

RENOVATION LCA

JUNE 2020*

To assess the environmental performance of renovated buildings and compare their levels with E+C-

Practical
guide



La Salle à Tracer - AIA Life Desirables

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CSTB
le futur en construction



* THIS DOCUMENT HAS BEEN ADAPTED AND TRANSLATED IN ENGLISH SINCE ITS FIRST RELEASE IN JANUARY 2019 (FRENCH VERSION)



USER GUIDE ...

The renovation LCA guide is an **educational document** aiming to understand the subtleties of Life Cycle Assessment (LCA) for renovated buildings. It illustrates and gives advice to implement the application rules for environmental assessment of existing buildings of Alliance HQE-GBC. This document mostly relates to the French LCA tools and French methodological background.

For the international reader, the glossary (page 40) will explain the most specific and technical terms.

This document is divided into 3 parts:

1. The first part covers the **methodology** of the renovation LCA,
2. The second part is an inventory of main **frequently asked questions** about the methodology asked by the modellers,
3. The last part is a **glossary** regrouping all vocabulary linked to the renovation LCA.

... TO IMPLEMENT LCA OF BUILDING RENOVATION

The application rules for the environmental assessment of existing buildings are an **addendum to the assessment method** of the **"CARBON ENERGY"** environmental performance for new buildings.

Thus, the topics covered in the framework of the renovation LCA methodology **regularly refer to the "CARBON ENERGY" standard.**

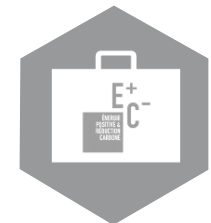
It is therefore highly recommended to familiarize beforehand with the "CARBON ENERGY" standard.

Click on the logo



to access the
Application rules
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to access the site
CARBON ENERGY
www.batiment-energiecarbone.fr
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METHODOLOGY



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FAQ



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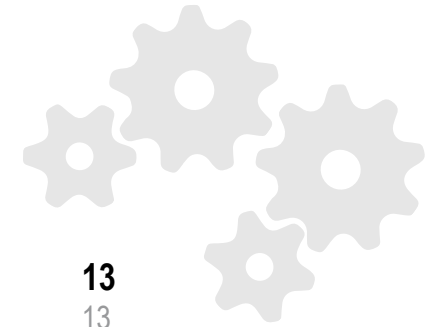
GLOSSARY



METHODOLOGY



01 METHODOLOGY



ISSUES OF THE RENOVATION LCA

PERIMETER OF THE STUDY

- Spatial perimeter
- Assessment perimeter
- Temporal perimeter

INPUT DATA

- Data collection
- Choice of the data

RENOVATION LCA

- Methodology

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- Calculation of environmental impacts
- Depreciation method for contributor CPE

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- Methodology for retained or removed elements
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The renovation LCA goals are multiple:



- **Guidance** for a choice between deconstruction / reconstruction vs renovation in terms of environmental performance,



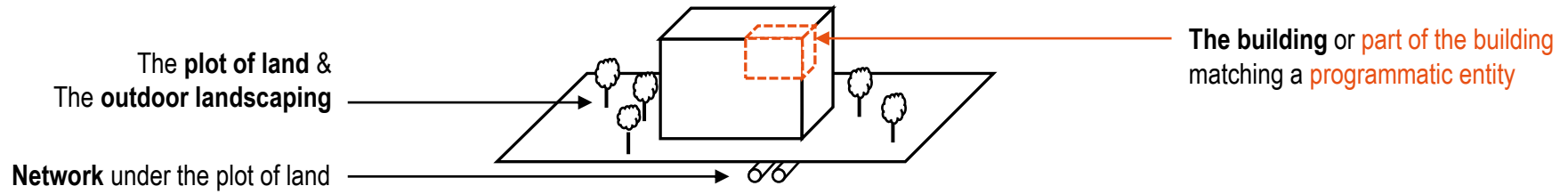
- **Knowledge** of environmental impacts of the construction and/or a building stock at a specific time,



- **Optimisation** of the environmental performance of the renovation project.



