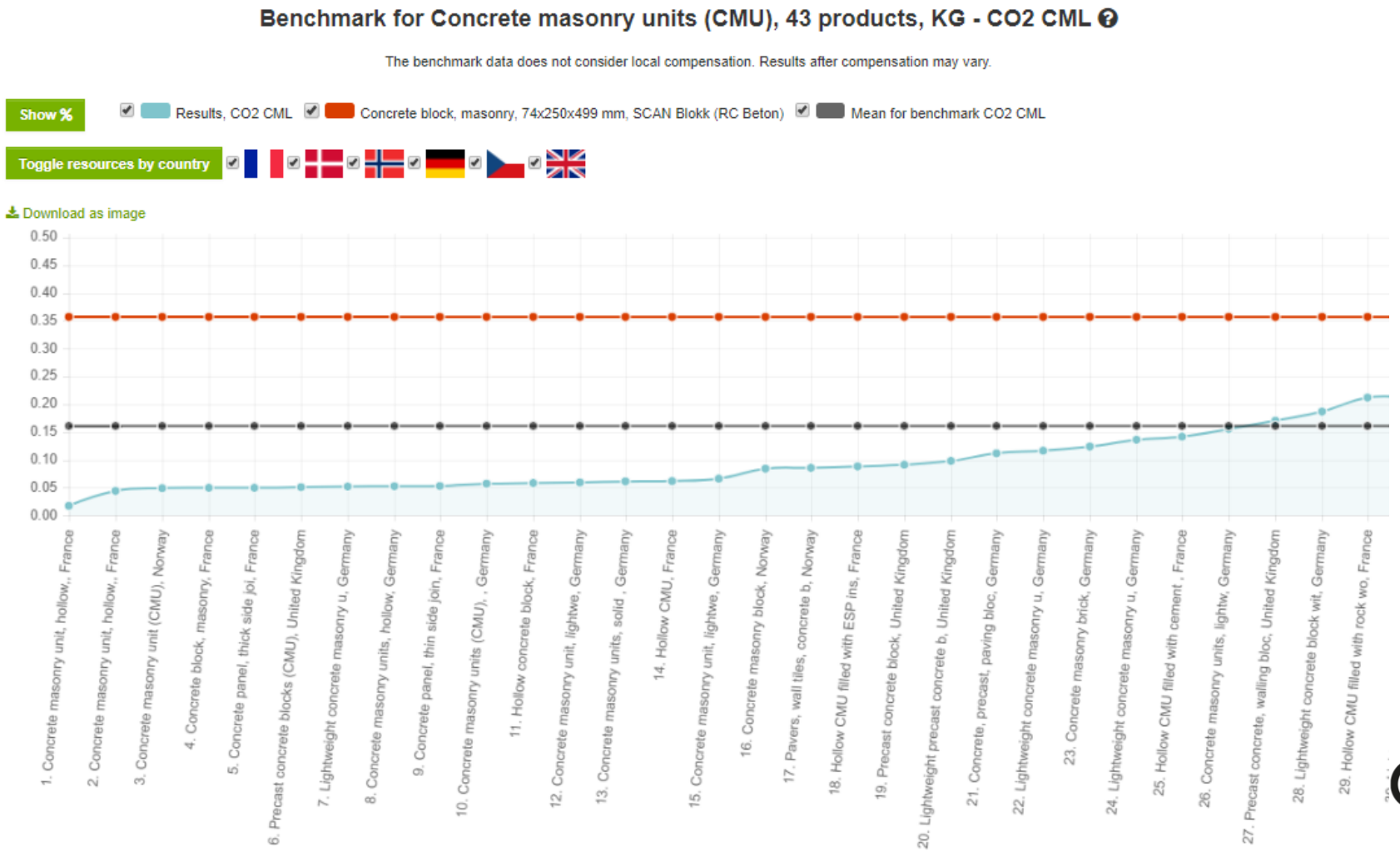
Baseline CO_2e **226 kg/m²** Optimized carbon impacts CO_2e **190 kg/m²** Carbon savings **-16.09%** Project level change **-182.2 tons CO_2e**

BUILDING ELEMENTS AND MATERIALS	Amount	Tons CO_2e	Carbon Share

Choose types of constructions you wish to use, and adjust the materials used in them as desired. You can also save the adjusted data to a design.

− Floor slabs	4000 m2	Share %	215 tn	23%	Carbon intensity	
Hollow-core slab floor assembly, incl. mineral wool acoustic slabs ?	0 m2	0	0 tn	0%	0 kg	Edit
Wooden joist floor assembly ?	4000 m2	100	215 tn	100%	54 kg	Edit
In-situ concrete slab assembly ?	0 m2	0	0 tn	0%	0 kg	Edit

