TCU VIA – 26S

VIA University College

5.01-3 INTRO SUSTAINABILITY

5th Semester TCU

5.01 CIVIL ENGINEERING CONSTRUCTION

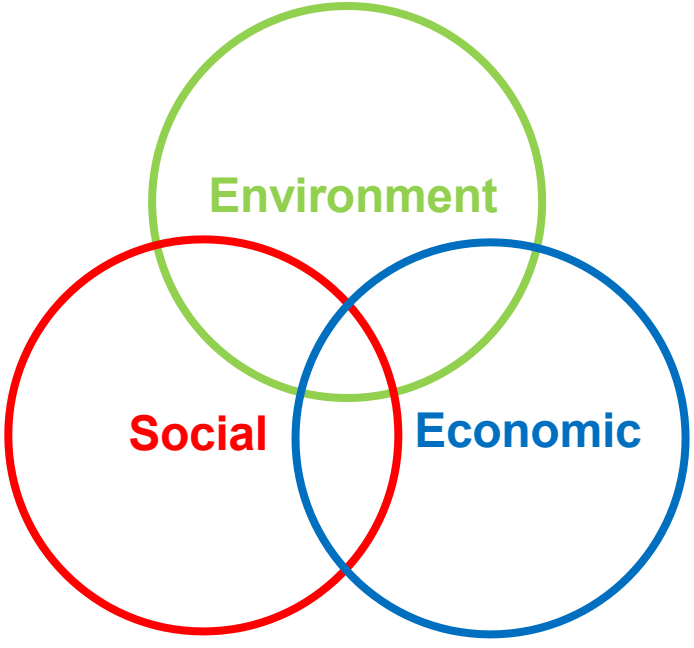
- What is sustainability?
- Country Overshoot Day
- Sustainable Development Goals
- Global Warming
- Circular economy
- LCA, Life Cycle Assessment
- EPD, Environmental Product Declaration



What is Sustainability ?



Sustainability – 3 equally important parts!





In this presentation
and in your assignment, we will
focus on **environmental aspects**

UN - United Nations

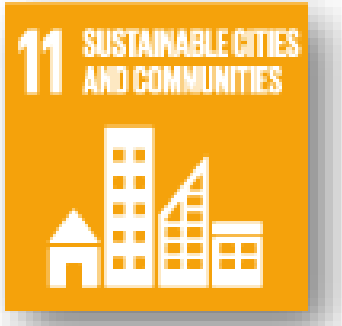


Sustainable Development Goals – *United Nations*

The goals below affect **constructions** - e.g.:

- **Resource consumption**
- **Energy production, energy consumption**
- **Pollution**
- **Biodiversity**
- **Climate impact**

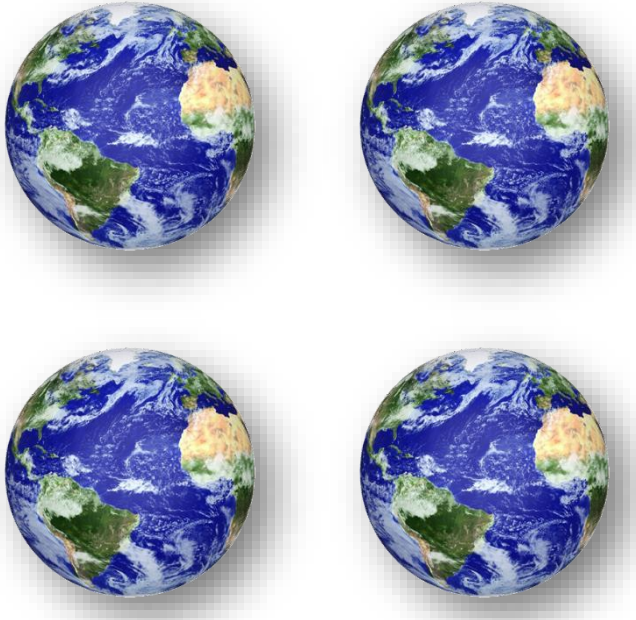








Resource Consumption





Linear Economy vs. Circular Economy



Cirkular Economy



Cirkular Economy - Renovation of Existing Buildings



Cirkular Economy – Design for Disassembly

Reversible connections enables disassembly of concrete elements.

Lime mortar can be removed easily in seconds.





