

**Erasmus+ Project 2022-1-NO01-KA220-HED-000087893**

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**BIM-LCA Construction Project****Title: LCA applied to Elements in Construction. Granta and OneClick****1 – Aims**

The objectives of this LCA tutorial are as follows:

- Learning about the LCA.
- Knowing about several uses of LCA applied to construction.
- Efficiently organize the LCA in a BIM project.

**2 - Learning methodology**

The teacher will give an explanation about LCA of about 30 minutes.

Students will read this tutorial and follow the steps shown in the tutorial, namely:

- LCA overview
- Project information
- Project LCA Goals and LCA Uses
- LCA process and strategy
- LCA exchange protocol and submittal format
- Project deliverables
- Collaboration Procedures

In order to evaluate the success of the application, a questionnaire will be held for the students.

**3 - Tutorial duration**

The implementation described in this tutorial will be implemented through the BIMVET3 platform by self-learning.

4 lesson hours are suitable for this training.

## 4 – Necessary teaching recourses

Computer room with PCs with internet access.

Required software: GRANTA EduPack, OneClickLCA

## 5 – Contents & tutorial

### 5.1 – Introduction

To efficiently organize the LCA implementation process on a BIM project, the definition and design of the element should be addressed in first place. Therefore, the following items should be discussed:

- Element/part of the building to be analyzed.
- List of materials of the element.
- Lifetime of the element.
- Content of recycled materials.
- Potentially recycling materials.

### 5.2 – LCA short overview

#### 5.2.1. What is LCA.

The large focus on sustainability and transition to a low carbon society is making it necessary for more companies to have a proactive sustainability strategy. For large companies, this task can be managed by separate directors, departments, and staff. The use of quantitative reporting of climate performance has increased in the later years and are moving from market based voluntary requirement to regulatory requirements. For instance, environmental product declarations (EPD) have been available since the mid-1990s and are based on life cycle assessment (LCA). LCA is a methodology for assessing environmental impacts associated with all the stages of the life cycle of a commercial product, process, or service. LCA aims to identify, quantify, check, and evaluate information in terms of environmental indicators. The outcome of the interpretation phase is a set of conclusions and recommendations for the study.

#### 5.2.2. Major LCA Goals / Objectives

To create an effective LCA, it is very important to consider the benefits that the report can bring to the project and define the goals we aim to achieve on this basis. This information can be used in two different ways:

1. LCA shows the energy and carbon footprint of an element or product. Therefore, this information is the basis for the elaboration of EPDs.

2. The report also shows the difference between the phases of the LCA. The identification of the most contaminating phase is helpful to design the strategies to efficiently decrease the environmental impact of the product.

### 5.2.3. EPDs

EPDs is a transparent strategy to report the commitment to measuring and reducing the environmental impact of a product or service. The environmental performance of the product shall be described from a life cycle perspective by carrying out a life cycle assessment of the product. The results of the LCA study and other information mandated by the reference shall be compiled in the EPD reporting format. The EPD shall then be verified by an approved independent verifier before being registered and published at the International EPD System.

The International EPD<sup>®</sup> System is a global programme for Environmental Declarations. Environmental Product Declarations present transparent, verified, and comparable information about the life-cycle environmental impact of products and services.

The main challenges in creating EPDs are the diversity of range of the product category rules, complexity and inconsistencies in databases, lac of satisfactory and acceptable third-party critical review, financial constraints and incomplete formation and interpretation of results.

Focusing in the Construction and Building Technologies, the International Green Construction Code (IgCC) is a model to include sustainability measurements for an entire construction project and its site. As an overlay code, it establishes minimum green requirements for buildings by exceeding the companion classical ICC model codes in the areas of energy efficiency, water usage and waste reduction, as well as focusing attention on health, safety, and community welfare.

Green buildings necessarily require careful product and material selection criteria. Understanding a product's environmental footprint increasingly considers all attributes across all of the phases of a product's life, including parameters such as energy consumption during manufacturing, waste impacts during installation and the product's maintenance requirements. And this approach, importantly, considers potential energy savings the product may offer during the long "use" phase as well as outcomes at its end of life disposition. The International Organization for Standardization, called ISO standards, explains how to apply these multi-attribute, life cycle approaches.

While ISO offers standards and guidance that help companies conduct life cycle assessments of their products, ISO standards can do even more than that. For companies that choose to develop an Environmental Product Declaration (EPD) under the ISO 14025 standard, the first step before an EPD is written (in general) is for an industry group to develop and establish a set of Product Category Rules (PCRs) for doing EPDs that contain LCAs. A PCR is a pre-requisite for conducting an EPD – this is covered in the ISO 14025 standard. The standard Product Category Rules (PCRs) are standardized rules for collection and reporting of environmentally-relevant information in an entire

product category (like insulation or pipe). Within these rules, a company can better develop an ISO-compliant Life Cycle Assessment (LCA) on its product, which measures the product's impact upon the environment across multiple attributes throughout its life cycle. Then, a company can prepare a report called an Environmental Product Declaration (EPD) if they so choose, following the rules set out in this ISO 14025 standard.

EPDs are becoming more available and are increasingly being used to address a growing market demand for quantified environmental information. EPDs make decisions and judgments more informed and more defensible for code officials making an approval determination.

Including EPDs in the model code gives builders more compliance options and more choices. The IgCC still includes single attribute materials and resources compliance pathways, EPDs would provide additional compliance choices to builders.

EPDs report environmental impacts over the lifespan of a product, so they function as a useful tool to support product evaluation. They do not require builders to select any particular product, since they are not comparative by nature. The cost of developing EPDs is borne by product manufacturers and does not fall upon builders.

One of the virtues of an EPD is that it provides information about energy use/savings delivered by the product during its use phase. Given that many buildings are constructed with a 100 year life span, and that energy consumption in buildings is a huge part of their environmental footprint, inclusion of this attribute is highly valuable to an accurate understanding of a product's full environmental footprint.

Consumers and businesses increasingly recognize the value of products that lower their monthly energy bills and lighten their home's environmental footprint not only on the day they move in but for the period of their occupancy and beyond.

EPDs are not a comparable claim of superiority – and are by their nature product and material neutral, since every company that wants to prepare an EPD has to use the same standards and rules for collecting and reporting information.

#### 5.2.4. LCA and BIM. A synergetic collaboration.

In the later years, EPD and carbon footprint of building materials has been introduced as building code requirement in countries such as Netherlands, Sweden, Denmark, Finland, France, and Norway. In regulation terms, the European Commission has a new directive on sustainability reporting of corporations, including requirements for indicators on climate performance according to Paris Agreement.

Currently, LCA for whole buildings is an exhaustive work due to the repetition of parameters extracted from BIM. Additionally, the complexity of LCA tools is another reason that keeps professionals away from the LCA in construction. Therefore, the integration of LCA in tools in BIM software will lead to an integral vision of the Civil Engineering with commitment to the environment.



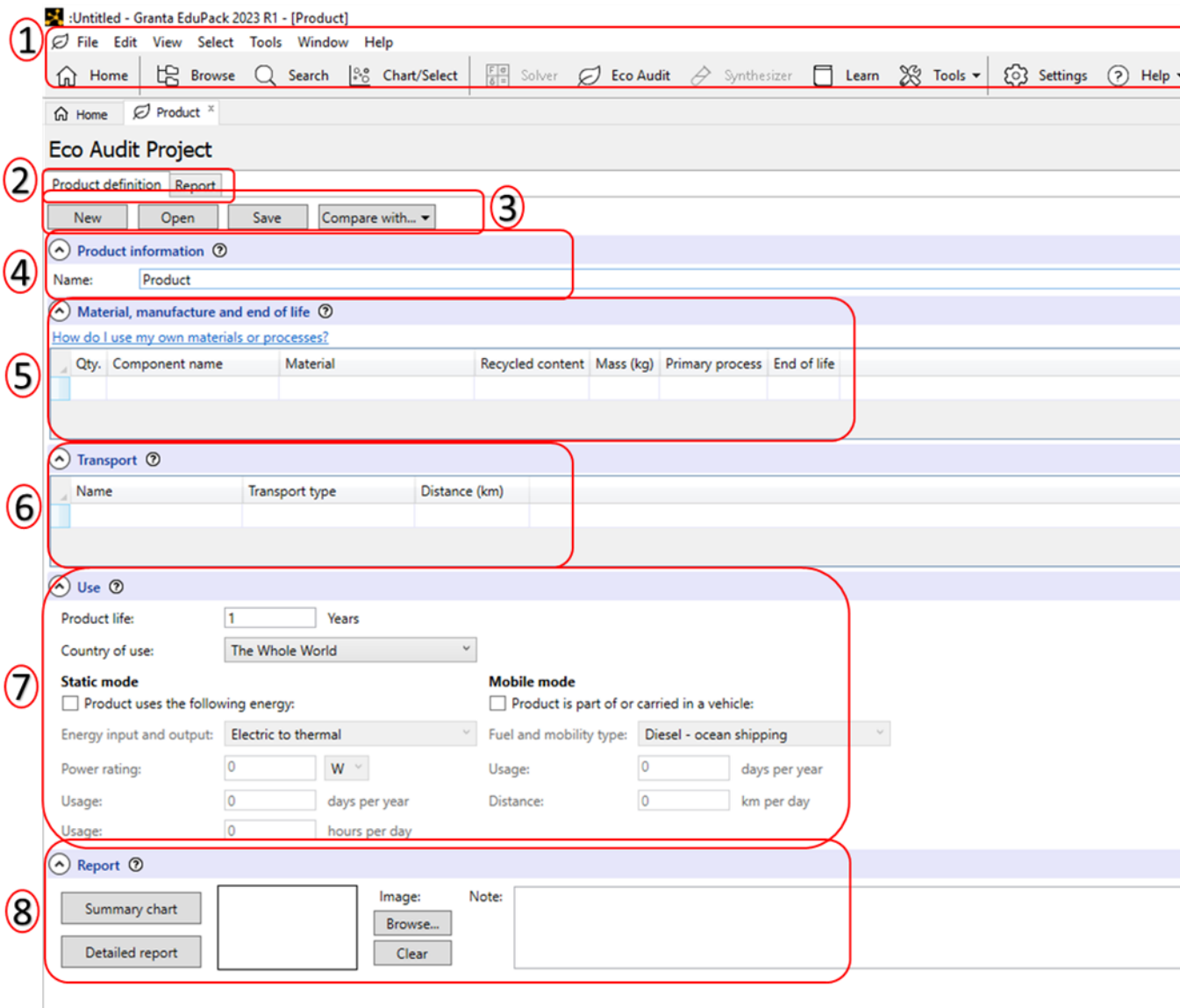
### 5.3. GRANTA EduPack. Eco Audit Tool.