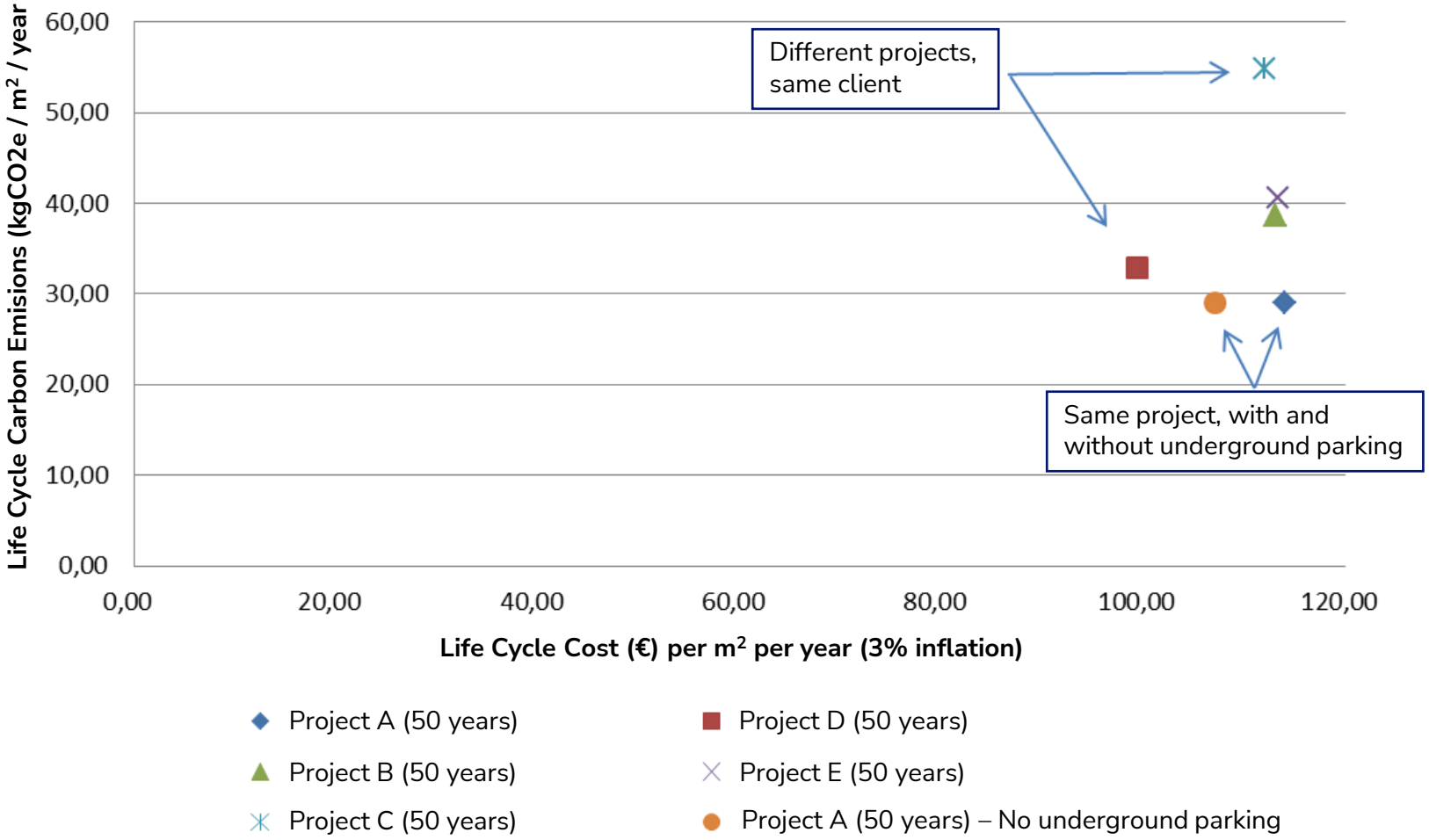
Procurement stage: Comparing material emissions with EPDs helps to find low carbon options



One Click LCA

Combine LCA & LCC to find optimal solutions

Example: Apartment building LCA results combined with LCC.



The building with least carbon emissions also has the lowest cost over the life time – attractive design choice!

One Click LCA

Carbon footprint and LCA gives points in green building certifications

LCA: 3 + 1 pistettä
EPDs: 2 pistettä

LCA: 5 + 1 credits
LCC: 3 credits
EPDs: 1 + 1 credits

World's Most Sustainable Office Building – UK (BREEAM)

One Click LCA was used to calculate LCA for the World's Most Sustainable Office Building, Bloomberg's New European Headquarters.

Zoo Atlanta Savanna Hall and Exhibit – US (LEED)

Read this case study on Life Cycle Assessment for LEED v4 and find out how Epsten Group used One Click LCA for their Savannah Hall project.

Shopping center I3 – Finland

Granlund has used One Click LCA to measure Life-Cycle metrics for their Kauppakeskus I3 project in Finland.