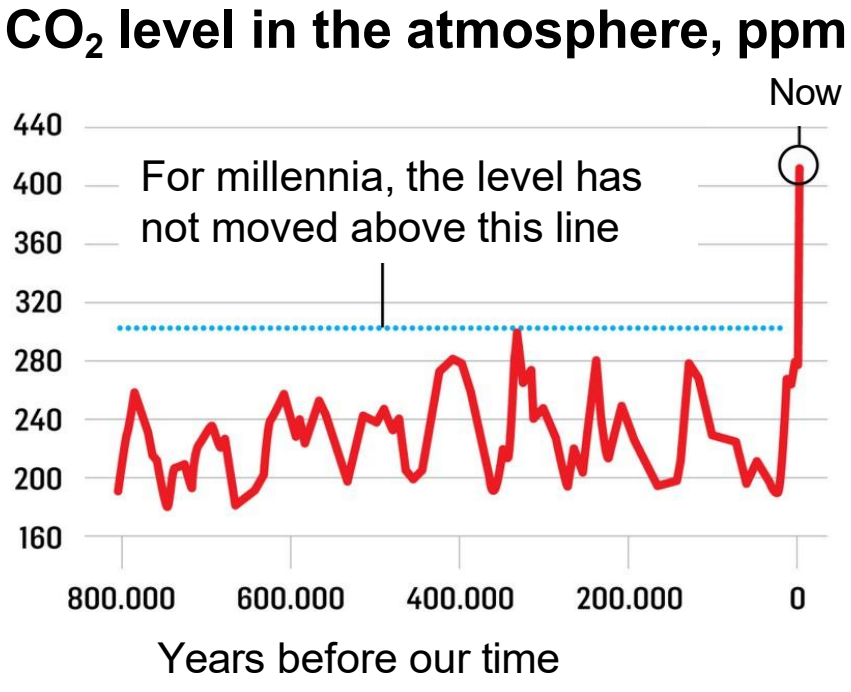
Cirkular Economy - Recycling of Concrete Elements



Global Warming - source: Graph and statistics from *Nasa*

It looks like the **increase** in CO_2 levels is **not a natural variation**, as many climate skeptics have claimed?





Global Warming

Contribution to the total human-caused greenhouse effect:

- **CO_2 (carbon dioxide) 55%**
- CH_4 (methane) 20%
- No_x (nitrous oxide) 4%
- O_3 (ozone) 8%
- Halocarbons (coolants) 13%



Global Warming - The Paris Agreement Goal

We should keep average **temperature increases** well below 2 degrees and preferably **no more than 1.5 degrees** compared to before we really started industrialization - the second half of the 19th century.

We are **already 1.2 degrees higher** than we were then!

Can we keep that promise?



Global Warming - Economy

In 2018, the UN Climate Panel estimated that **it would cost approximately 2.5% of the global economy per year** to change our energy systems enough **to meet the Paris Agreement goal**.

Is that expensive?