Ansys Granta EduPack—formerly CES EduPack—is a unique set of teaching resources that help academics enhance courses related to materials across engineering, design, science and sustainable development.

The Granta EduPack Eco Audit Tool enables the first part of a two-part strategy for selecting materials for eco-aware product design. The second part of the strategy is implemented through the Granta EduPack selection software. The Eco Audit Tool draws on the same database of material and process properties as Granta EduPack, ensuring consistency. The approach described provides an excellent basis for teaching students key eco design concepts.

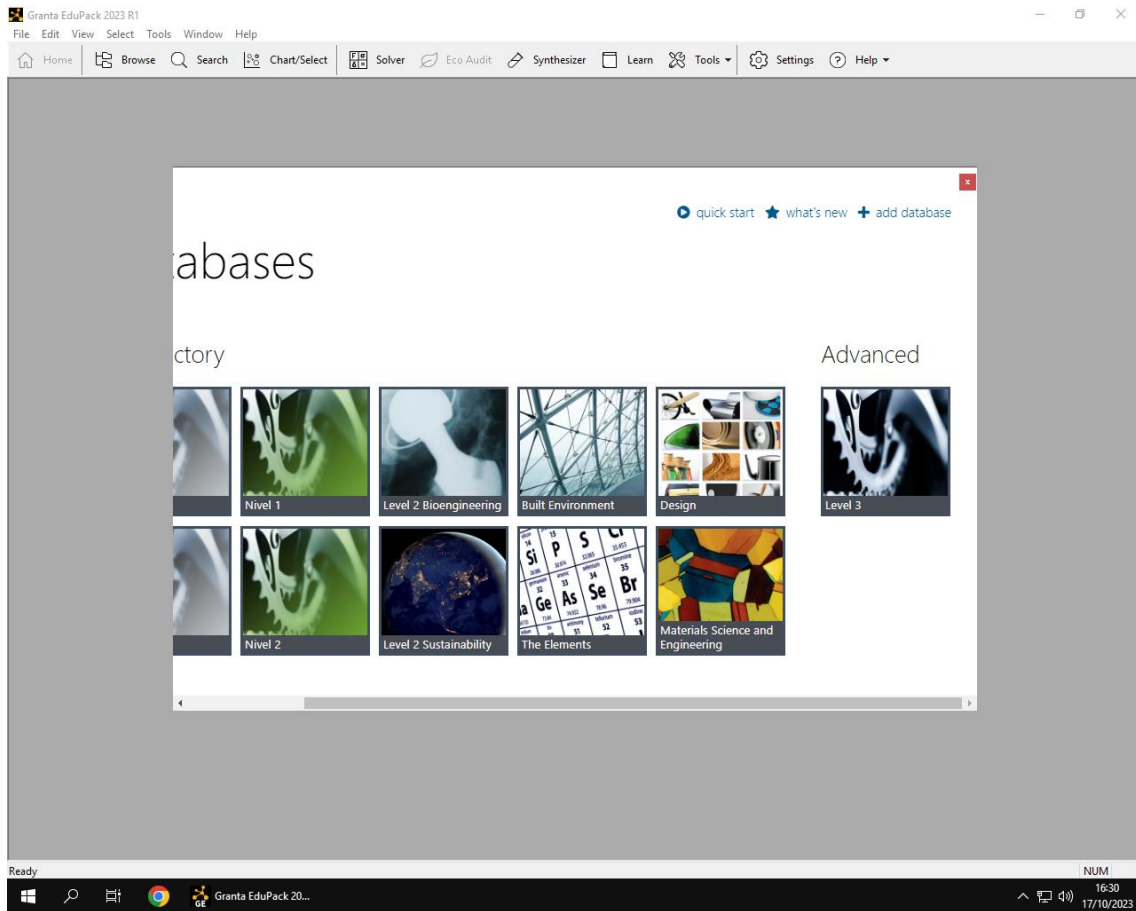
#### 5.3.1. EcoAudit Tool Interface.

1. Tabs.
2. Navigation bar.
3. Project Browser.
4. Panel for product/element information.
5. Panel for material information (type, recycled fraction, manufacturing, mass and end of life).
6. Panel for transport information.
7. Panel for use information (static or mobile mode).
8. Panel for report.

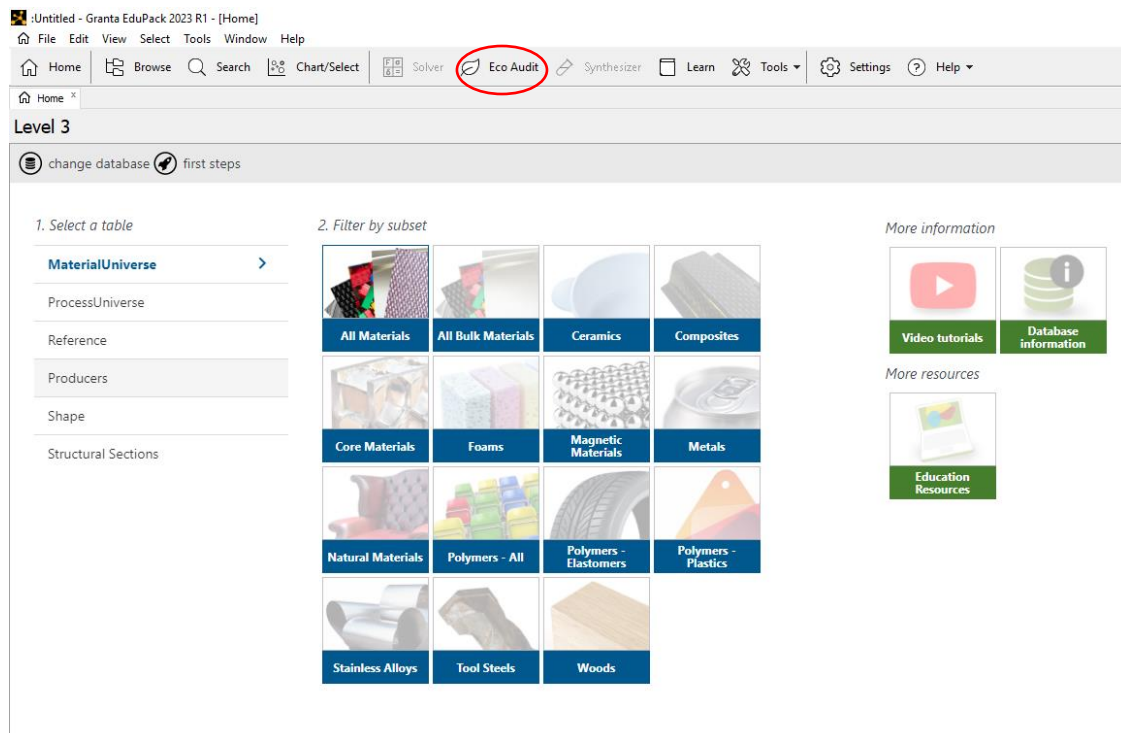


### 5.3.2 – Starting a project with EcoAudit.

After opening the program, different libraries are open. Eco Audit Tool is available in Levels 2 and 3, but it is highly recommended to use Level 3 (Advanced) for a better understanding and accuracy of data.

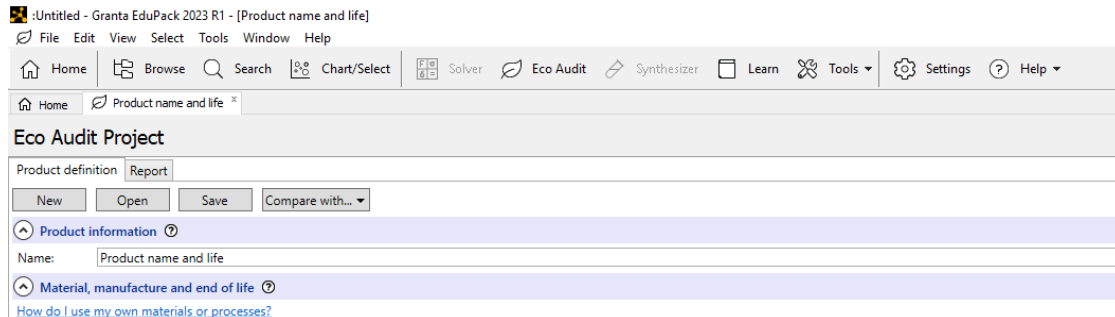


When the library is open, the tool Eco Audit will appear in the navigation bar.