One Click LCA

Process for steering emissions through different stages of construction projects

PRE-PROJECT

DESIGN

AS BUILT

Impacts of site options

Study concepts and set a target

Design for high performance

Choose low-carbon products

Validate final performance

Benchmark to peers

1. STRATEGY

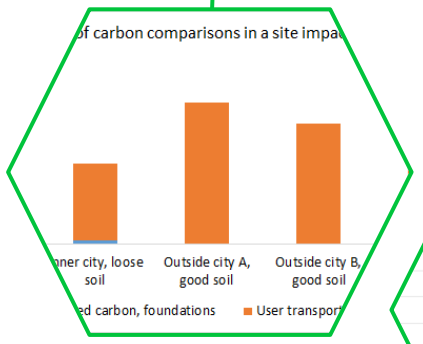
2. CONCEPT

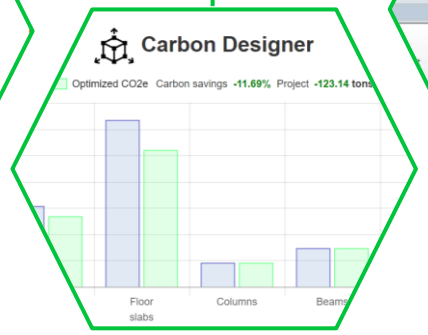
3. DESIGN

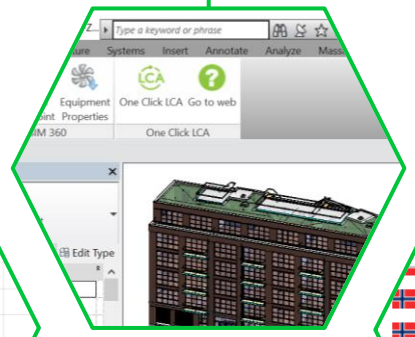
4. CONTRUCTION

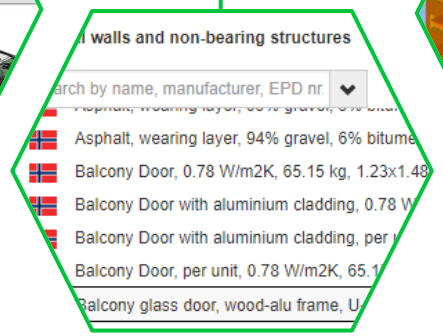
5. AS BUILT

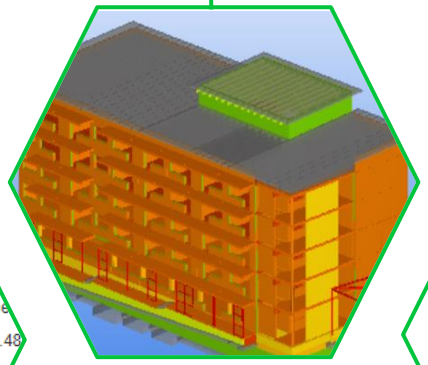
6. COMMISSION

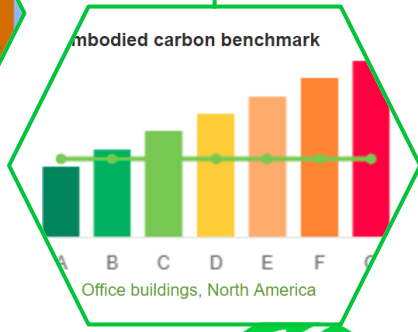






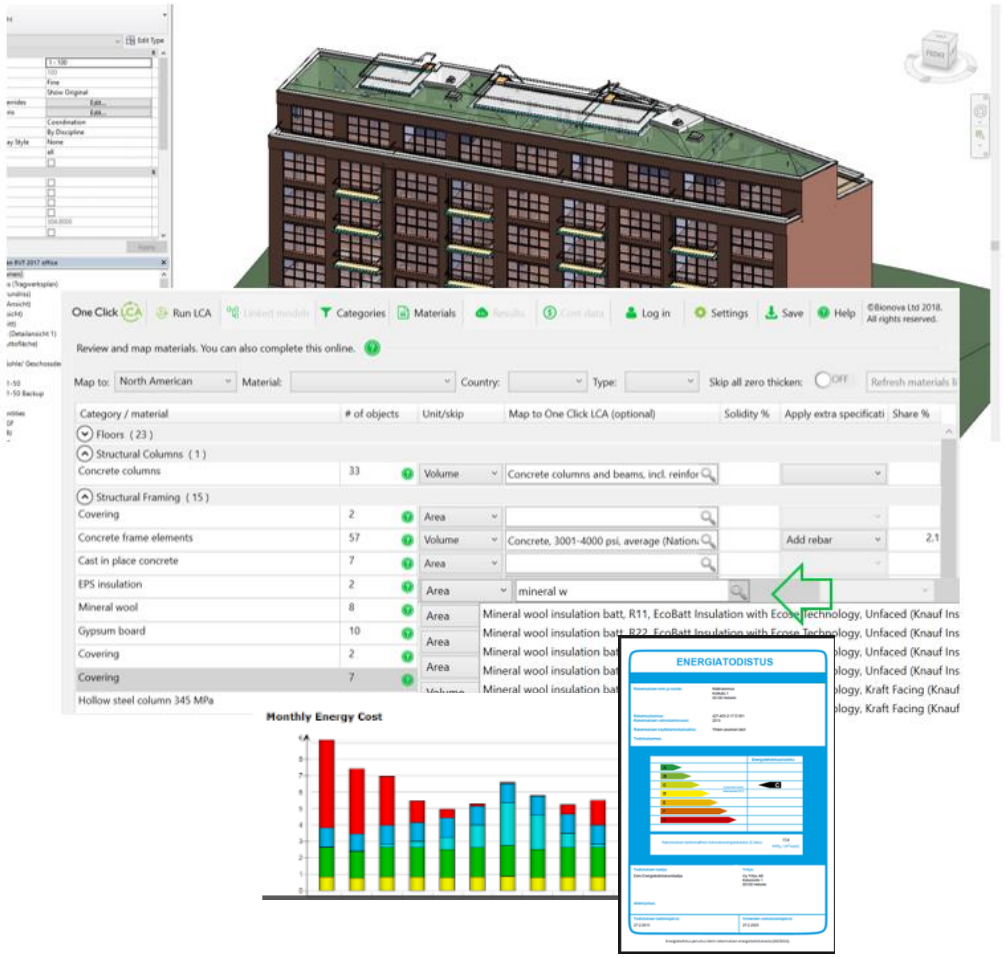






One Click LCA

Automation from Design Tools



COMPLAIANCE TOOLS

DesignBuilder

IES

DESIGN

AUTODESK REVIT

GRAPHISOFT ARCHICAD

TEKLA

Rhinoceros

grasshopper

FILE FORMATS

Microsoft Excel

gbXML

BIM MANAGEMENT

Trimble Connect

SOLIBRI Model Checker

simplebim.