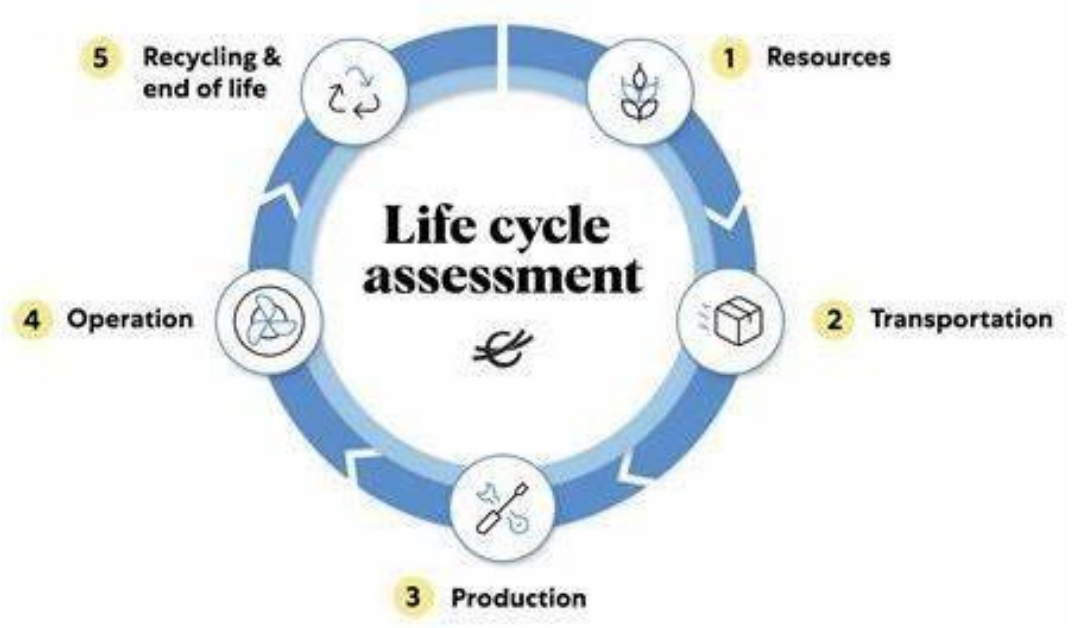




Global Warming – LCA – Life Cycle Assessment

One of the ways the construction industry can **reduce carbon footprint** is to **use LCA**.

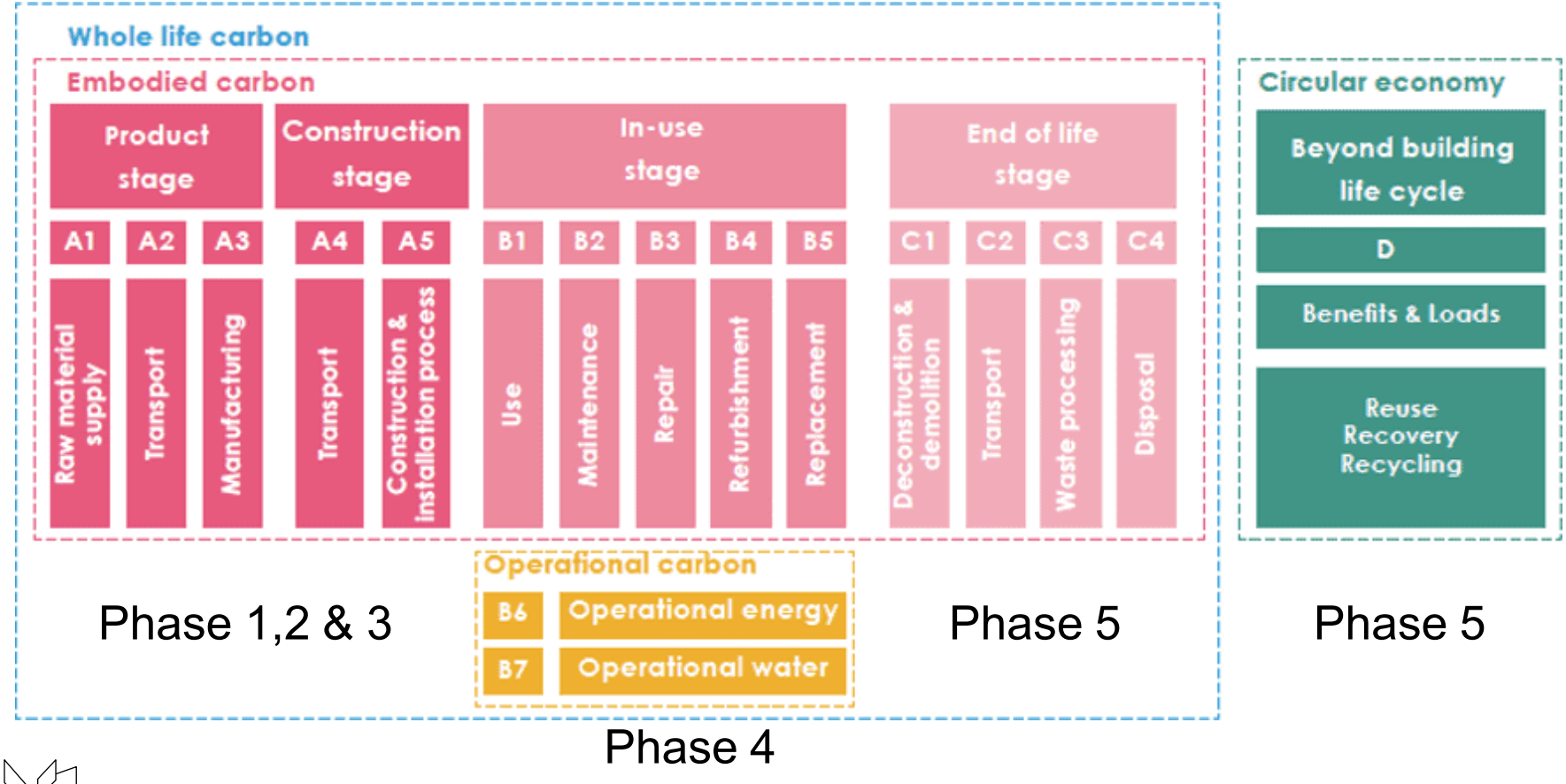
There are **5 phases** in a life cycle assessment.