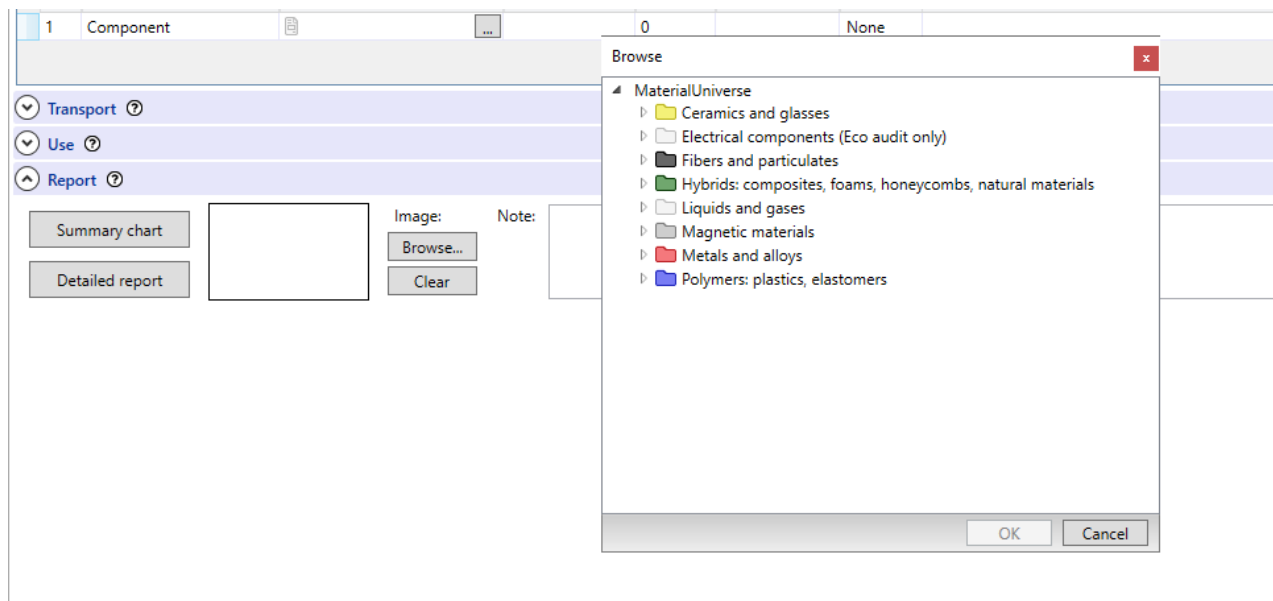
After Eco Audit Tool is open, we can start to introduce the data of our project. We can divide the project into five different actions.

### Action 1. Enter product name and life.



**Action 2.** Enter component name. Select material and process. Enter mass and end of life.

1. After entering the name of our component, it is necessary to select the material from the data base. A browser is open, and we can select the material from the Material Universe Library. In Level 3 a quite detailed library, containing more than 4000 entries, is available.



2. Once the material is selected, we can add the recycled content. We can select three options (virgin, typical or reused) but it is also possible to add a specific quantity.
3. An easy, but critical point is to add the mass of the material.
4. Then the manufacturing process must be selected. The different options are the most common fabrication processes for the selected material. However, it is also possible to add a custom process.



Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Component	Coated steel, stainless...	Virgin (0%)	1		Downcycle

Image: 
 Note:

Transport ?  
 Use ?  
 Report ?

Casting  
 Roll forming  
 Forging  
 Extrusion, foil rolling  
 Wire drawing  
 Metal powder forming  
 Vaporization  
 Add custom process...

5. Finally, the End of Life is defined from a list of the possibilities for these specific materials.

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Component	Coated steel, stainless...	Virgin (0%)	1	Forging	Downcycle

Image: 
 Note:

Transport ?  
 Use ?  
 Report ?

Downcycle  
 Recycle  
 Re-manufacture  
 Reuse  
 None

After all the information about one of the components is added, we can add as much materials or components as we need to. At the end, we introduce a list of materials with the manufacturing, mass and end of life.

**Action 3.** Enter transport.


Select transport mode from the browser and enter distance. We can add as much transport as necessary.

Transport ?		
Name	Transport type	Distance (km)
1	Train, diesel	5000
2	▼	0

Use ?  
Report ?

Aircraft, all types (cooled)  
 Aircraft, all types (frozen)  
 Aircraft, long haul belly-freight  
 Aircraft, long haul dedicated-freight  
 Aircraft, medium haul, belly-freight  
 Aircraft, medium haul, dedicated-freight  
 Aircraft, short haul, belly-freight  
 Aircraft, short haul, dedicated freight  
 Aircraft, very short haul, belly-freight  
 Aircraft, very short haul, dedicated freight  
 -----  
 Train, diesel  
 Train, electricity  
 Train, all fuels (cooled)  
 Train, all fuels (frozen)  
 -----  
 Light commercial vehicle

**Action 4.** Enter product life. Select static mode if product does not move (energy in and out, power and usage). Select mobile mode if product moves (select fuel and type of mobility).

 :Untitled - Granta EduPack 2023 R1 - [Product name and life]

File Edit View Select Tools Window Help

Home Browse Search Chart/Select Solver Eco Audit Synthesizer Learn

Home Product name and life

### Eco Audit Project

Product definition Report

New Open Save Compare with...

**Product information**

Name: Product name and life

**Material, manufacture and end of life**

[How do I use my own materials or processes?](#)

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Component	Coated steel, stainless...	25,0%	1	Forging	Re-manufacture

**Transport**

Name	Transport type	Distance (km)
Transport 1	Train, diesel	5000
Transport 2	Small truck (refrigerated),	250

**Use**

Product life: 1 Years

Country of use: The Whole World

**Static mode**

Product uses the following

Energy input and output:

Power rating:

Usage:

Usage:

**Mobile mode**

Product is part of or carried in a vehicle:

Fuel and mobility type: Diesel - ocean shipping

Usage: 0 days per year

Distance: 0 km per day

**Report**

Summary chart

Detailed report

Note:

The power supply changes from one region to other. Therefore, we need to select the country of use.

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File Edit View Select Tools Window Help

Home Browse Search Chart/Select Solver Eco Audit Synthesizer Learn

Home Product name and life

## Eco Audit Project

Product definition Report

New Open Save Compare with...

Product information

Name: Product name and life

Material, manufacture and end of life

[How do I use my own materials or processes?](#)

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Component	Coated steel, stainless...	25,0%	1	Forging	Re-manufacture

Transport

Name	Transport type	Distance (km)
Transport 1	Train, diesel	5000
Transport 2	Small truck (refrigerated), I	250

Use

Product life: 1 Years

Country of use: Europe

**Static mode**  
 Product uses the following energy:

**Mobile mode**  
 Product is part of or carried in a vehicle:

Energy input and output: Electric to thermal

Fuel and mobility type: Diesel - ocean shipping

Power rating: Electric to thermal

Usage: Electric to mechanical (electric motors)

Usage: Electric to chemical (lead acid battery)

Usage: Electric to chemical (advanced battery)

Usage: Electric to em radiation (incandescent lamp)

Usage: Electric to em radiation (LED)

Report

Summary chart

Detailed report

- Fossil fuel to thermal, enclosed system
- Fossil fuel to thermal, vented system
- Fossil fuel to electric
- Fossil fuel to mechanical, internal combustion
- Fossil fuel to mechanical, steam turbine
- Fossil fuel to mechanical, gas turbine

In the static mode (the product does not move), we select the energy input and output. For example, a heater is electric to thermal.

:Untitled - Granta EduPack 2023 R1 - [Product name and life]

File Edit View Select Tools Window Help

Home Browse Search Chart/Select Solver Eco Audit Synthesizer Learn Tools Settings Help

Home Product name and life

### Eco Audit Project

Product definition Report

New Open Save Compare with...

Product information

Name: Product name and life

Material, manufacture and end of life

[How do I use my own materials or processes?](#)

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Component	Coated steel, stainless...	25,0%	1	Forging	Re-manufacture

Transport

Name	Transport type	Distance (km)
Transport 1	Train, diesel	5000
Transport 2	Small truck (refrigerated), 1	250

Use

Product life: 1 Years

Country of use: Europe

**Static mode**  
 Product uses the following energy:

Energy input and output: Fossil fuel to thermal, vented system

Power rating: 120 W

Usage: 5 days per year

Usage: 12 hours per day

**Mobile mode**  
 Product is part of or carried in a vehicle:

Fuel and mobility type: Diesel - ocean shipping

Usage: 0 days per year

Distance: 0 km per day

Report

Summary chart

Detailed report

Image: Note:

Browse...

Clear

After the selection of the input/output of energy, the power and time of usage should be selected.

:Untitled - Granta EduPack 2023 R1 - [Product name and life]

File Edit View Select Tools Window Help

Home Browse Search Chart/Select Solver Eco Audit Synthesizer Learn Tools

Home Product name and life

### Eco Audit Project

Product definition Report

New Open Save Compare with...

Product information

Name: Product name and life

Material, manufacture and end of life

[How do I use my own materials or processes?](#)

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Component	Coated steel, stainless...	25,0%	1	Forging	Re-manufacture

Transport

Name	Transport type	Distance (km)
Transport 1	Train, diesel	5000
Transport 2	Small truck (refrigerated), l	250

Use

Product life: 1 Years

Country of use: Europe

**Static mode**

Product uses the following energy:

Energy input and output: Fossil fuel to thermal, vented system

Power rating: 120 W

Usage: 5 days per year

Usage: 12 hours per day

**Mobile mode**

Product is part of or carried in a vehicle:

Fuel and mobility type: Diesel - ocean shipping

Usage: Diesel - ocean shipping

Distance: Diesel - coastal shipping

Diesel - rail

Diesel - barge

Diesel - 55 tonne (8 axle) truck

**Diesel - 40 tonne (6 axle) truck**

Diesel - 32 tonne (4 axle) truck

Diesel - 26 tonne (3 axle) truck

Diesel - 14 tonne (2 axle) truck

Diesel - light goods vehicle

Diesel - family car

-----

Electric - family car

Electric - rail

Report

Summary chart

Detailed report

Image: Note:

Browse...

Clear

If the product moves, we have to select the mobile mode and then the fuel and mobility type should be selected from a browser.

:Untitled - Granta EduPack 2023 R1 - [Product name and life]  
File Edit View Select Tools Window Help

Home Browse Search Chart/Select Solver Eco Audit Synthesizer Learn Tools Settings Help

Home Product name and life x

### Eco Audit Project

Product definition Report

New Open Save Compare with...

Product information

Name: Product name and life

Material, manufacture and end of life

How do I use my own materials or processes?

Qty.	Component name	Material	Recycled content	Mass (kg)	Primary process	End of life
1	Component	Coated steel, stainless...	25,0%	1	Forging	Re-manufacture

Transport

Name	Transport type	Distance (km)
Transport 1	Train, diesel	5000
Transport 2	Small truck (refrigerated),	250

Use

Product life: 1 Years  
Country of use: Europe

**Static mode**  
 Product uses the following energy:  
Energy input and output: Fossil fuel to thermal, vented system  
Power rating: 120 W  
Usage: 5 days per year  
Usage: 12 hours per day

**Mobile mode**  
 Product is part of or carried in a vehicle:  
Fuel and mobility type: Diesel - 40 tonne (6 axle) truck  
Usage: 5 days per year  
Distance: 20 km per day

Report

Summary chart Detailed report Image: Note: Browse... Clear

Finally, we select the usage and distance.