One Click LCA

Suggested Embodied Carbon Pyramid to prioritize circular and low carbon design

One Click LCA

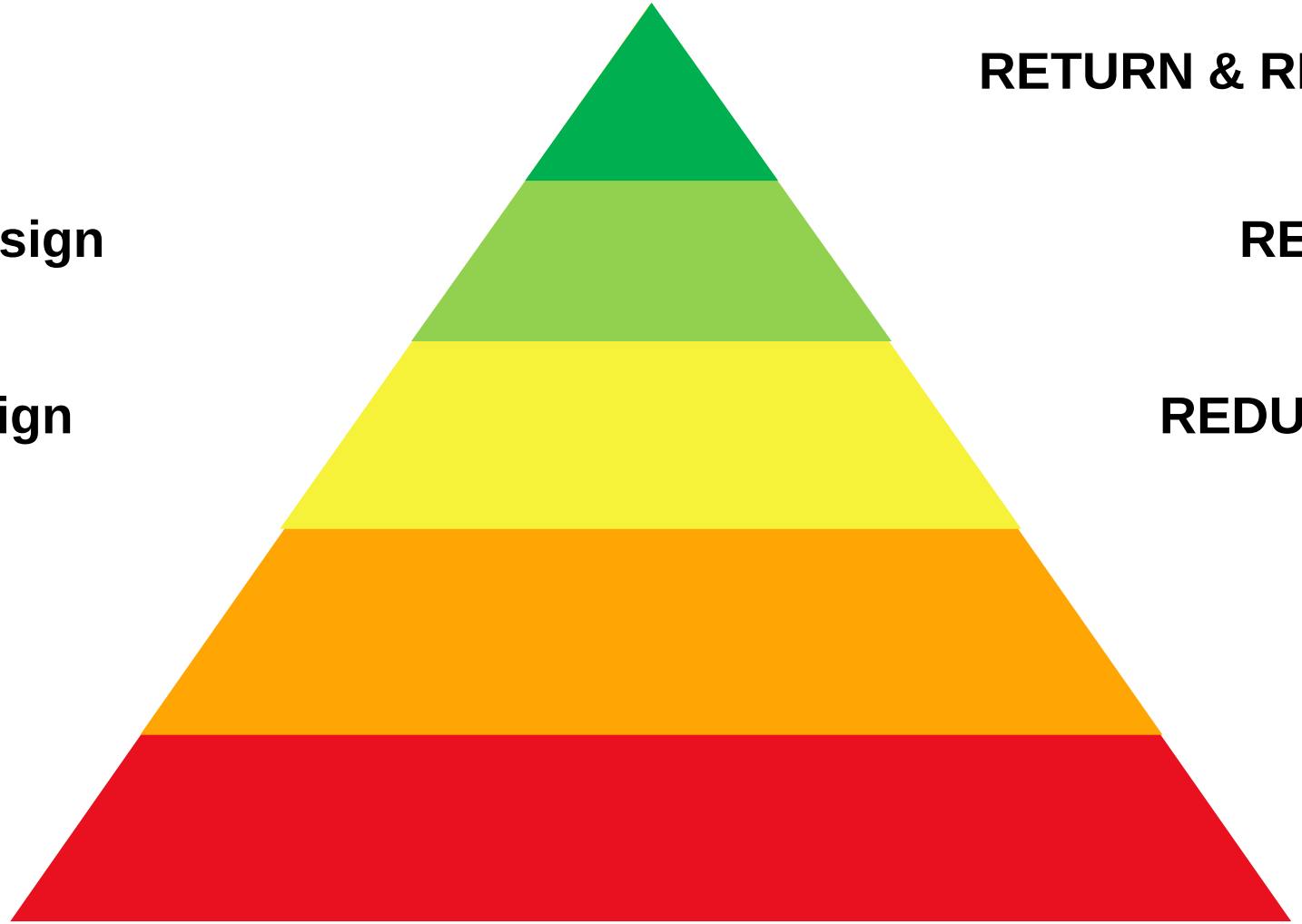
Construction — **RETURN & RECYCLE** unused materials

Technical Design — **RETAIN** low carbon solutions

Concept Design — **REDUCE & REPLACE** materials

Briefing — **REUSE** existing materials

Strategy — **REDEFINE** the problem



One Click LCA Demo

One Click LCA

Software Solutions Resources Pricing Support FREE TRIAL LOGIN

Embodied Carbon & Circular Economy Road Tour, World Green Building Week, 23-29 Sept. Join us online or in 6 countries!

Calculate Your Environmental Impacts in Minutes

Reduce Cost, Carbon, and Material Use in Construction.

For LEED, BREEAM and more.

Integrated with Revit, BIM, IESVE and other tools.