SPATIAL PERIMETER

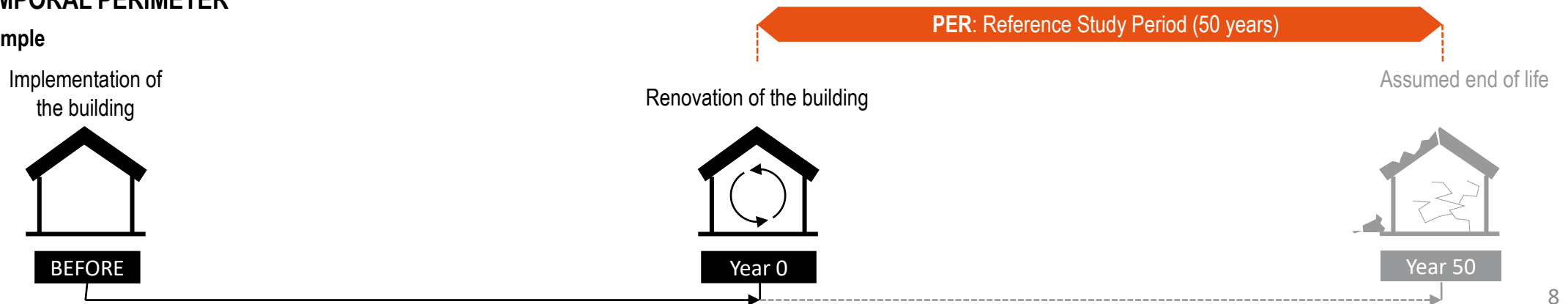


ASSESSMENT PERIMETER (4 contributors)



TEMPORAL PERIMETER

Example



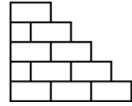


DATA COLLECTION



RETRACE THE HISTORY OF THE CONSTRUCTION

- Date of implementation
- Date(s) of renovation



PRODUCE AN INVENTORY OF THE PRODUCTS AND EQUIPMENT

- Quantitative evaluation of existing and new
- Separate new / retained / removed elements
- Retrace the history of retained / removed elements



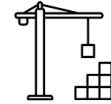
EVALUATE ENERGY CONSUMPTION

- Evaluate the consumption by means of regulatory calculation or Dynamic Thermal Simulation (DTS)
- Provide, for information, the consumption before renovation



EVALUATE WATER CONSUMPTION

- Evaluate water consumption of the renovated building
- Provide, for information, the consumption before renovation



EVALUATE THE IMPACTS OF THE BUILDING SITE

- Provide the duration of the building site
- Time of crane usage
- Volume of soil excavated and discharged
- Distance from the building site to the location of discharged soil

CHOICE OF THE DATA

CONSTRUCTION PRODUCTS AND EQUIPMENT

Order of priority

- 1 - Environmental and Health Product Declarations (EHPD) and individual Profile Environmental Product (PEP)
- 2 - Environmental and Health Product Declarations (EHPD) and collective Profile Environmental Product (PEP)
- 3 - Modules of Generic Default Environmental Data (MDGED)
- 4 - Standard values of simplified lots