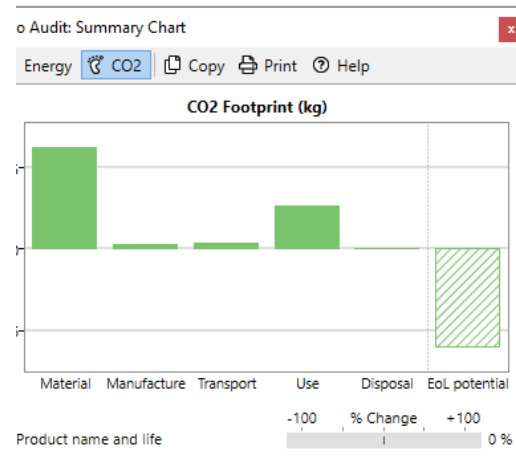
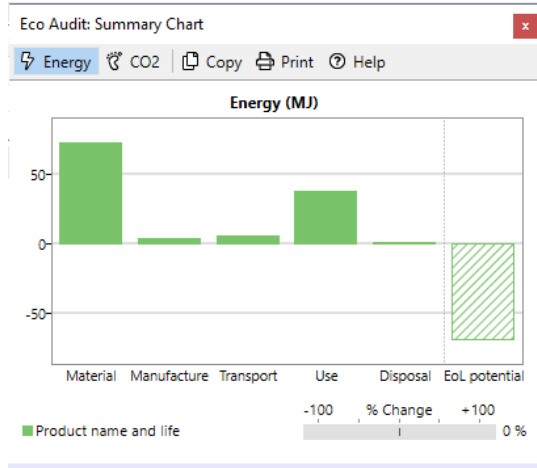
Action 5. Enter notes and images. The software allows the insertion of notes and images in the report.

Report

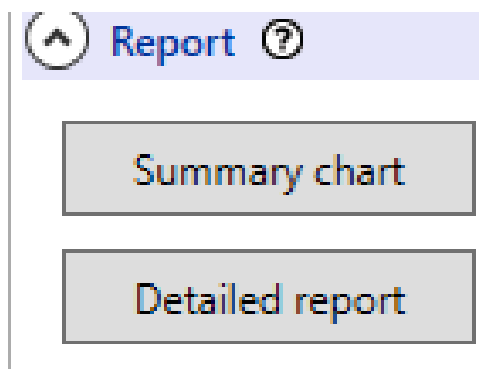
Summary chart Detailed report Image: Note: Add notes. Browse... Clear

Action 6. Summary Chart.

This option is a quick evaluation of the LCA. A chart of either energy or carbon footprint appears. These charts are useful to check if there is any information missing and which are the phases of the LCA with more and less impact.



Finally, press “Detailed report”.



#### 5.4. OneClick LCA.

OneClick LCA is a tool to assess and manage the sustainability of Buildings and Construction projects. It contributes to the reduction of the environmental impacts and to the development of greener edification. This tool assists to the design of low carbon footprint projects and acquire certifications. The inventory of this tool integrates data from available EDPs platforms, following EN 15804 and ISO 14025 standards.

##### 5.4.1. Oneclick LCA interface.

The following figure is a main menu of the software, which includes both own projects and demos.



OneClick LCA Licences - Help - Manuel Vinke Meulmeester -

Academy 11th-15th Septemb... Construction LCA Bootcamp Learn how to deliver LCAs for construction projects

Survey Carbon Experts Survey 2023 Raise your voice. Take survey now to cut carbon in construction

Education August 2023 Ecodesign in practice The role of insulation in whole-life carbon optimisation

Public demo Search All projects (21) Date created ↓ + Add

Your projects 2 Public demo 21

Name	Type	Country	Size m <sup>2</sup>	GWP	Certifications	Users	Desl... or pe...	Date created ↓
Academy - Bootcamp 2023 - Steel co...	Product	Finland				3	1	12 Sep 2022
EU - Full Building Life Cycle Carbon ...	Office building	Ireland	12430	E 762 kg CO <sub>2</sub> e/m <sup>2</sup>		1	1	27 Sep 2021
FR - Env RE2020 logement collectif	Apartment building	France	4000	C 690 kg CO <sub>2</sub> e/m <sup>2</sup>	RE 2020	4	2	23 Sep 2021
UK - GLA Office	Office building	United Kingdom	7570	B 507 kg CO <sub>2</sub> e/m <sup>2</sup>		1	3	31 Aug 2021
FR - Energie Carbone bâtiment résid...	Free-time residential building	France	3500	C 533 kg CO <sub>2</sub> e/m <sup>2</sup>		2	2	08 Mar 2021
SG - LEED v4-1 Office	Office building	Singapore	7000	A 180 kg CO <sub>2</sub> e/m <sup>2</sup>		1	3	26 Jun 2018
NO - NS3720 and BREEAM NOR	Office building	Norway	3778	A 288 kg CO <sub>2</sub> e/m <sup>2</sup>	BREEAM	1	2	26 Jun 2018

#### 5.4.2. Starting a project with OneClick LCA.

To start a project with OneClick LCA, we have to select “Your Projects” and add “Building”. Then, the software requires the tool which depends on the license. In our case we select Life-cycle assessment, EN-15978.

OneClick LCA Licences - Help - Manuel Vinke Meulmeester -

Academy 11th-15th Septemb... Construction LCA Bootcamp Learn how to deliver LCAs for construction projects

Survey Carbon Experts Survey 2023 Raise your voice. Take survey now to cut carbon in construction

Education August 2023 Ecodesign in practice The role of insulation in whole-life carbon optimisation

Your projects Search All projects (2) Date created ↓ + Add

Your projects 2 Public demo 21

Name	Type	Country	Size m <sup>2</sup>	GWP
TFG	Attached or row house	Spain	210	
VERDE 2020 Project	Apartment building	Spain	500	E 842 kg CO <sub>2</sub> e/m <sup>2</sup>

- Building [Learn more](#)
- Product [Learn more](#)
- Organization [Learn more](#)
- Portfolio
- Infrastructure [Learn more](#)
- Planetary (Free upfront carbon tool)
- Folder You need to create a company account. [Learn more](#)

One Click LCA © copyright One Click LCA LTD | Version: 1.10.0



## Available calculation tools - [Get more tools](#)

✕

Tools available in applied licences

- Life-cycle assessment, EN-15978** Building life-cycle assessment according to the European Standard EN 15978. This LCA software covers [See all](#)
- Building Circularity** Material efficiency and circular economy - for BREEAM MAT 06 and GRI G4 reporting as well as other p [See all](#)

Toggle all

Next

After adding the new building, a series of data should be included regarding the basic information of the project: license number, name of the project, type of building and country. Then, we have to choose the type of building closer to our design.

### New project

1

Basic information

2


Optional informa...

Link project to the following license [Enter license key](#)

One Click LCA Student (International) Busines... ✕ ▼

Name (mandatory)

TFG

Folder 

Main Page (create or join a company account to ... ▼)

Type (mandatory)

If the building has several types, choose the most suitable.

Select ▼

Country (mandatory)

Spain ▼

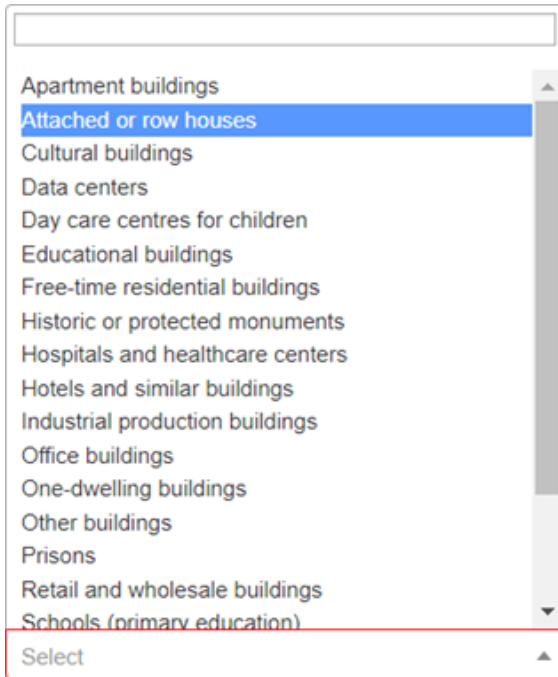
Address

Cancel

Back

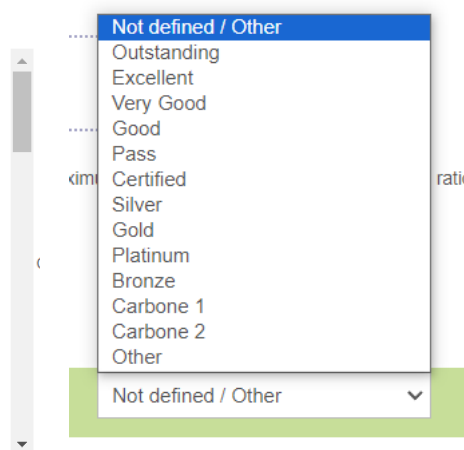
Next

Please provide at least the information highlighted as mandatory to proceed.



New Project – optional information. In this section recommended, but not compulsory, information shall be added, such as: surface, number of floors, structure, images and the final certification to be acquired. In our case, the certification is BREEAM ES Vivienda 2020, which is a methodology to assess the sustainability of edification.


Certifications pursued




**Design.**

From now on, we will add the data of our design: name, description, phase of the project, type of project (new construction, refurbishment, etc.), structure and parts of the design.

Main > TFG Users (1) More actions ▾

 TFG

> General information

 Create at least one design to start calculations. Click Get Started to continue.