LCA – Life Cycle Assessment

- **Standard method** for estimating the environmental impact and resource use of a product over its entire life cycle.
- Can be used **to assess a wide range of different environmental issues**.
- **LCA data** can be found **in an EPD** (*Environmental Product Declaration*) from a building product manufacturer.

LCA – Life Cycle Assessment - According to EN 15978

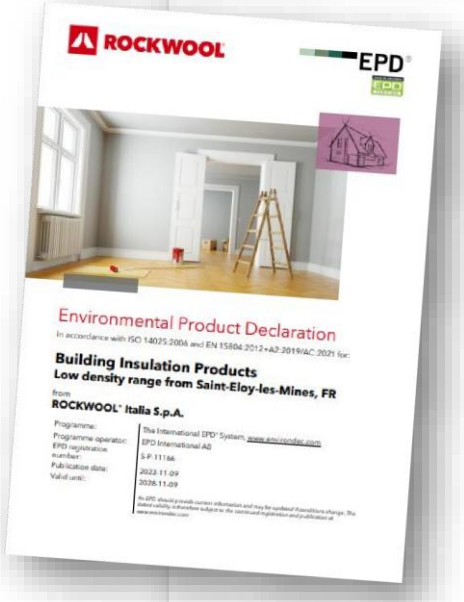


LCA – Life Cycle Assessment

The **calculation period** for an LCA **can vary** depending on which sustainability system you follow - in **Denmark**, the authorities default to a **50-year lifespan for a building** - then the building is demolished!



EPD - Environmental Product Declaration – environdec.com



EPD – Life Cycle Assessment

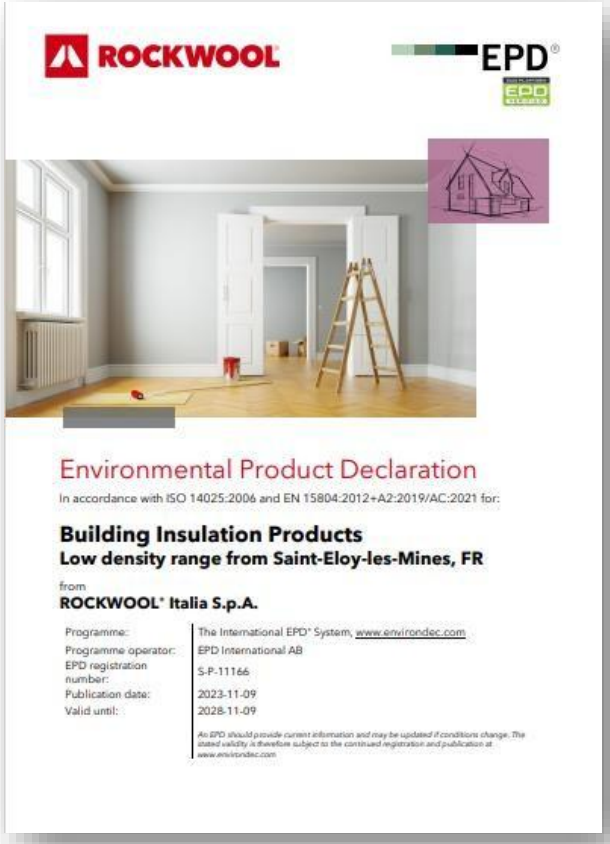
Some of the data from EPD:

GWP Global Warming Potential
Carbon footprint

ADP Abiotic Depletion Potential
reduction of access to raw materials such as metal, minerals, oil, gas etc.