GET A FREE DEMO

Access to the software

One Click LCA

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Calculate Your Environmental Impacts in Minutes

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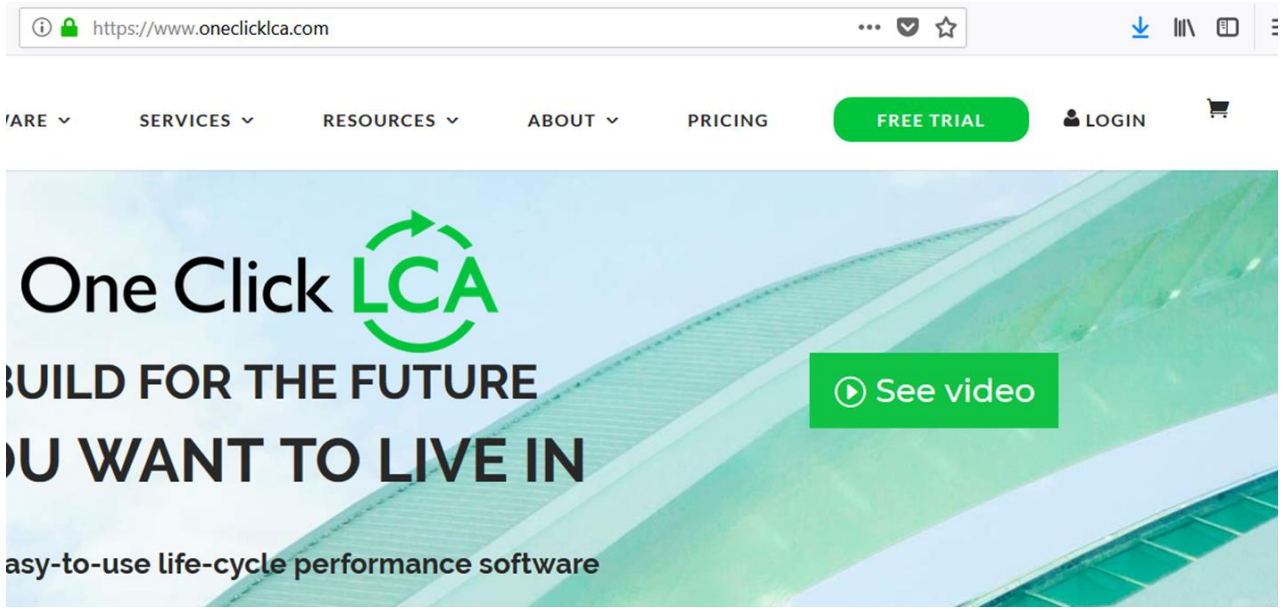
GET A FREE DEMO

Steps to get started

1. Create a One Click LCA account
2. Create calculation project
3. Activate your licence using the license key provided

Create account

1. Go to oneclicklca.com
2. Choose “Login” from the right corner of the page
3. In the login form choose “New user? Register here!”
4. Fill in your information
5. Activate the account from the link in your email
6. Log in to One Click LCA using the same login form