▾ Design phase: 0 designs Choose calculation tools and set up calculations [Get started](#)

## Create a design

### Name, design stage and calculation tools

Name <sup>?</sup>

Additional information (e.g. description in portfolio)

Stage of construction process (RIBA / AIA stages) <sup>?</sup>

Life-cycle assessment, EN-15978

### Scope and type of analysis

Project type <sup>?</sup>

Frame type <sup>?</sup>

Included parts. Check all applicable. <sup>?</sup>

- Foundations and substructure
- Structure and enclosure
- Finishings and other materials
- External areas
- Services

[Back](#)

Then we start the design phase. To carry out the LCA, we shall input our data from the browser “Input data → Building materials”.

▼ Design phase: 1 designs Parameters + Add a design Compare data Carbon Design

Tool	Unit
LCA, EN-15978 <a href="#">? Help</a>	kg CO <sub>2</sub> e

**View results (Mandatory data missing)**

**Data inputs**

- > Building materials [\(Click to input missing\)](#)
- > Energy consumption, annual [\(Click to input missing\)](#)
- o Water consumption, annual
- o Construction site operations
- > Building area [\(Click to input missing data\)](#)
- > Calculation period [\(Click to input missing\)](#)

**Import data**

- o Import Excel or gbXML files
- o Import from Procure
- o Import from another software

> **Building materials** > Energy consumption, annual Water consumption, annual Construction site operations > Building area > C

Clear **Material** Filter:  **Country** Filter:  **Data source** Filter:  **Type** Filter:  **Upstream** Filter:  **CO2e** Filter:  **Unit** Filter:

**i** Fill in the material consumptions by material type. You may fill in all materials lumped together, or on separate rows for example by type of structure. Unless in Materials can be added in any section. [Material selection help](#).

> **Completeness (%) and plausibility checker (-)**

**1. Foundations and substructure**

Materials in the foundations will never be replaced, no matter assessment period length (except for RE2020 and FEC tools). For BREEAM UK Mat 1 IMPACT equivalent provide Excavation works.

**Foundation, sub-surface, basement and retaining walls** + Create a group + Move materials Compare data Add to compare

▼

**2. Vertical structures and facade** [?](#)

**External walls and facade** + Create a group + Move materials Compare data Add to compare

▼

**Columns and load-bearing vertical structures** + Create a group + Move materials Compare data Add to compare

▼

**Internal walls and non-bearing structures** + Create a group + Move materials Compare data Add to compare


▼

The required information is:

- **Building materials.** Foundations and substructure, vertical structures and fachada, horizontal structures (beams, floors and roofs). The data base contains

more than 30,000 materials divided in 127 material categories according to their functional properties.

> **Building materials**
> Energy consumption, annual
Water consumption, annual
Construction site operations
> Building area

  
Clear

**Material**

**Country**

**Data source**

**Type**

**i** Fill in the material consumptions by material type. You may fill in all materials lumped together, or on separate rows for example by type of structure. Uni

> **Completeness (-) and plausibility checker (-)**

### 1. Foundations and substructure

Materials in the foundations will never be replaced, no matter assessment period length (except for RE2020 and FEC tools). For BREEAM UK Mat 1 IMPACT equivalent

**Foundation, sub-surface, basement and retaining walls** + Create a group + Move materials [Add to compare](#)

---

### 2. Vertical structures and facade

**External walls and facade** + Create a group + Move materials [Add to compare](#)

**Columns and load-bearing vertical structures** + Create a group + Move materials [Add to compare](#)

**Internal walls and non-bearing structures** + Create a group + Move materials [Add to compare](#)

---

### 3. Horizontal structures: beams, floors and roofs

**Floor slabs, ceilings, roofing decks, beams and roof** + Create a group + Move materials [Add to compare](#)

---

### 4. Other structures and materials

- + Choose a category to see data or click here to see all.
- + Glass wool insulation - 1055 matches
- + Paints, coatings and lacquers - 998 matches
- + Ready-mix concrete for external walls and floors C30-C35/4001-5500 psi - 949 matches
- + Ready-mix concrete for foundations and internal walls C20-C25/2501 - 4000 psi - 786 matches
- + Rock wool insulation - 746 matches
- + Ready-mix concrete for structures (beams, columns, piling) C40-C45/5501 - 6500 psi - 727 matches
- + Electrification components and systems - 718 matches
- + Carpet flooring - 689 matches
- + Cement - 688 matches
- + Acoustic insulation panels - 645 matches
- + Furniture - 569 matches
- + EPS (expanded polystyrene) insulation - 567 matches
- + Resilient flooring - 561 matches

When the material is added to the design, we shall select the units (kg, ton, m<sup>3</sup>, m<sup>2</sup>, ud, m). The software gives default values for the transport and distance, but they can be manually modified. Finally, the end of life is required.

### 1. Foundations and substructure

Materials in the foundations will never be replaced, no matter assessment period length (except for RE2020 and FEC tools). For BREEAM UK Mat 1 RPACT equivalent provide the data for site excavation fuel use here, choose resource Excavation works.

Foundation, sub-surface, basement and retaining walls [Create a group](#) [Move materials](#) [Add to compare](#)

Start typing or click the arrow

Resource	Quantity	CO <sub>2</sub> e	Comment	Transport, kilometers	Transport, leg 2, kilometers	Service life	Localisation	EDL Process	Reused material
Ready-mix concrete, normal strength	m <sup>3</sup>			80	Concrete mixer truck, appr. 8 m <sup>3</sup> , 100%		Spain	Concrete on	

- **Energy and water consumption.** These data depend on the kind of building, location, climate conditions, energetic efficiency and habits of the inhabitants.

[Building materials](#)
[Energy consumption, annual](#)
[Water consumption, annual](#)
[Construction site operations](#)

For building life-cycle calculation and most other purposes the figures are provided on an annual basis. For product EPD calculations the data

### 1. Electricity consumption

#### Electricity use (mandatory)

Select type of electricity and fill in the consumption and the use of electricity. The bought electricity is reported here. Electricity can be reported separate by purchased in building design stage calculations. For NS 3720 always use Norwegian degressive energy profiles here

Start typing or click the arrow

Resource	Quantity	CO <sub>2</sub> e	Comment	Profile	Usage
Electricity, Spain	kWh			IEA2020	Overall

### 2. Fuels demand, stationary units

#### Fuel use

Select the fuels and fill in their consumption. Fuel for backup power generators is also typed in here. Select the fuels according to the unit you wish to use. Use here.

Start typing or click the arrow

### 3. The consumption of district heating

#### District heat use

[Click to input data](#)

#### Fuels used in nearby or on-site heat suppliers

[Click to input data](#)

> Building materials > Energy consumption, annual **Water consumption, annual** ✓ Construction site operations ✓ Building area
















1 This query collects data of water consumption.

## 1. The water consumption

### Total water consumption

Water embedded into structures or products is not reported here. They are reported separately.

Start typing or click the arrow

-   Tap water, conventional plus reverse osmosis treated (One Click LCA) - One Click LCA ?
-   Tap water, conventionally treated (One Click LCA) - One Click LCA ?
-  Wastewater from residence - One Click LCA ?
-   Collective sanitation of domestic wastewater, French data (MDEGD) - INIES ?
-   Collective sanitation of rain water, French data (MDEGD) - INIES ?
-   Non-collective sanitation of domestic wastewater, French data (MDEGD) - INIES ?
-   Non-collective sanitation of rain water, French data (MDEGD) - INIES ?
-   Provision of drinking water from the tap, French data (MDEGD) - INIES ?
-   Drinking water, 1000 kg/m3 - OKOBAUDAT  ?
-   Tap water, at user, Australian average - AusLCI ?
-   Tap water, at user, New South Wales - AusLCI ?
-   Tap water, at user, Northern Territory - AusLCI ?
-   Tap water, at user, Queensland - AusLCI ?
-   Tap water, at user, South Australia - AusLCI ?

- **Construction scenarios.** In this case the impact of the usage of electricity, water, and fuel during the construction is considered. The waste materials and the transport are also taking into account. This information depends on very specific data from the Project, however, OneClick LCA is able to give an estimation based on the area and Surface.



> Building materials
✓ Energy consumption, annual
✓ Water consumption, annual
✓ Construction site operations
✓ Building area
> Calculation period

Filter: 
 Filter: 
 Filter: 
 Filter: 
 Filter: 
 Filter: 
 Filter:

1 See GUIDE here

### 1. Construction site scenarios

#### Construction site scenarios

Select the climate zone and area of the building. The scenarios consider electricity, fuel, waste and transportation impacts. If you select one of the scenarios, make sure the data is not double-reported in sections below. For area definitions see [guide here](#).

Start typing or click the arrow

Resource 
 Quantity  m<sup>2</sup>
 CO<sub>2</sub>e 
 Comment

### 2. Deconstruction/demolition scenarios (C1)

#### Deconstruction/demolition scenarios

+ [Click to input data](#)

### 3. Energy use on the site

#### Site electricity consumption

+ [Click to input data](#)

#### Site district heating consumption

+ [Click to input data](#)

#### Site fuel consumption

+ [Click to input data](#)

#### Machine hours

+ [Click to input data](#)

### 4. Construction site water use

- **Area definitions.** The building area is denominator of the results, including basements but excluding parking and motor vehicle circulation areas.

> Building materials
✓ Energy consumption, annual
✓ Water consumption, annual
✓ Construction site operations
✓ Building area
> Calculation period

1 Provide building area data for benchmarking and calculation purposes. See [GUIDE here](#)

### 1. Area definitions

#### Building area (mandatory)

Please always provide gross internal floor area to get benchmark feedback. These figures are always given excluding parkings and motor vehicle circulation areas, but including basements. You may mark furtl definitions allows for national level benchmarking.

Start typing or click the arrow

- Gross Internal Floor Area (IPMS/RICS) ?
- Number of users ?
- User days ?
- User hours ?
- Annual visitors ?
- Conditioned Building Volume ?
- Goods handled ?
- Gross Floor Area ?
- Surface de plancher (decret 2011-1539), France ?
- Surface réglementation thermique (SHON RT2012), France ?
- Useful internal floor area (IPMS) ?
- Bruto vloeroppervlakte (BVO), the Netherlands ?
- Brutto-Rauminhalt, BRI (DIN 277), Germany ?

- **Calculation period.** This is the required service life of the building.