REGULATORY ENERGY CALCULATION METHOD

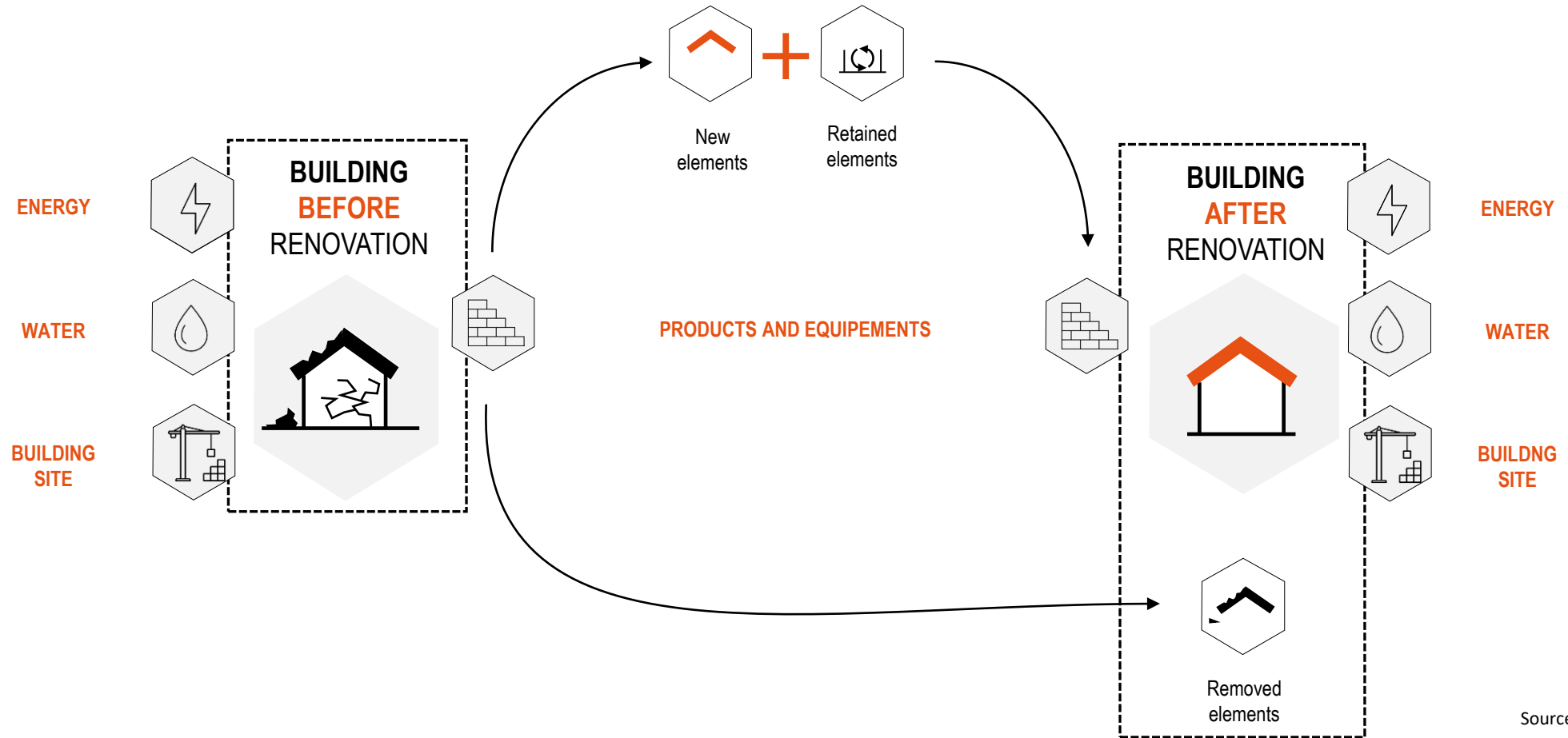
- Calculation method TH-C-E-ex for **renovated buildings**
TH-C-E is the French methodology used in the regulation to assess the building thermal energy balance