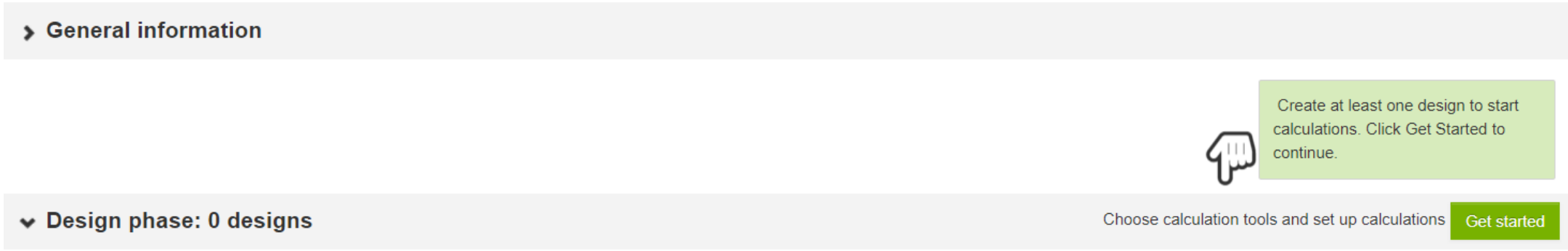


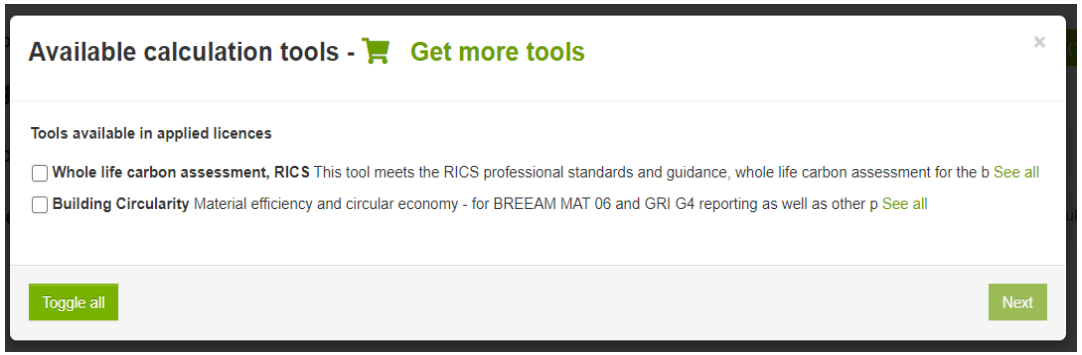
Create project and activate licence

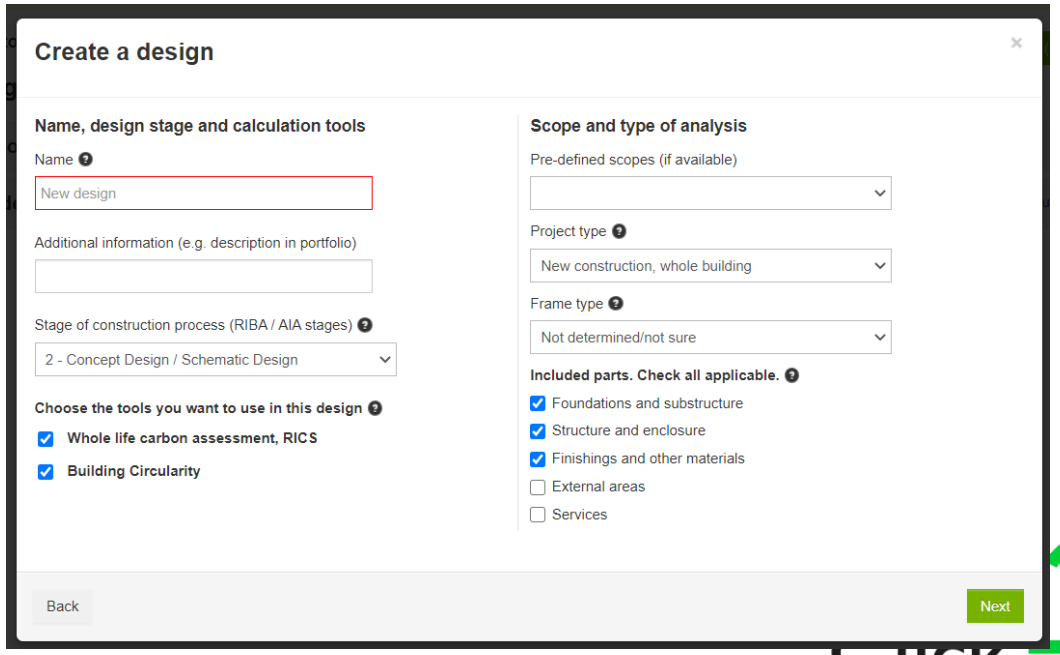
1. Select “Create a new project”
2. Select “Building”
3. Choose building and add basic information for your own building and save.
4. Activate your licence by typing the licence key provided by your teacher.
5. Press “Get started” and add the Level(s) tool.

