



SUSTAINABILITY EXPERTS

BOLLAARSTRAAT IN LIER

BREEAM – MAT 01 : LCA STUDY

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INTRODUCTION

The new residential development will be located in Lier near the R16 ring road. The site consist of 3 building blocks A, B and C located on a common underground car park.

This report describes the study made during design stage to demonstrate compliance with the MAT01 – Life cycle assessment. The reference used for this purpose is the *BREEAM New Construction 2016 version 2.0 manual*.

Compliance is demonstrated using the approved LCA-tool, OneClick LCA. The 3 building blocks and underground car park has been coded

METHODOLOGY

LIFE CYCLE ASSESSMENT

A life cycle assessment (LCA) is a way to quantify the environmental impact of a “product” (in this case, a building) over its entire life cycle, from cradle to grave. Based on the inputs and outputs (inventory), the contribution to various environmental problems (such as global warming, ozone depletion, human toxicity, etc.) is quantified.



Figure 1 : principle of an LCA (source : One Click LCA)

The methodology of the analysis is detailed in ISO 14040 and ISO 14044. It consists of four steps:

1. Definition of the objectives and scope of the study
2. Inventory analysis
3. Impact assessment
4. Interpretation of results

SOFTWARE

The tool used for the life cycle analysis is One Click LCA.

It is an internationally recognized tool with which it is possible to measure the sustainability of a building component, system or complete building in an objective manner and according to a scientific methodology.

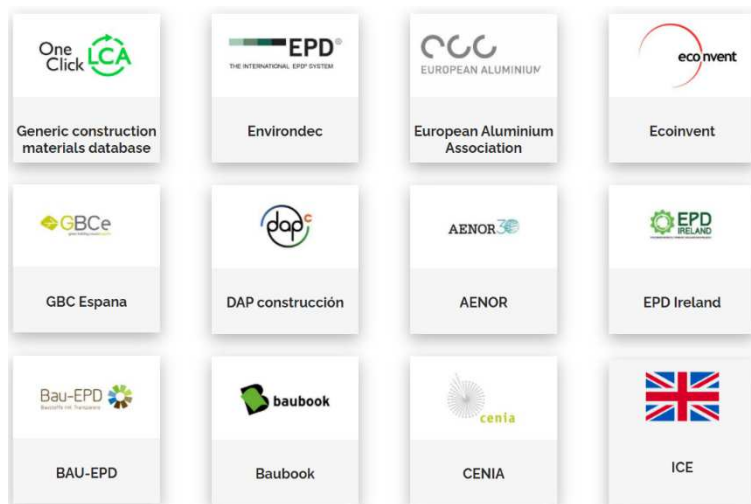
This software is based on the EN 15978 standard, in compliance with ISO 14040 and ISO 14044 and is BREEAM approved

Product Stage			Construction Process Stage		Use Stage							End-of-Life Stage				Benefits and loads beyond the system boundary		
Raw material supply	Transport	Manufacturing	Transport to building site	Installation into building	Use/application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D

Figure 2 : The considered stages of an LCA according to standard EN 15978 (source : One Click LCA)

DATABASE

Different databases were used to determine the environmental impact of each material.