Click on the logo to access the
INIES database
French version only



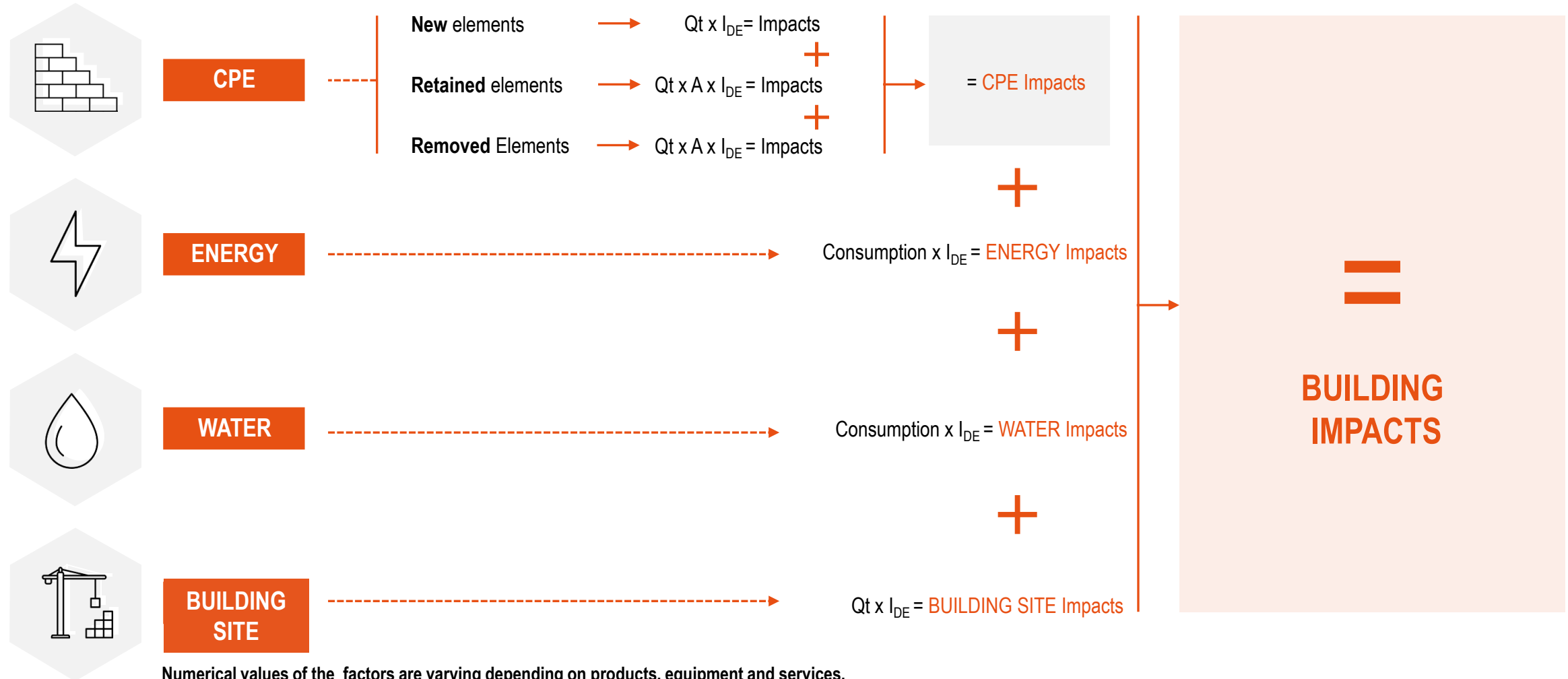
METHODOLOGY



Source : Alliance HQE-GBC



CALCULATION OF ENVIRONMENTAL IMPACTS



I_{DE} : Indicators from Environmental Data (EHPD/MDGED/PEP)

Qt : Quantities

A : Depreciation factor



DEPRECIATION METHOD FOR CPE CONTRIBUTOR

The environmental impacts of construction products and equipment are mitigated all along their whole service life, generating a depreciation effect. For example, if a product has a service life of X years, we will depreciate its environmental impact by 1/X each year.

EXAMPLE

Implementation of the building



YEAR 0

Renovation of the building



YEAR 30

- Adding new elements
- The initial elements will become retained or removed elements
- Reduction of consumption (energy and water)
- Renovation work

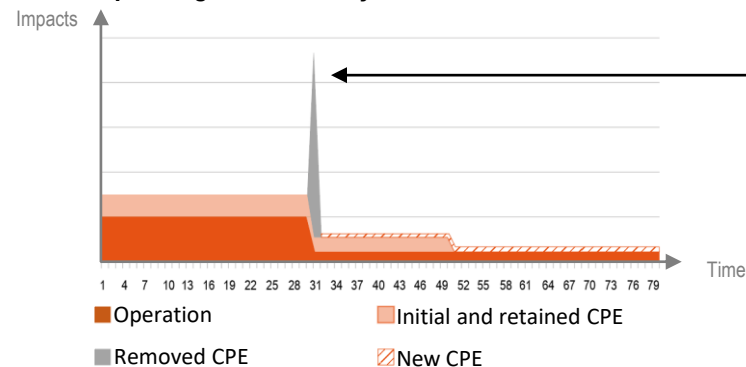
Assumed end of life



YEAR 80

PRESENTATION OF RESULTS AS GRAPHICAL FIGURES

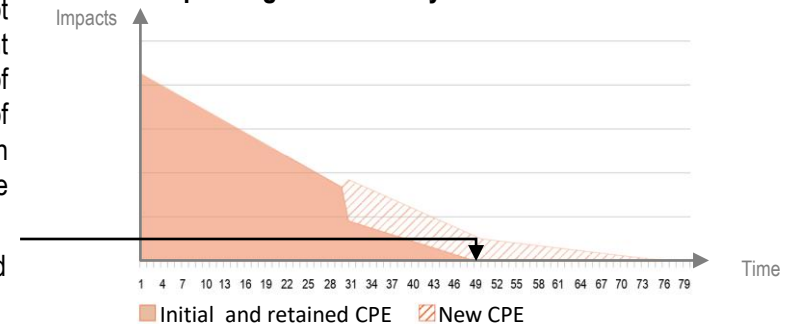
Graphical figure representing the annual repartition of the impacts for the 4 contributors, depending on the history of the construction

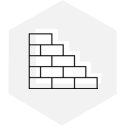


The removed elements are not depreciated, they are taken into account by the owner of the building at the time of the renovation work. The impacts of removed elements are therefore taken into account for the year of the renovation.