Getting started – Inside the project

1/ Click on “Getting Started” button and
2/ name your 1st design



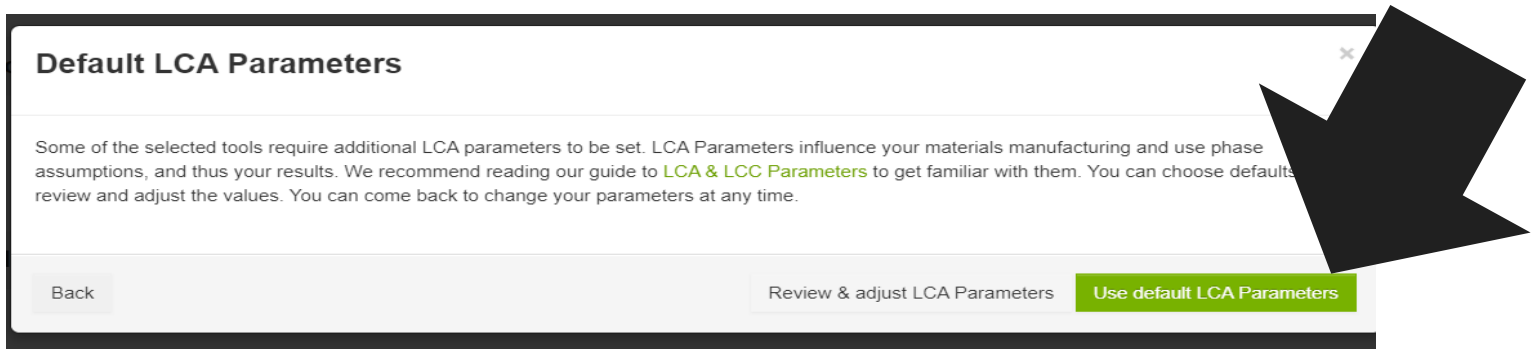


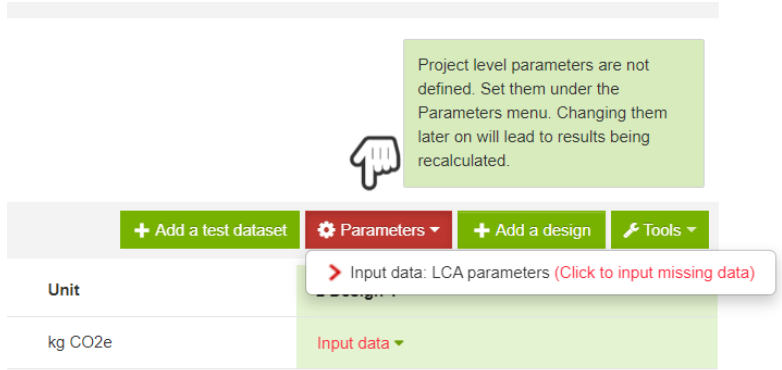


Getting started – Approve or review parameters

3/ You can confirm “Use default LCA Parameters” or Review

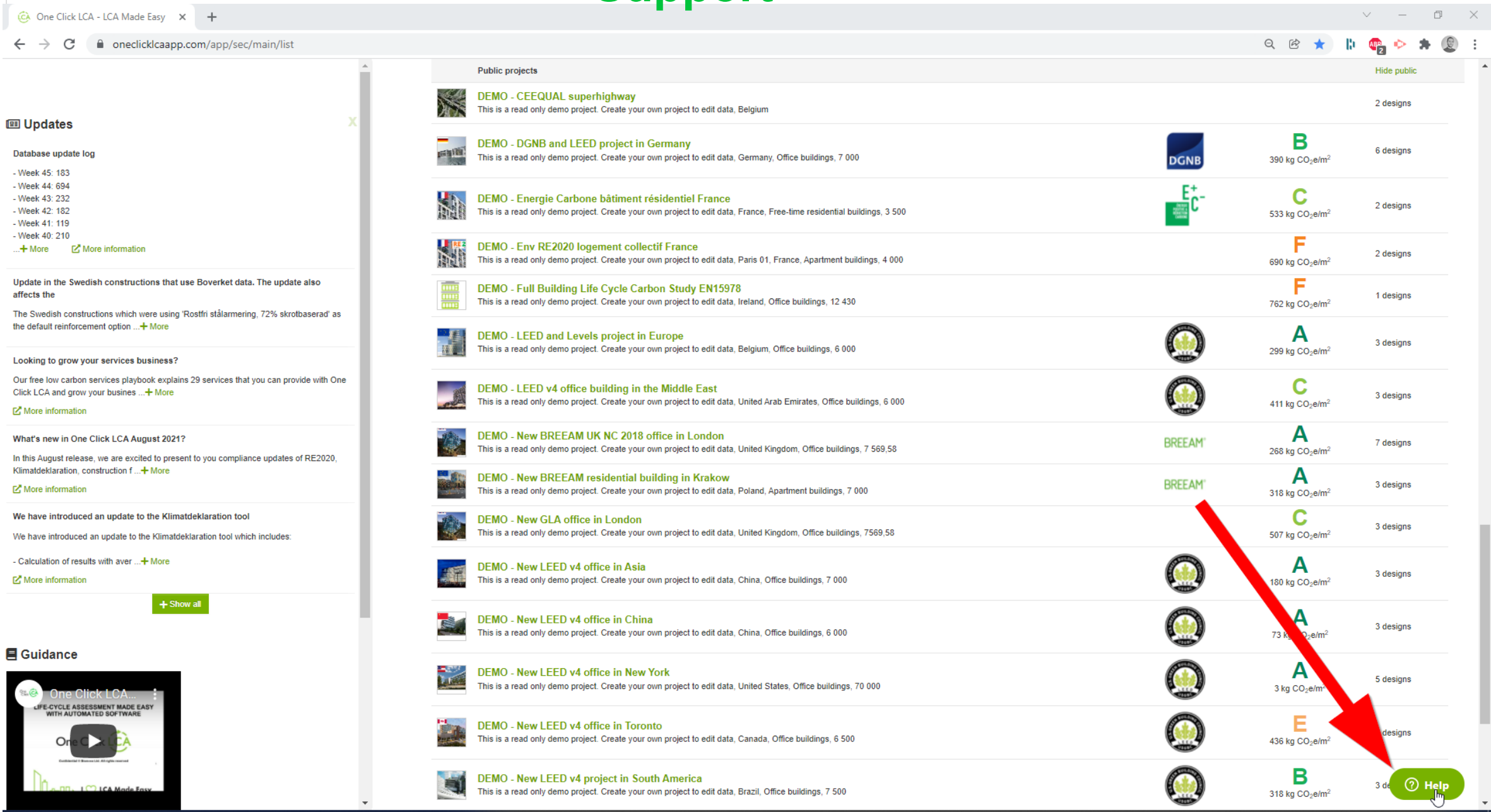
- Default choices are almost always what you need
- Can always be edited and project is recalculated