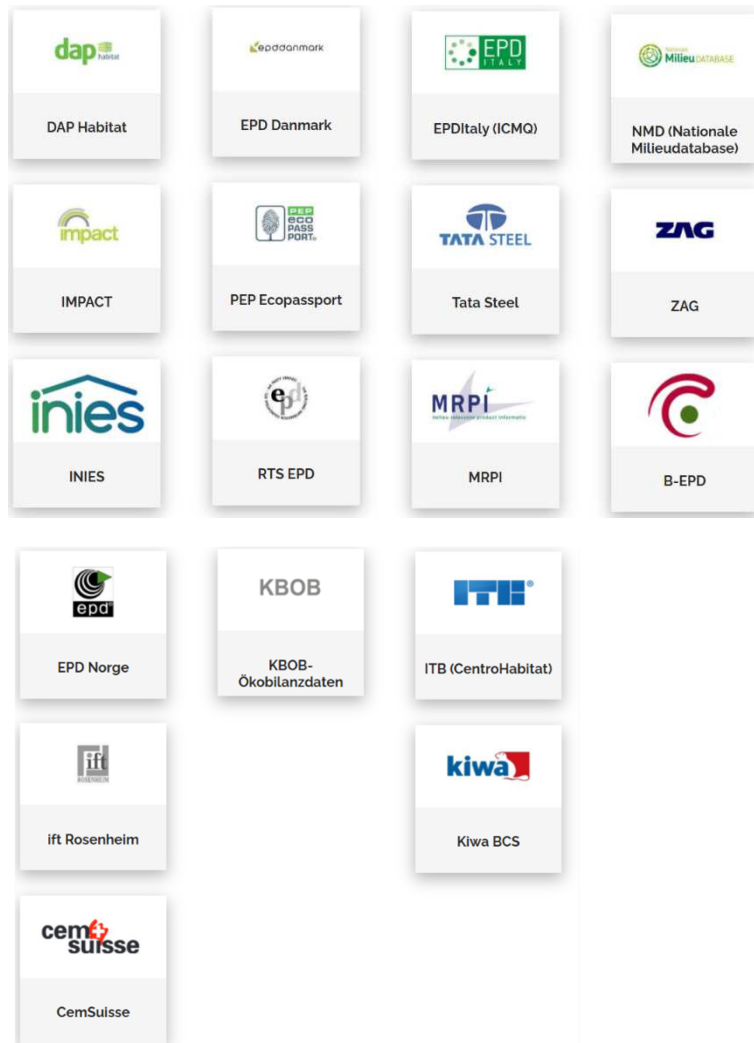


Figure 3 : Database for Europe (source : One Click LCA)

For several European suppliers of building materials, One Click LCA has detailed manufacturer data, which allows for very accurate calculation results. The EPD databases (International, Norway, Spain...) include detailed technical descriptions for many products and comply with EN 15804 and/or ISO 14025 standards. All European databases comply with EN 15804 standards and North American databases comply with ISO 14040/44 standards.

Most of the EPD's used for the project are:

- INIES (France)
- IBU (Germany, EU)
- EPD Norge (Norway)
- One Click LCA generic construction

In Belgium, there is not yet a complete database. For this reason, the method of regionalized data is used, according to CEN/TR 15941:2010, in order to adjust emissions and to correspond to the conditions of local manufacturers. This method has been validated by the BRE and is based on the robustness of the method which has given One Click LCA a 100% quality assessment for BREEAM International.

PERIOD OF THE STUDY

The LCA study covers a period of 60 years. Every material with a shorter lifespan will be replaced (some even several times) during the considered period.

CODED DATA

The LCA is based on the information received from the architect and the plans dated 23/12/2020.

1. Floor surface

The total floor surface of the project is 11323.62 m²

2. Energy Consumption

The total energy consumption is based on the EPB results of the 06/10/2021:

Total energy consumption (Electricity) is 25 322.92 kWh

3. Water consumption

The coded consumption is based on the results of the WAT01 calculator and is 7225.54 m³/y.

4. Construction materials

Three categories are defined in the MAT01 calculator:

a. Fabric

Following fabric categories are included in the LCA:

- External walls
- External windows and rooflights
- Internal floor finishes
- Structural frame
- Upper floors
- Ground floor
- Internal ceiling finishes
- Internal walls and partitions
- Roof
- Stairs and ramps
- Internal wall finishes

b. Building services

The building services are not included in this study.

c. Landscaping

The landscaping is not included in this study.

RESULTS

The total environmental impact of the building is **7,04 kg CO₂/m².y.**

The figure below shows the environmental impact of the building by life-cycle stage for each environmental indicator. The production stage (A1-A3) contributes the most to the total environmental impact followed by the end-of-life stage(C1-C4).