ADP-minerals & metals are non-fossil resources

ADP-fossil are fossil resources

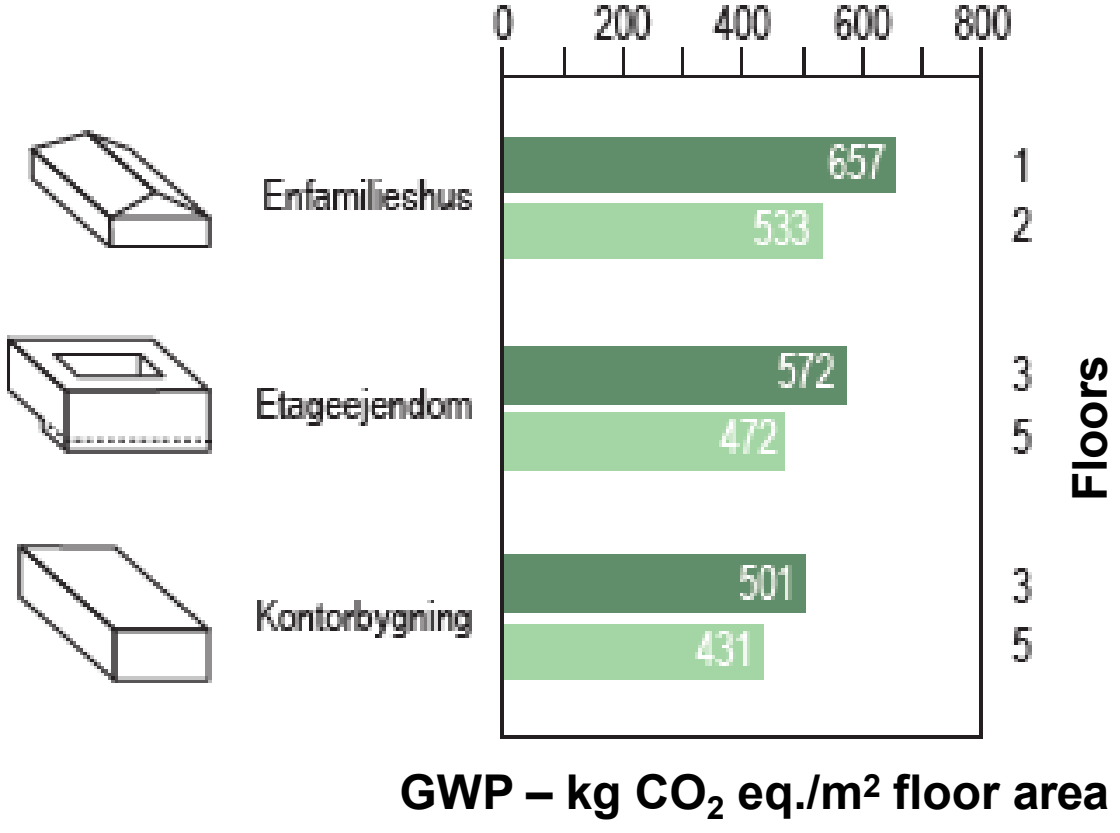


LCA – Climate Impact for Building Types

Single family house

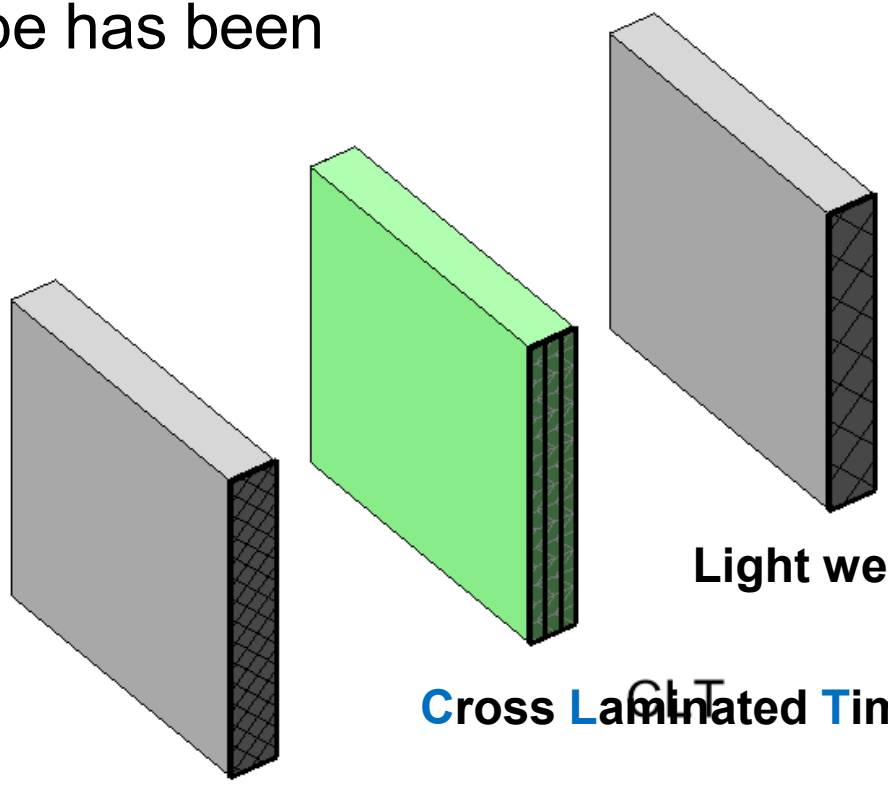
Apartment building

Office building



EPD – Climate Impact of Materials

1m² of each wall type has been selected.