From the 51st year on, all products and initial equipment are depreciated.

Graphical figure representing the linear depreciation of the impacts related to the products and equipment, depending on the history of the construction





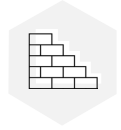
METHODOLOGY

The **PCE contributor** covers all components of the building and its plot of land.

The description of the elements is carried out according to **splitting into lots and sub-lots** presented in annex of the “**CARBON ENERGY**” standard.

In the framework of a rehabilitated or renovated building, the perimeter covers the following products and equipment, and distinguishes:

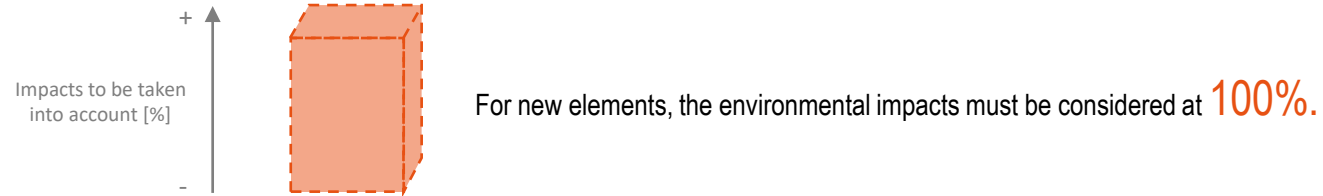
- **New elements**, i.e. those newly added to the construction in the renovation operation,
- **Retained elements** during the operation,
- **Removed elements** during the work.

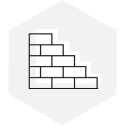


METHODOLOGY FOR NEW ELEMENTS

Impact calculation for a **new element remains unchanged with regard to the “CARBON ENERGY” standard.**

The following diagram represents a gauge of environmental impacts to be considered.



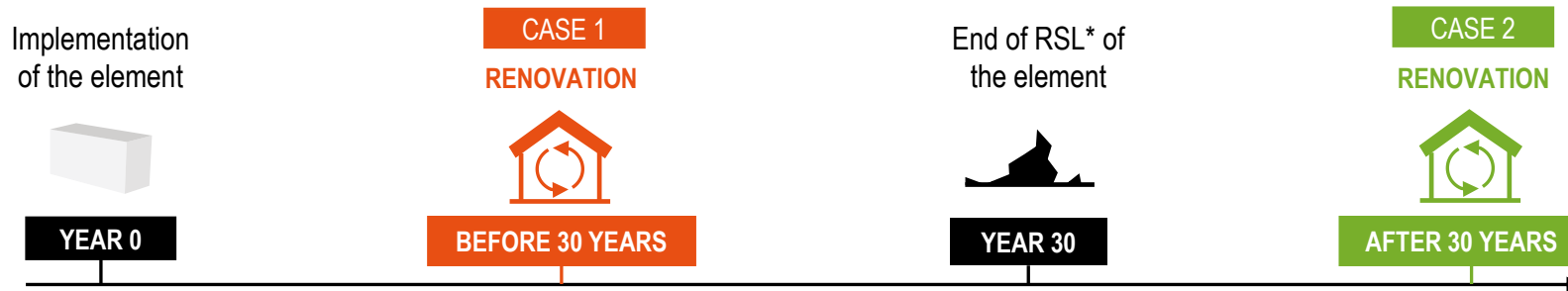


METHODOLOGY FOR RETAINED AND REMOVED ELEMENTS

Impacts related to retained or removed elements are taken into account as following:

- **Case 1** : The element did not live its entire RSL* at the time of renovation, it has therefore a remaining service life. The CPE is not depreciated, its remaining impacts shall be taken into account.
- **Case 2** : The element lived its entire RSL* at the time of renovation. The CPE is depreciated, no impact is to be considered.