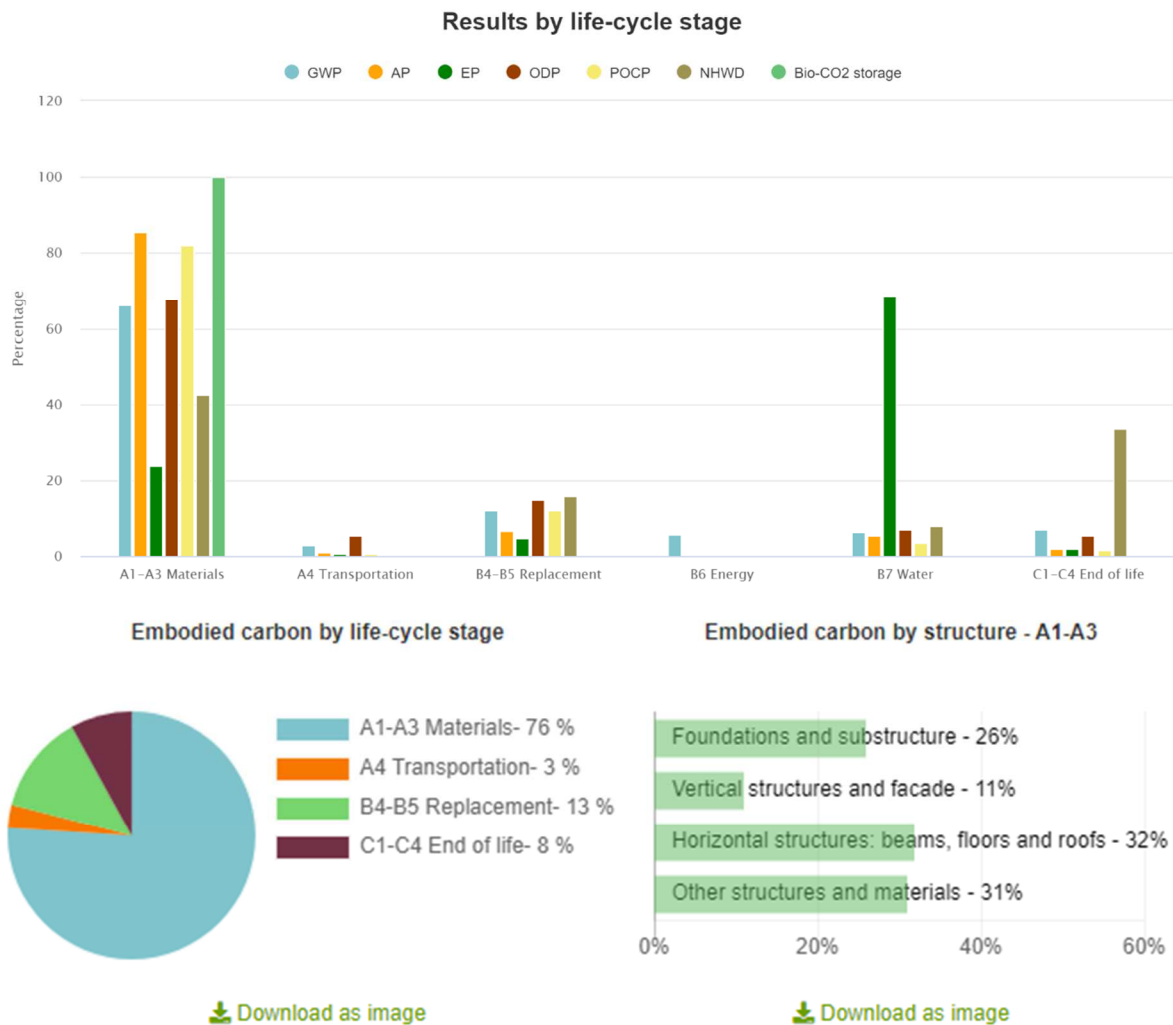


Figure 4: extract of One Click LCA showing the results by life-cycle stage

By looking to the materials in detail for the global warming potential, figure 5 below shows that the highest impacts are due to the foundations, retaining walls and basement with more than 31% of the impact. Then the biggest impact is the upper floors

Global warming kg CO2e - Classifications

- External walls (envelope, structure and finishes) - 7.6%
- External windows and rooflights - 16.4%
- Foundations (including excavation) - 8.3%
- Internal floor finishes (incl. access floors) - 10.3%
- Upper floors (including horizontal structure) - 29.1%
- Basements/retaining walls (including excavation) - 15.0%
- Stairs and ramps - 10.1%
- Total water consumption
- Electricity use
- Unclassified/other - 3.2%

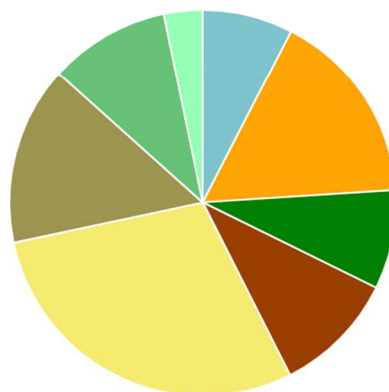


Figure 5: extract One Click LCA of impact on global warming potential

Bubble chart, total life-cycle impact by resource type and subtype, Global warming

Hover your mouse over legends or the chart to highlight impacts. Bubble minimum and maximum sizes constrained for readability