All set to start adding data to your 1st DESIGN

Support


One Click LCA - LCA Made Easy
oneclicklcaapp.com/app/sec/main/list
Updates
Database update log
- Week 45: 183
- Week 44: 694
- Week 43: 232
- Week 42: 182
- Week 41: 119
- Week 40: 210
More
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Update in the Swedish constructions that use Boverket data. The update also affects the
The Swedish constructions which were using 'Rostfri stålarmering, 72% skrotbaserad' as the default reinforcement option ...More
Looking to grow your services business?
Our free low carbon services playbook explains 29 services that you can provide with One Click LCA and grow your busines ...More
More information
What's new in One Click LCA August 2021?
In this August release, we are excited to present to you compliance updates of RE2020, Klimatdeklaration, construction f ...More
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We have introduced an update to the Klimatdeklaration tool
We have introduced an update to the Klimatdeklaration tool which includes:
- Calculation of results with aver ...More
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Guidance
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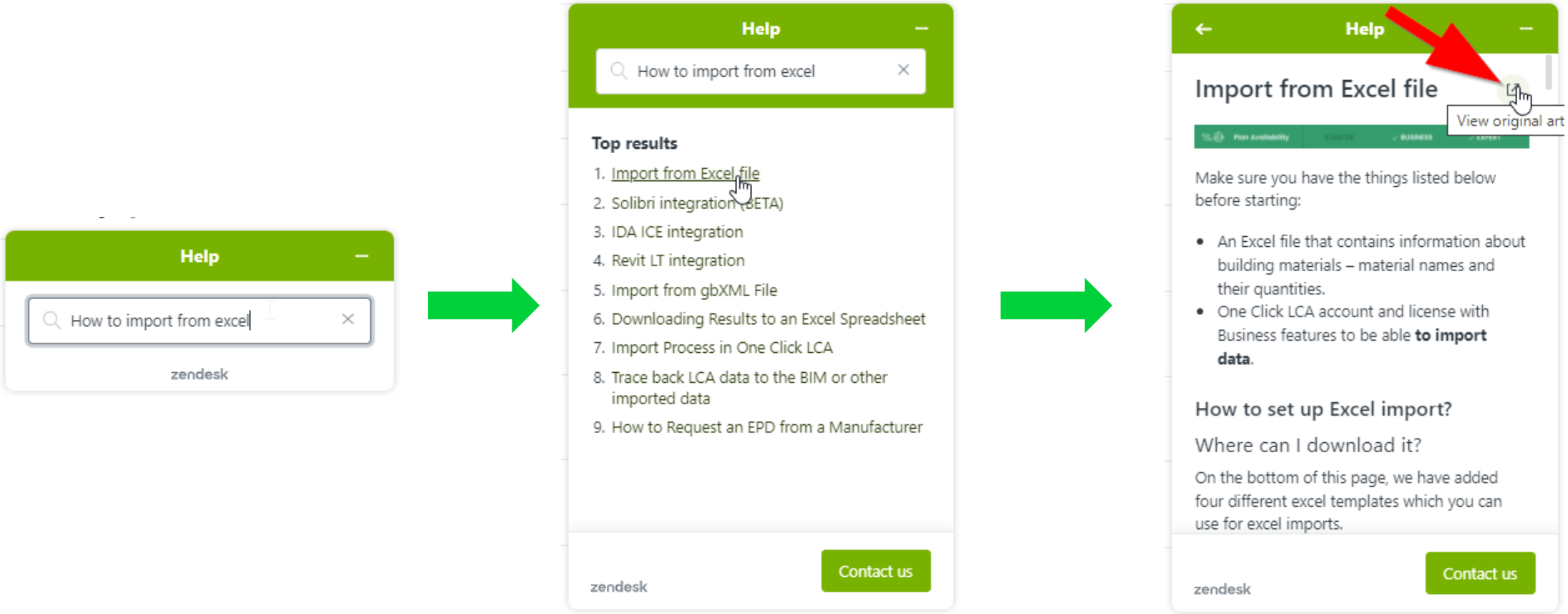
Public projects
Hide public
DEMO - CEEQUAL superhighway
This is a read only demo project. Create your own project to edit data, Belgium
2 designs
DEMO - DGNB and LEED project in Germany
This is a read only demo project. Create your own project to edit data, Germany, Office buildings, 7 000
DGNB
B
390 kg CO2e/m2
6 designs
DEMO - Energie Carbone bâtiment résidentiel France
This is a read only demo project. Create your own project to edit data, France, Free-time residential buildings, 3 500
C
533 kg CO2e/m2
2 designs
DEMO - Env RE2020 logement collectif France
This is a read only demo project. Create your own project to edit data, Paris 01, France, Apartment buildings, 4 000
F
690 kg CO2e/m2
2 designs
DEMO - Full Building Life Cycle Carbon Study EN15978
This is a read only demo project. Create your own project to edit data, Ireland, Office buildings, 12 430
F
762 kg CO2e/m2
1 designs
DEMO - LEED and Levels project in Europe
This is a read only demo project. Create your own project to edit data, Belgium, Office buildings, 6 000
A
299 kg CO2e/m2
3 designs
DEMO - LEED v4 office building in the Middle East
This is a read only demo project. Create your own project to edit data, United Arab Emirates, Office buildings, 6 000
C
411 kg CO2e/m2
3 designs
DEMO - New BREEAM UK NC 2018 office in London
This is a read only demo project. Create your own project to edit data, United Kingdom, Office buildings, 7 569,58
BREEAM
A
268 kg CO2e/m2
7 designs
DEMO - New BREEAM residential building in Krakow
This is a read only demo project. Create your own project to edit data, Poland, Apartment buildings, 7 000
BREEAM
A
318 kg CO2e/m2
3 designs
DEMO - New GLA office in London
This is a read only demo project. Create your own project to edit data, United Kingdom, Office buildings, 7569,58
C
507 kg CO2e/m2
3 designs
DEMO - New LEED v4 office in Asia
This is a read only demo project. Create your own project to edit data, China, Office buildings, 7 000
A
180 kg CO2e/m2
3 designs
DEMO - New LEED v4 office in China
This is a read only demo project. Create your own project to edit data, China, Office buildings, 6 000
A
3 designs
DEMO - New LEED v4 office in New York
This is a read only demo project. Create your own project to edit data, United States, Office buildings, 70 000
A
5 designs
DEMO - New LEED v4 office in Toronto
This is a read only demo project. Create your own project to edit data, Canada, Office buildings, 6 500
E
436 kg CO2e/m2
DEMO - New LEED v4 project in South America
This is a read only demo project. Create your own project to edit data, Brazil, Office buildings, 7 500
B
318 kg CO2e/m2
Help
03 Presentations
Session 2
One Click LCA - LC...
SG Contest 1st lect...
ENG
11:25
06/12/2021

Support



Or visit our help centre directly at: https://oneclicklca.zendesk.com/

Support

Unable to find an answer in the help centre?

1. Contact your university's **main user (teacher)**

2. **Your teacher** will either have an answer or contact the One Click LCA support team


QUESTIONS?