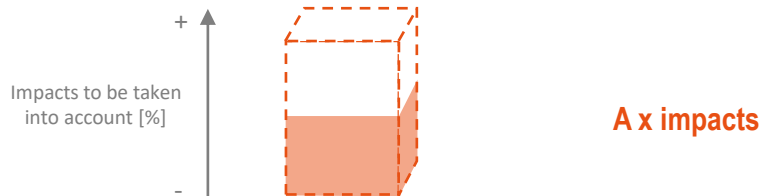
EXAMPLE : Assuming an element with a RSL of 30 years



CASE 1

Renovation **before the end of the RSL* of the element.**
The impacts to be considered for the element are:

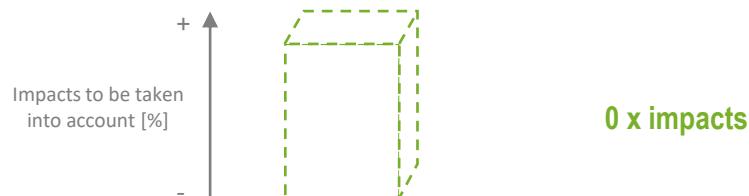
The **ELEMENT** is **REMOVED** or **RETAINED** Not depreciated



CASE 2

Renovation **after the end of the RSL* of the element.**
The impacts to be considered for the element are:

The **ELEMENT** is **REMOVED** or **RETAINED** Depreciated



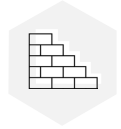
Pro-rata calculation of the depreciation of a CPE [in %] :

$$A = \frac{\text{Remaining Service Life}}{\text{Reference Service Life (RSL)}}$$

Example for case 1 :

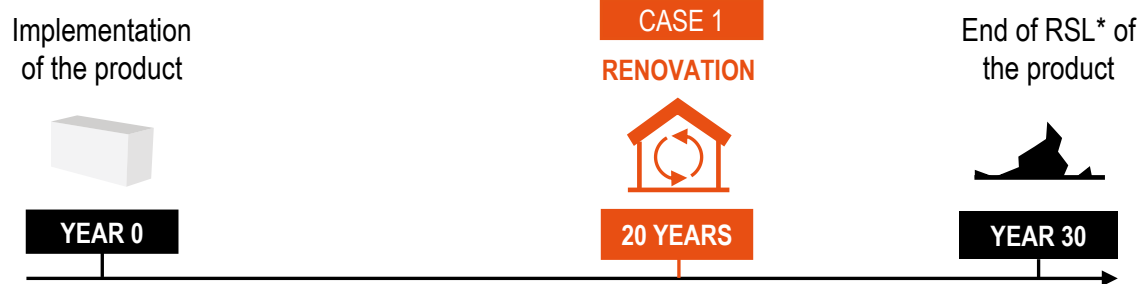
Assuming an element with a RSL* of 30 years. The renovation being carried out after 20 years, the product has not totally paid its environmental debts. Its remaining service life is therefore 10 years. It will have to depreciate 1/3 of the CPE impacts (10/30) in its next life cycle.

* **RSL**: Reference Service Life stated in the EHPD and PEP



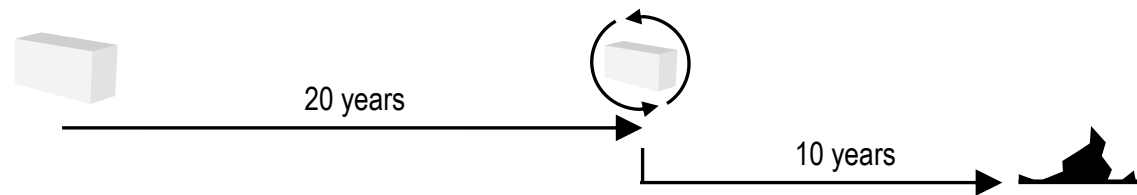
CASE 1 EXAMPLE: Assuming a product with a RSL of 30 years

GENERAL CONTEXT



RETAINED ELEMENT

RSL > achieved service life. The product is not totally depreciated.