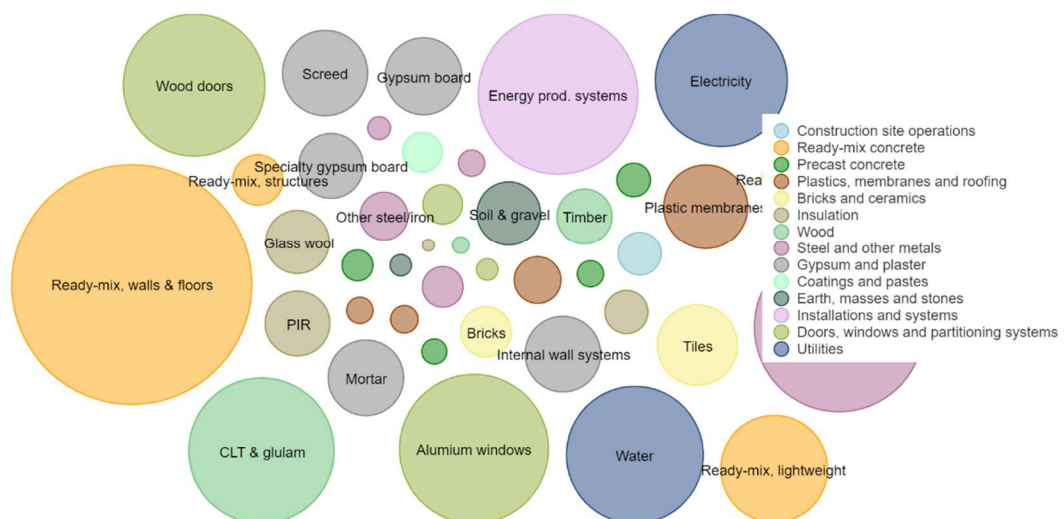


Figure 6: extract One Click LCA of impact resource type on global warming potential

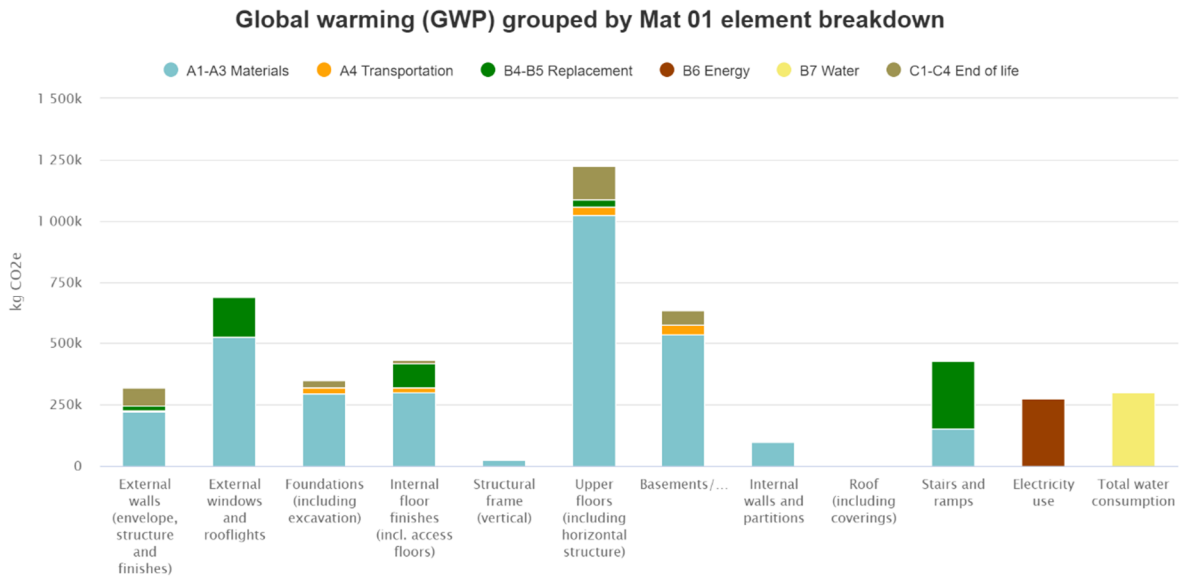


Figure 7: extract One Click LCA of total life-cycle impact on global warming potential by classification

Looking at the embodied carbon benchmark, the construction works are classified as being of level B.