- > Building materials
- ✔ Energy consumption, annual
- ✔ Water consumption, annual
- ✔ Construction site operations
- ✔ Building area
- > Calculation period

1 This query defines the service life (calculation period) of the building. See [GUIDE here](#)

### 1. Calculation period

Calculation period (mandatory)

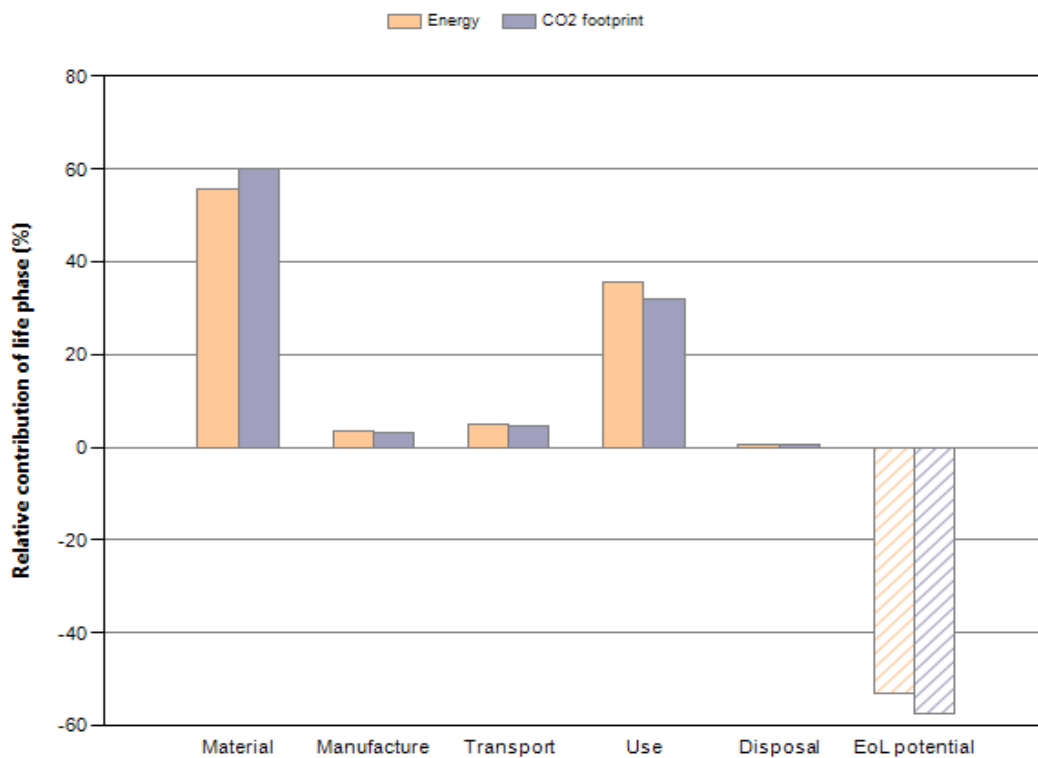
Required service life of the building. If not otherwise defined, use technical service life of the asset. Product replacements and maintenance are calculated for this period. For IMPACT-compliant use allowed values b

 years

## 5.5 - The results.

### 5.5.1 – The report. EcoAudit.

The report form EcoAudit consists of a chart with the relative contribution of life phase in percentage of the different phases: material, manufacture, transport, use, disposal, and potential end of life. In this first graph the information in Energy and Carbon footprint is shown useful for a preliminary assessment.



A table with the data in Energy (MJ and %) and Carbon Footprint (kg and %) is added to the report.


Phase	Energy (MJ)	Energy (%)	CO2 footprint (kg)	CO2 footprint (%)
Material	58,3	55,8	5	60,0
Manufacture	3,57	3,4	0,268	3,2
Transport	5,35	5,1	0,376	4,5
Use	37,1	35,5	2,67	32,1
Disposal	0,2	0,2	0,014	0,2


Total (for first life)	105	100	8,32	100
End of life potential	-55,3		-4,79	


In appendix 1, a total report is shown. After this first page, the information in depth for Energy (page 2) and Carbon Footprint (page 3) is shown, with the corresponding values for each material and phase of the LCA.

### 5.5.2 – The report. OneClick LCA.

The first information from the report is a quick overview with the values of CO<sub>2</sub> emissions and the social cost. In depth, we can evaluate the different phases of the LCA and the contribution to different environmental impacts: global warming, acidification, eutrophication, ozone depletion, ozone formation, primary energy, and biogenic CO<sub>2</sub> storage. All these data can be visualized in pie-charts and Sankey diagrams.

 247 Toneladas CO<sub>2</sub>e

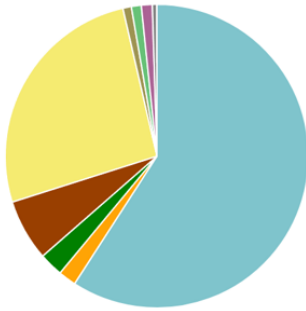
 23,51 kg CO<sub>2</sub>e / m<sup>2</sup> / año

 12 345 € Costo social del carbono

Categoría de resultados	Calentamiento Global kg CO <sub>2</sub> e	Acidificación kg SO <sub>2</sub> e	Eutrofización kg PO <sub>4</sub> e	Agotamiento de la capa de ozono kg CFC11e	Formación de ozono en la baja atmósfera kg Ethenee	Uso total de energía primaria excluyendo materias primas MJ	Almacenamiento de carbono biogénico kg CO <sub>2</sub> e bio
A1-A3 <a href="#">?</a> <b>Producto de construcción</b>	146 006,19	445,82	2 264,21	0,01	44,3	3 414 405,67	11 480,11
<b>A4</b> <a href="#">?</a> Transporte a la construcción	4 666,17	9,88	2,08	0	0,61	83 980,24	
A5 <a href="#">?</a> <b>Proceso de instalación/construcción</b>	6 287,38	32,6	8,31	0	0,73	76 019,07	
B1-B5 <a href="#">?</a> <b>Mantenimiento y reemplazo del material</b>	16 155,63	60,24	10,64	0	4,18	313 832,18	
B6 <a href="#">?</a> <b>Consumo de energía</b>	64 894,57	248,98	55,26	0,01	11,58	3 725 050,32	
B7 <a href="#">?</a> <b>Uso de agua en servicio</b>	2 222,62	15,21	3,54	0	0,53	36 497,58	
<b>C1-C4</b> <a href="#">?</a> Fin de vida	6 666,68	27,34	7,71	0	1,02	146 122,42	
<b>D</b> <a href="#">?</a> Impactos externos (no incluidos en el total)	-39 521,07	-134,54	-16,03	-0	-17,73	-478 779,52	
<b>Total</b>	246 899,22	840,07	2 351,74	0,02	62,96	7 795 907,49	11 480,11
<b>Resultados por denominador</b>							
Por área de superficie interna bruta (IPMS/RICS) 210.0 m <sup>2</sup>	1 175,71	4	11,2	0	0,3	37 123,37	54,67

### Calentamiento Global kg CO2e - Etapas del ciclo de vida

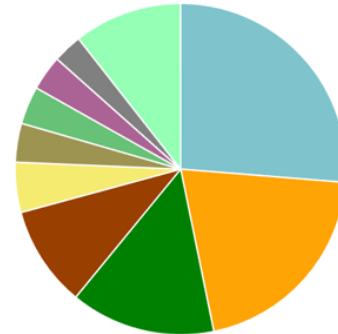
- A1-A3 Materiales - 59.1%
- A4 Transporte - 1.9%
- A5 La construcción - 2.5%
- B1-B5 Mantenimiento y reemplazo - 6.5%
- B6 Energía - 26.3%
- B7 Agua - 0.9%
- C1 Deconstrucción / demolición - 1.1%
- C2 Transporte de residuos - 1.2%
- C3 Procesamiento de residuos - 0.5%
- C4 Disposición de residuos - 0.0%



### Calentamiento Global kg CO2e - Tipos de recursos

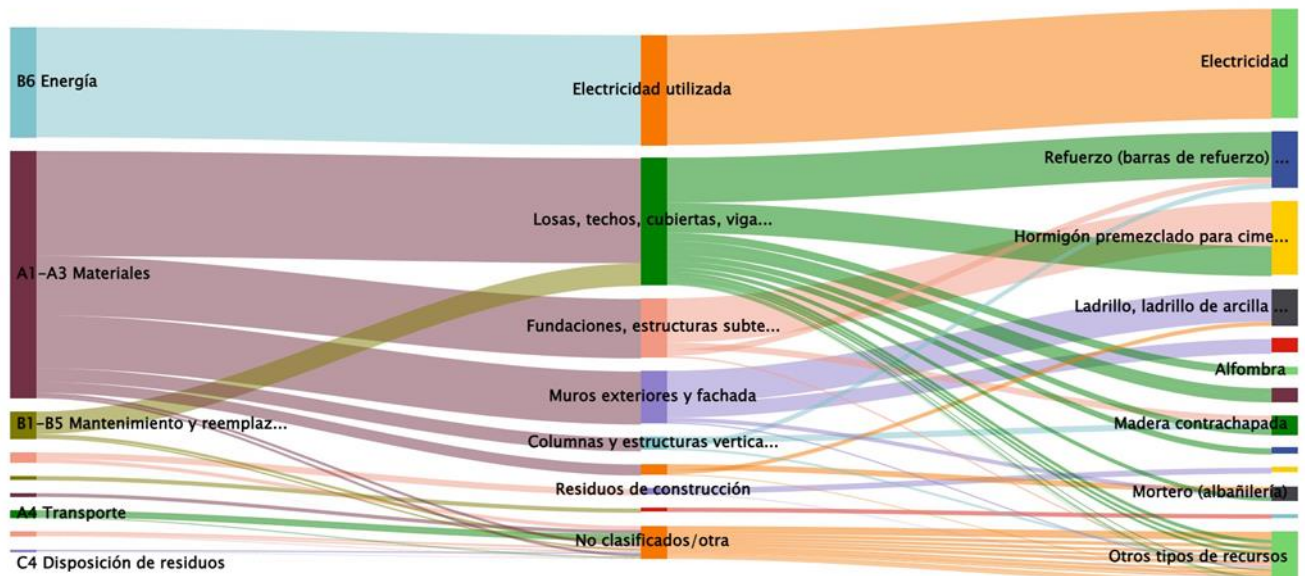
Esta es una gráfica desglosada. Haga clic en la gráfica para verla en detalle

- Electricidad - 26.3%
- Hormigón premezclado para cimentaciones y paredes internas - 20.5%
- Refuerzo (barras de refuerzo) para hormigón - 14.1%
- Ladrillo, ladrillo de arcilla común - 9.9%
- Madera contrachapada - 4.9%
- Aluminio - 3.8%
- Mortero (albañilería) - 3.7%
- Baldosas de pared y piso - 3.4%
- Alfombra - 2.8%
- Otros tipos de recursos - 10.6%



Sankey diagrams are especially useful in LCA. This type of graphs depicts the amount and direction of the flow in a process or systems, identifying the loss, inefficiencies and optimization of resources..