IMPACTS TO CONSIDER

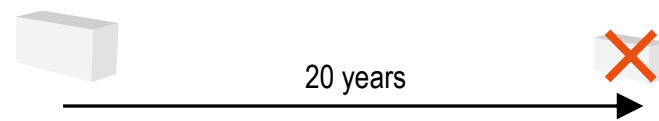
Impacts still to be depreciated: $A = 10/30$ for the **retained CPE**

+

Impacts of one or several **replacing elements**

REMOVED ELEMENT

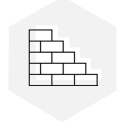
RSL > achieved service life. The product is not totally depreciated.



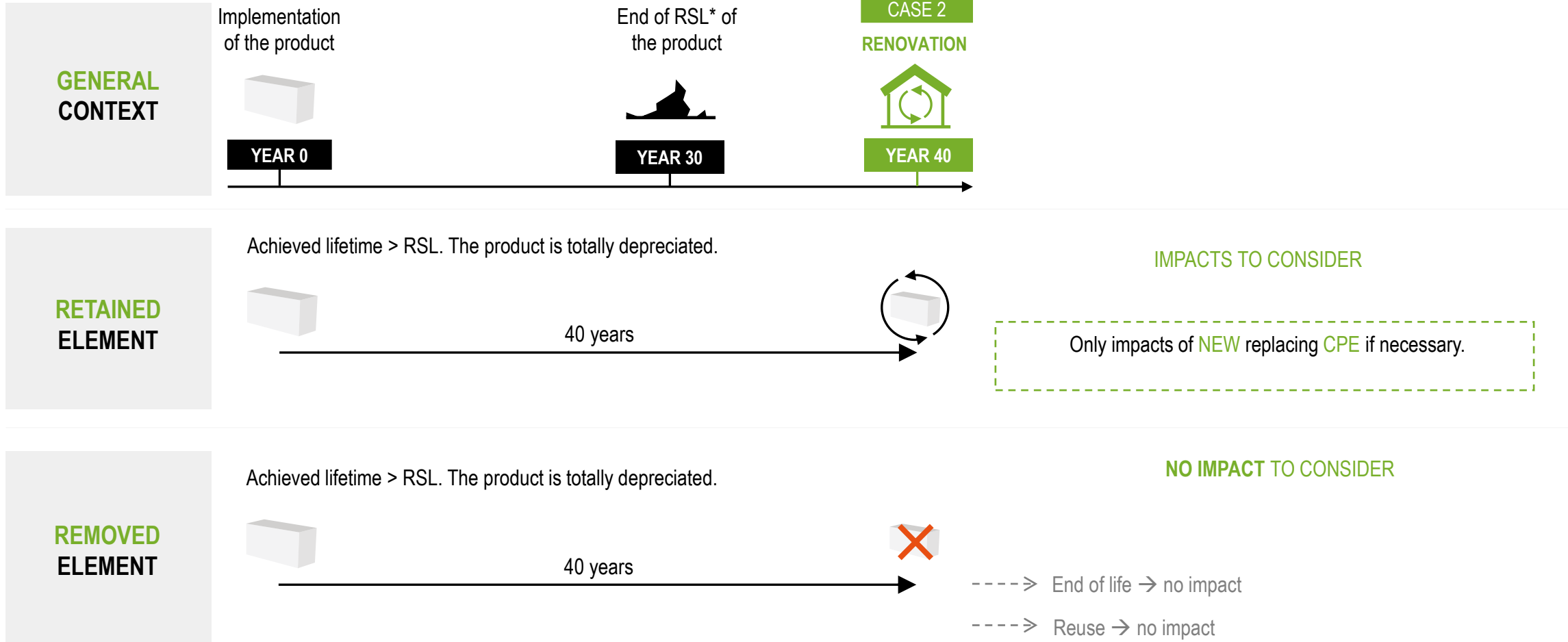
IMPACTS TO CONSIDER

Impacts still to be depreciated: $A = 10/30$ for the **REMOVED CPE**

- > The product is removed and finished its end of life → Impact to be taken into account
- > The product is removed and reused in another building → Impact transferred to the new owner (CF question about reuse)

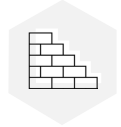


CASE 2 EXAMPLE : Assuming a product with a RSL of 30 years



NOTE

If the renovation occurs 50 years after the implementation of the building, then all retained and removed elements are depreciated (even if their RSL is higher than 50 years).



INPUT PROCEDURE

The impact calculation and the input of **new elements** remain unchanged with regard to the “CARBON ENERGY” standard of new buildings.