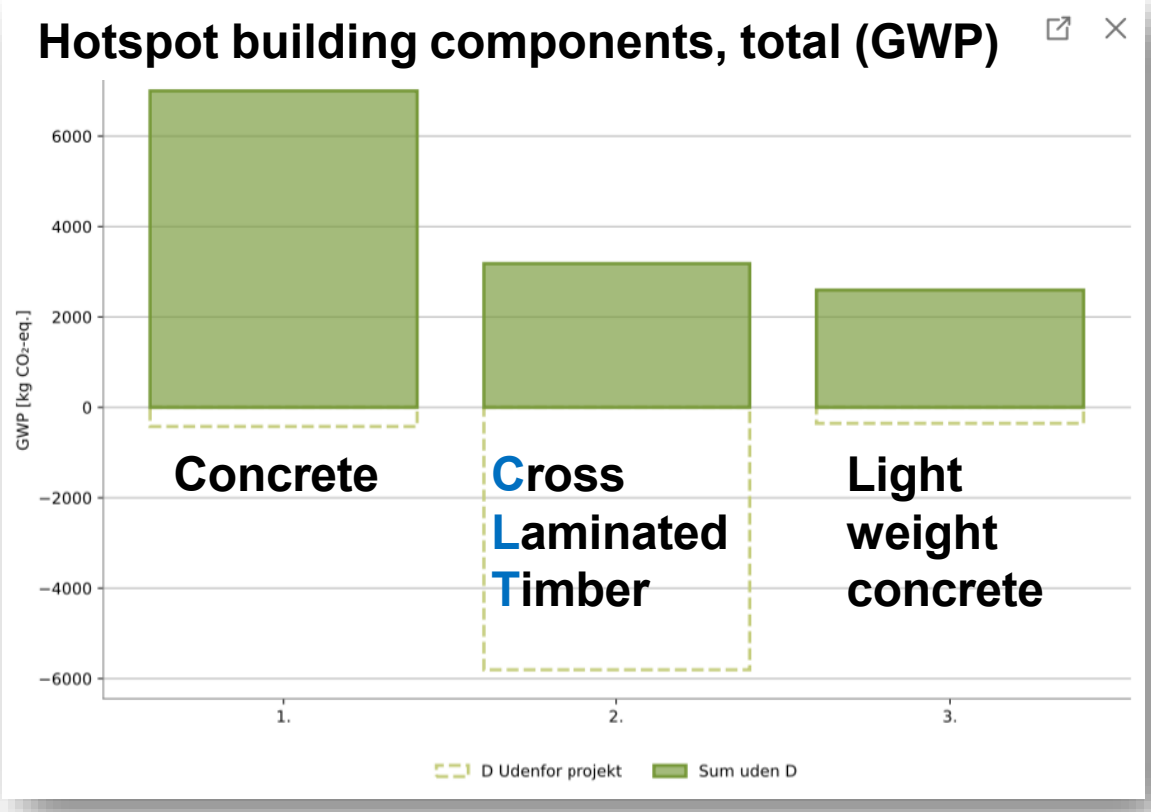


Concrete

Cross Laminated Timber

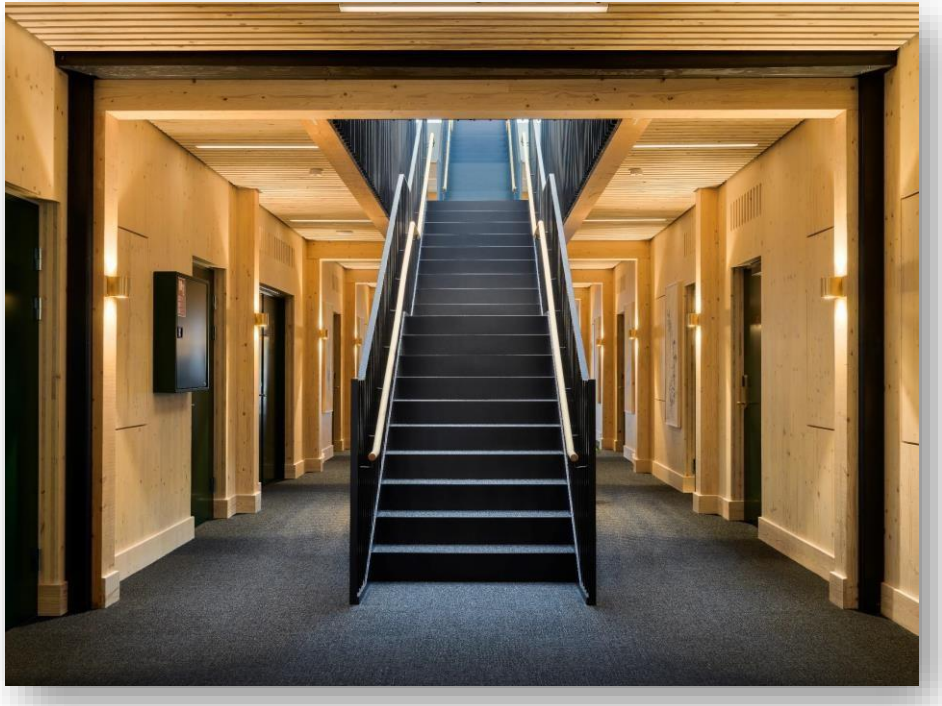
Light weight concrete

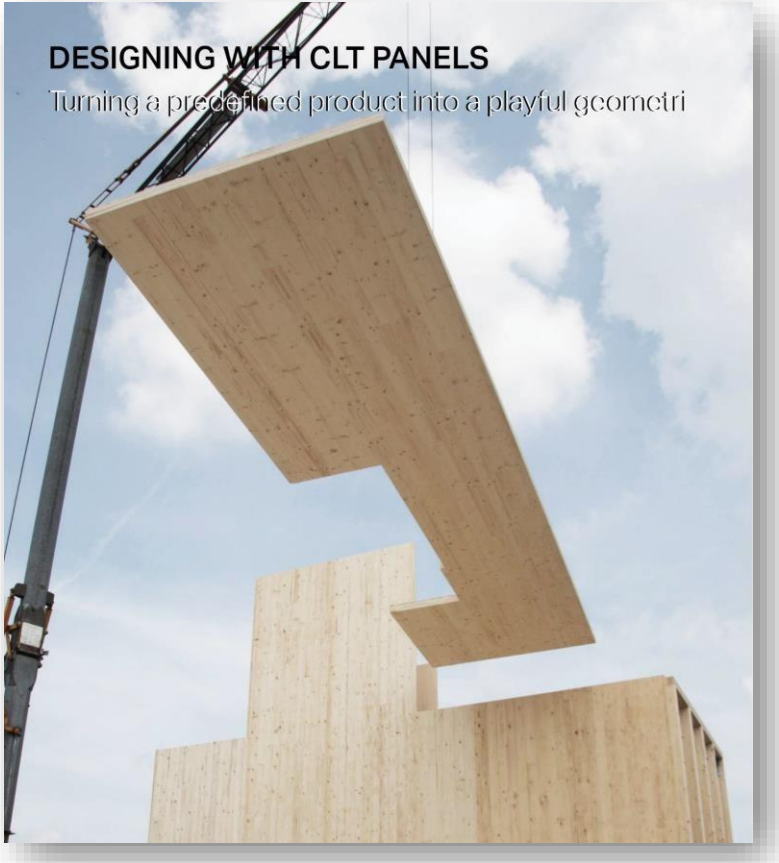
EPD – Climate Impact of Materials



CLT – Inner Leaf and support layer in Storey Partitions

Cross Laminated Timber





Wooden Facade Elements

traditional elements of wooden framework





Facades with Wood Cladding

Board Cladding