### Diagrama Sankey, Calentamiento Global



## 5.6 Getting more sustainable in the Construction and Building Technology.

Perspective 1 – Embodied carbon: Moving towards a holistic life cycle approach.

Over the last 30 years, the building industry has prioritized energy savings, and these efforts will intensify in the coming years. This means that as operating efficiency grows, the focus will naturally shift to the carbon footprint stored in the building itself.

In the Embodied Carbon topic session, participants agreed that digital models will play an important role in defining the CO<sub>2</sub> footprint of the materials used and simplify the selection of materials that embody less carbon. Low-carbon technologies and materials will also become a more active consideration in investment decision-making.

The construction industry still falls short in planning and building according to circular principles and in taking a life cycle assessment (LCA) approach to the design of buildings. Achieving net zero embodied carbon by 2050 is an aim that is in line with the Paris agreement goal of limiting the temperature rise to 1.5°C. The biggest challenge here is making the existing progress towards the goal visible and fact-based.

Establishing waste and material cycles, repurposing raw materials before building demolition begins, and even maintaining portions of existing buildings are all useful practices in reaching the net zero goal. Integrating locally available sustainable energy sources like wind or sun will also contribute to achieving a net-zero carbon footprint.

## **Perspective 2 - Upfront carbon: Mindset shift to reduce CO<sub>2</sub> in material production and construction**

The expression upfront carbon means the CO<sub>2</sub> emissions triggered by the sourcing and processing of the raw materials, as well as what's emitted during the actual construction process. Participants do see some positive indicators of growing sustainability by the year 2030. The industry is already making an effort to source materials with a low CO<sub>2</sub> footprint, whether they are organic or recycling-based. And likewise, CO<sub>2</sub> classification systems for buildings will lead to new design concepts.

What are still likely to be missing in 2030 are extremely detailed, widely accessible, interlinked databases of materials, their properties, and their carbon footprints. Participants see filling this gap as critical and argue that building material databases and building information modelling (BIM) systems should employ artificial intelligence (AI) to analyse the material mix and optimize planning during construction. These databases should also reflect regional differences in materials and architectural styles and encourage building methods that minimize environmental impacts.

Overall, the challenge for embodied carbon is to achieve a mindset shift, incorporating upfront carbon into a holistic life cycle philosophy. Decisions made

in the design and construction phase will have a knock-on effect on the carbon emission footprint over the entire life of a building.

### **Perspective 3 - Use phase embodied carbon: Enhance efficiency and circularity during operation**

Owners and operators are typically the customers for new construction and renovations. Workshop participants believe that the industry will therefore naturally tend to optimize design to suit these clients, which means achieving the lowest possible running costs and CO<sub>2</sub> footprint for the operation and maintenance phase.

Recent advances in heating technology, building insulation, and overall energy efficiency have reduced CO<sub>2</sub> emissions and increased sustainability during the use phase. But by 2030, participants expect the industry to embody less carbon thanks to improved practices including the increased use and reuse of modular, detachable, and recyclable building components.

For the use phase, participants see the biggest short-term win in increasing circularity and conserving resources. Logistics for handling construction waste recycling should be established, enabling further use of the building fabric. Introducing a resource passport would boost material transparency, enabling more effective, detailed EPDs. Creating energy efficiency incentives, capturing, and reading energy consumption digitally will contribute to a more sustainable use phase. Integrating more renewable energy sources directly into building elements can also help lower environmental impact in the short term.

### **Perspective 4 - End-of-life carbon: Build for deconstruction, standardize low carbon building codes**

The end-of-life stage of a building offers huge potential for reducing the CO<sub>2</sub> footprint. Workshop participants noted that there is already a lot of experimentation and testing of circular solutions for deconstruction. On-site recycling of old materials already takes place in some areas, particularly in road construction. Metal materials are often recycled. The exchange of building parts is already possible.

Unfortunately, sustainable practices at the end of a building's life are the exception, not the rule. Demolition/tear-down and new building almost always take priority over recycling and reuse. There is an urgent need to shift to more recycling and reuse of materials, basic knowledge sharing, and for buildings where disassembly is baked into the design from day one. Recycled materials from other industries should be also included in the service catalogue as building materials. A

CO2 tax and introduction of a demolition permit could also incentivize low carbon deconstruction practices.

The end-of-life solution is to build more simply and flexibly up front, with deconstruction as part of the original plan. Prefabricated building modules can be planned for dismantling and separation of their materials according to type. In parallel, adapting building and planning regulations to accommodate climate protection measures should be a high priority, while also simplifying them and standardizing them across regions. Participants in the workshop agreed they have a role to play in this transformation, with a responsibility to discuss, visualize and create “lighthouse” projects as an inspiration for wider change.

## 5.7 LCA project.

To face the LCA project it is necessary to define 4 main deliverables.

**Goal definition.** In this part we have to set the limits of our aims and objectives. For this, the System Boundary Definition should be marked within the coverage, scope and signification of the analysis. It is also important to describe the functional unit and the reference flow.

**Inventory Analysis.** A difficult part of the project is to define the data collection, quality and validation with a secure and accurate inventory.

**Impact Analysis.** In this part of the project, we carry out the quantitative analysis of data and the data normalization.

**Life Cycle Interpretation.** Finally, we verify the results for consistency and completeness and derive the recommendations.

### 5.7.1. Project deliverables

At each phase of the Design and Construction process, the delivery of the model could be required, along with electronic versions of hardcopy submissions and other files that support the intent of the project.

Table 12 and 13 present an example of file types for Design and Construction deliverables.

Phase	Submission requirements
Goal definition.	Narrative Project Execution Plan Existing Condition Model(s)
Inventory Analysis.	Narrative Materials

Phase	Submission requirements
	Energy Carbon Footprint
Impact Analysis.	Energy Carbon Footprint Ecoindicators Toxicity Water Footprint Solid Waste Biodegradability
Life Cycle Interpretation.	Essential contributions Inventory parameters Impact category indicators

Table 1: Example of deliverables.

### 5.7.2. LCA Coordination.

It is necessary to document the type and frequency of meetings related to the elaboration of the project. Table 2 depicts the typical project meetings including the type, deliverable, frequency, participants and location.

Table 2: LCA Coordination meetings

Meeting Type	Deliverable	Frequency	Participants	Location

### 5.7.3. Worksets.

Worksets is a way to separate a set of elements in the project model into subsets for “worksharing”. During the development of LCA projects, users should be aware of the active workset. Each new element added or assessed into the project will be placed in the active workset. Different information could be added to the Workset (materials, manufacturing, recycling, etc.).

Table 3: Example of workshets for different elements/parts added to a project.

Workset name	Elements	
	Parts	Materials
Window	Frame, glass	Al2024, silica glass
Piping	Pipes, valves	PVC, AISI 316





## 6 - Deliverables

To evaluate the success of the application, students will have to answer an online questionnaire.

## 7- What we have learned

How to prepare LCA projects.

Why is the LCA prepared.

What are the LCAExecution Plan components.