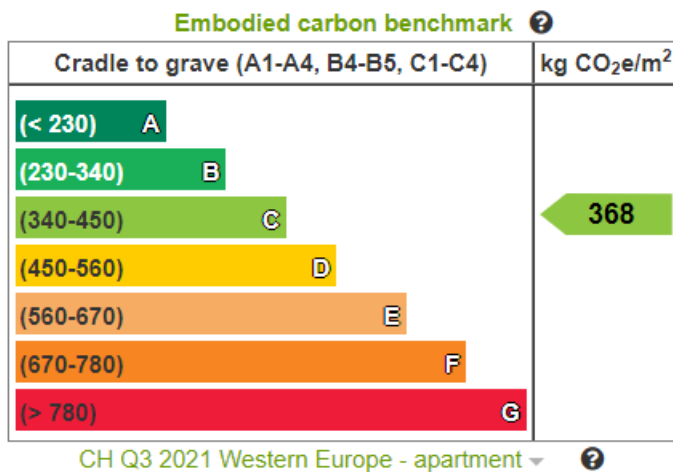


Figure 8: embodied carbon benchmark

To be able to have a view on the total impact of the building based on all the indicators, the social cost for every indicator, as defined in Totem¹, is calculated (See Figure 9). The total social cost of the new construction is **38,20 €/m²**. This is the cost for repairing the environmental damage caused by the construction of the building and its energy and water consumption for 60 years.

¹ TOTEM is the Belgian tool for analyse the environmental impact of buildings approved by the three regions.

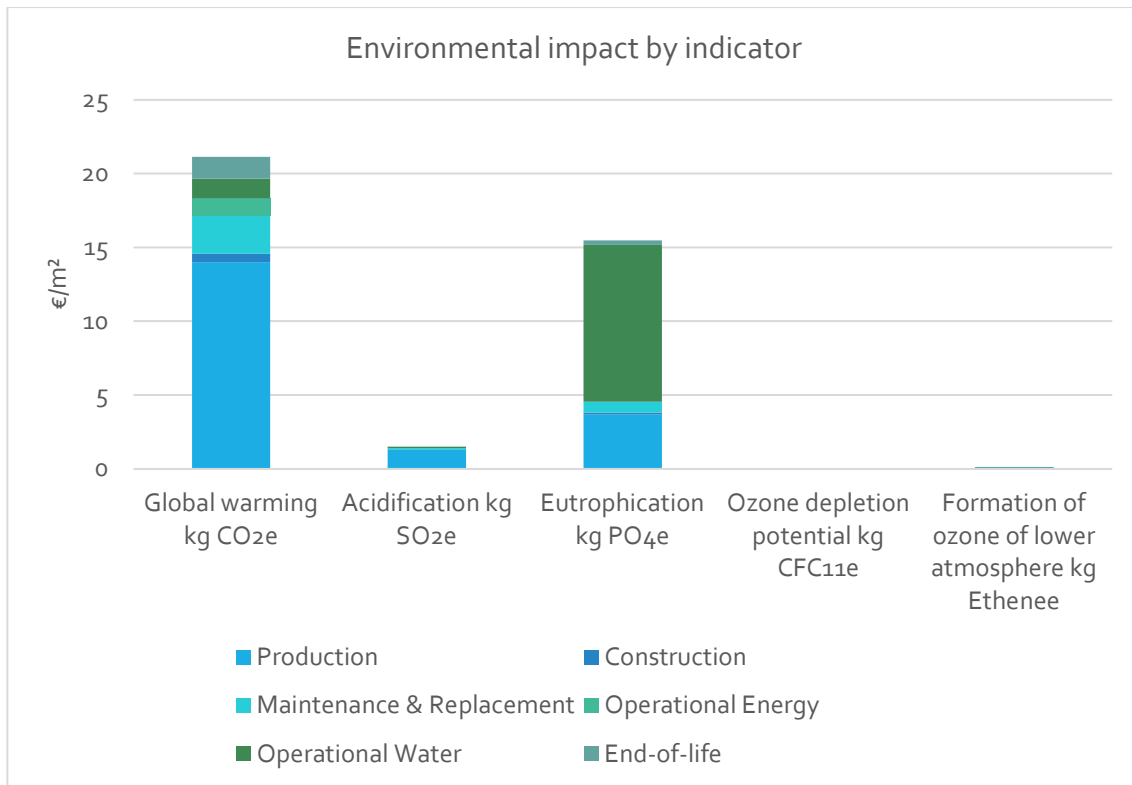


Figure 9: Social cost of every indicator by lifecycle stage

CONCLUSION

This report describes the study made for the Bollaarstraat project during design stage to demonstrate compliance with the MAT01 – Life cycle assessment. The reference used for this purpose is the BREEAM international New construction 2016 version 2.0 manual.

As explained above the works are coded in OneClick LCA. The total social cost of the building is 26.03 €/m². De global warming has the biggest impact, being **7.04 kg CO₂eq/m²y**.

By coding the above-mentioned data into the MAT01 calculator, 90.0 % of the MAT01 points are reached meaning **5 + 1 exemplary credit can be awarded**.

ANNEXE I – MAT₀₁ CALCULATOR

ANNEXE II – OUTPUT OF ONE CLICK LCA