## 8- Appendix 1. Eco Audit Report.

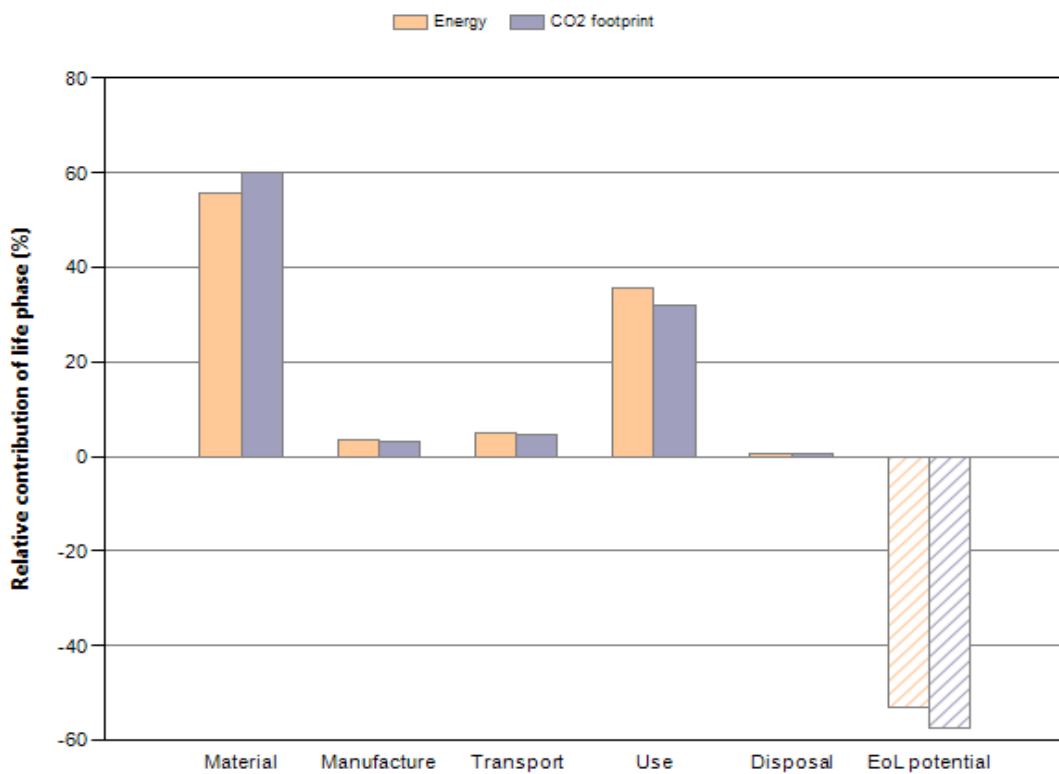


GRANTA EDUPACK

### Eco Audit Report

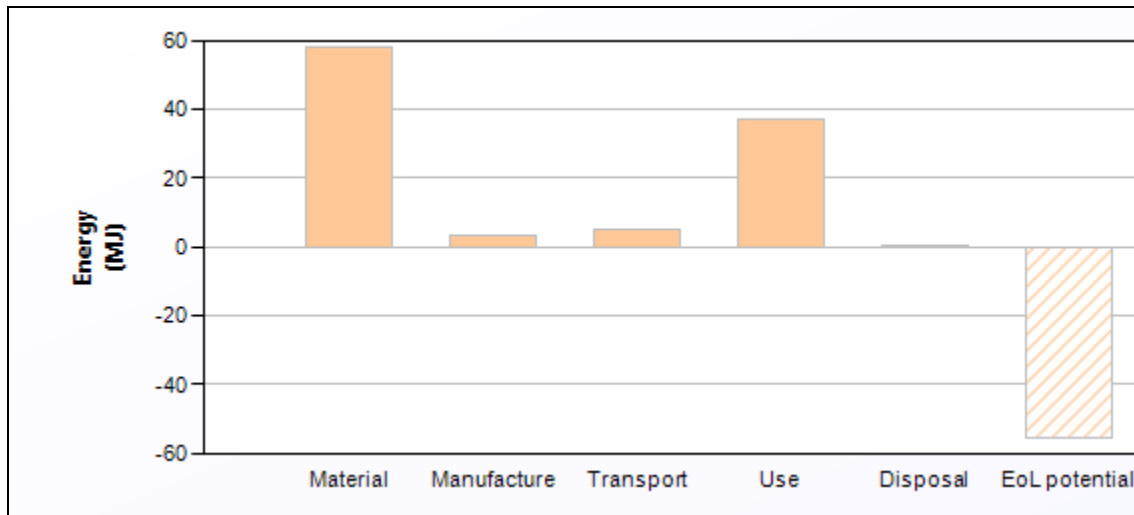
Product name	Product name and life
Country of use	Europe
Product life (years)	1

#### Summary:



Phase	Energy (MJ)	Energy (%)	CO2 footprint (kg)	CO2 footprint (%)
<b>Material</b>	58,3	55,8	5	60,0
<b>Manufacture</b>	3,57	3,4	0,268	3,2
<b>Transport</b>	5,35	5,1	0,376	4,5
<b>Use</b>	37,1	35,5	2,67	32,1
<b>Disposal</b>	0,2	0,2	0,014	0,2
Total (for first life)	<b>105</b>	<b>100</b>	<b>8,32</b>	<b>100</b>
<b>End of life potential</b>	-55,3		-4,79	

## Energy Analysis

[Summary](#)


	Energy (MJ/year)
Equivalent annual environmental burden (averaged over 1 year product life):	105

## Detailed breakdown of individual life phases

### Material:

[Summary](#)

Component	Material	Recycled content* (%)	Part mass (kg)	Qty.	Total mass (kg)	Energy (MJ)	%
Component	Coated steel, stainless steel, terne coated	25,0%	1	1	1	58	100,0
Total				1	1	58	100

\*Typical: Includes 'recycle fraction in current supply'

\*\*\*User-defined material

### Manufacture:

[Summary](#)

Component	Process	Amount processed	Energy (MJ)	%
Component	Forging	1 kg	3,6	100,0
Total			3,6	100

## Transport:

[Summary](#)

### Breakdown by transport stage

Stage name	Transport type	Distance (km)	Energy (MJ)	%
Transport 1	Train, diesel	5e+03	3,9	72,0
Transport 2	Small truck (refrigerated), EURO 6	2,5e+02	1,5	28,0
Total		<b>5,3e+03</b>	<b>5,3</b>	<b>100</b>

### Breakdown by components

Component	Mass (kg)	Energy (MJ)	%
Component	1	5,3	100,0
Total	<b>1</b>	<b>5,3</b>	<b>100</b>

## Use:

[Summary](#)

### Static mode

Energy input and output type	Fossil fuel to thermal, vented system
Country of use	Europe
Power (W) rating	1,2e+02
Usage (hours per day)	12
Usage (days per year)	5
Product life (years)	1

### Mobile mode

Fuel and mobility type	Diesel - 40 tonne (6 axle) truck
Country of use	Europe
Product (kg) mass	1
Distance (km per day)	20
Usage (days per year)	5
Product life (years)	1

### Relative contribution of static and mobile modes

Mode	Energy (MJ)	%
Static	37	99,8
Mobile	0,082	0,2
Total	<b>37</b>	<b>100</b>

### Breakdown of mobile mode by components

Component	Energy (MJ)	%
Component	0,082	100,0
Total	<b>0,082</b>	<b>100</b>

## Disposal:

[Summary](#)



Component	End of life option	Energy (MJ)	%
Component	Re-manufacture	0,2	100,0
Total		<b>0,2</b>	<b>100</b>

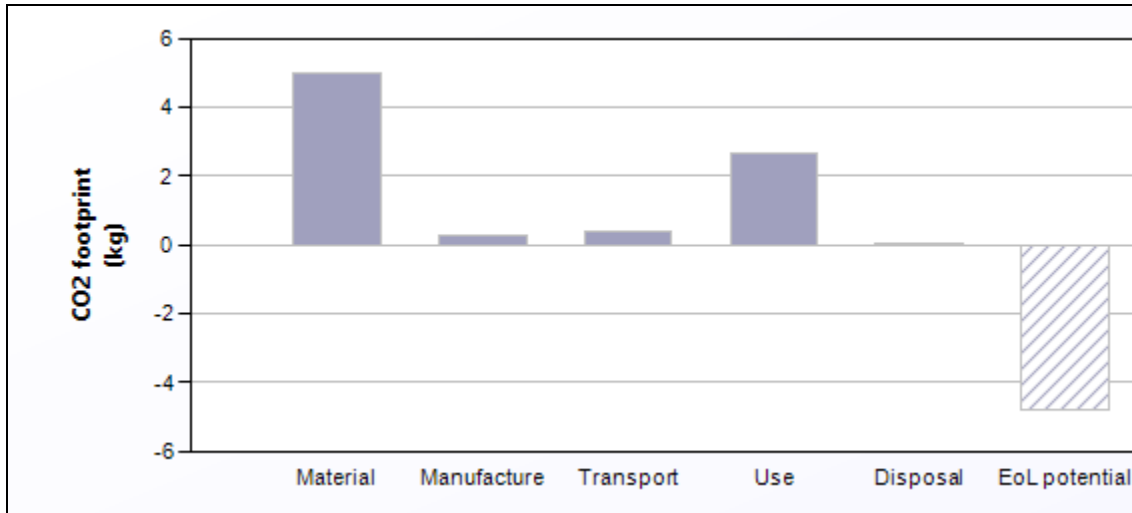
**EoL potential:**

Component	End of life option	Energy (MJ)	%
Component	Re-manufacture	-55	100,0
Total		<b>-55</b>	<b>100</b>

---

**Notes:**[Summary](#)

Add notes

**CO2 Footprint Analysis**
[Summary](#)


	CO2 (kg/year)
Equivalent annual environmental burden (averaged over 1 year product life):	8,32

**Detailed breakdown of individual life phases**
**Material:**
[Summary](#)

Component	Material	Recycled content* (%)	Part mass (kg)	Qty.	Total mass (kg)	CO2 footprint (kg)	%
Component	Coated steel, stainless steel, terne coated	25,0%	1	1	1	5	100,0
Total				1	1	5	100

\*Typical: Includes 'recycle fraction in current supply'

\*\*\*User-defined material

**Manufacture:**
[Summary](#)

Component	Process	Amount processed	CO2 footprint (kg)	%
Component	Forging	1 kg	0,27	100,0
Total			0,27	100

## Transport:

[Summary](#)

### Breakdown by transport stage

Stage name	Transport type	Distance (km)	CO2 footprint (kg)	%
Transport 1	Train, diesel	5e+03	0,28	73,2
Transport 2	Small truck (refrigerated), EURO 6	2,5e+02	0,1	26,8
Total		<b>5,3e+03</b>	<b>0,38</b>	<b>100</b>

### Breakdown by components

Component	Mass (kg)	CO2 footprint (kg)	%
Component	1	0,38	100,0
Total	<b>1</b>	<b>0,38</b>	<b>100</b>

## Use:

[Summary](#)

### Static mode

Energy input and output type	Fossil fuel to thermal, vented system
Country of use	Europe
Power (W) rating	1,2e+02
Usage (hours per day)	12
Usage (days per year)	5
Product life (years)	1

### Mobile mode

Fuel and mobility type	Diesel - 40 tonne (6 axle) truck
Country of use	Europe
Product (kg) mass	1
Distance (km per day)	20
Usage (days per year)	5
Product life (years)	1

### Relative contribution of static and mobile modes

Mode	CO2 footprint (kg)	%
Static	2,7	99,8
Mobile	0,0059	0,2
Total	<b>2,7</b>	<b>100</b>

### Breakdown of mobile mode by components

Component	CO2 footprint (kg)	%
Component	0,0059	100,0
Total	<b>0,0059</b>	<b>100</b>

## Disposal:

[Summary](#)



Component	End of life option	CO2 footprint (kg)	%
<b>Component</b>	Re-manufacture	0,014	100,0
Total		<b>0,014</b>	<b>100</b>

**EoL potential:**

Component	End of life option	CO2 footprint (kg)	%
<b>Component</b>	Re-manufacture	-4,8	100,0
Total		<b>-4,8</b>	<b>100</b>

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**Notes:**
[Summary](#)

Add notes