For the **removed and retained elements**, Alliance HQE-GBC offers an **EXCEL** tool allowing to **simplify the input of these elements**. This spreadsheet allows you to **rapidly get the quantity of elements (retained or removed) still to be depreciated**.

With this tool, you can **do your LCA with any software compliant** with the “CARBON ENERGY” standard experimentation.



CLICK ON THE LOGO GET DIRECT ACCESS THE TOOL.

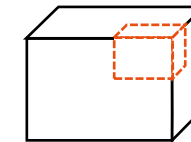
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- ▼ Building
 - ▼ Zone
 - ▼ Construction products and equipment
 - ▶ 1 External works (roads and networks)
 - ▶ 2. Foundation and infrastructure
 - ▼ 3. Superstructure - Masonry
 - ▼ 3.1 Horizontal elements – floors, slabs, balconies
 - ▶ Slab on ground – existing building preserved
 - ▶ Slab on ground – extension
 - ▶ Wood floor L1 – existing building removed



Screenshot of ELODIE, a LCA software compliant with the E+C-standard

To dissociate the construction products and the building equipment, for the input, it will be necessary to specify if the element is new, retained or removed.



PROGRAMMATIC ENTITIES

In some cases, the perimeter of the LCA study may be restricted to the programmatic entity. In this case the allocation rules by programmatic entities of the “CARBON ENERGY” standard shall be applied.



CALCULATION METHOD

The contributor “energy consumption” covers **usage of energy** in the building:

- **The 5 usages of the French Thermal Regulation RT2012** (heating, hot water, cooling, lighting, ventilation)
- **Specific building usages** (lifts, outdoor lighting, ventilation and parking lighting)
- **Specific furnishing usages** (computers, equipment ...)

The calculation formula and ratios of **specific usages** to be taken considered to calculate the associated consumptions are described in the “**CARBON ENERGY**” standard.

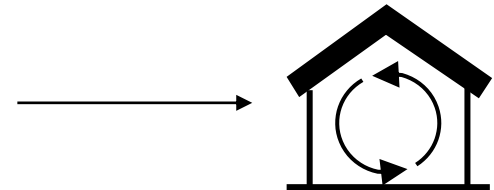
For usages not taken into account (currently outside the scope of the RT2012 French regulation), a Dynamic Thermal Simulation (DTS) or an analysis of consumptions of the old building should be carried out.

Renovated building

Regulatory calculation method: **TH-C-E-ex**

In case of an **existing calculation by elements**, it is necessary to carry out a **full calculation of the whole building**.

If the building is not covered by the Thermal Regulation, it is necessary to **carry out a Dynamic Thermal Simulation (DTS)**



The modeller will be asked to **fill in**, if possible, **the energy consumption of the old building, for information**, either through the interface of the software, or in a supplemental document.

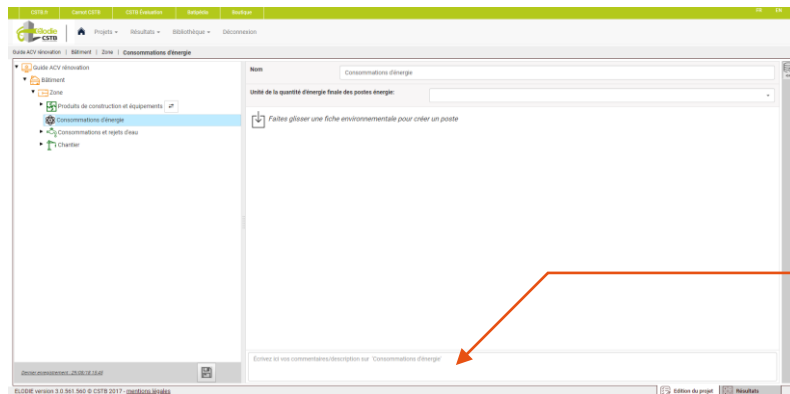


CALCULATION METHOD

The contributor “water consumption” covers **all usages of water** in the building, it allows to take following into account:

- Impacts of the **treatment for used drinking water** in the building;
- Impacts of **wastewater treatment** and of **storm-water management** for the plot of land.

The calculation method of impacts linked to the contributor is described in the “**CARBON ENERGY**” standard .



The modeller will be asked to **fill in**, if possible, **the water consumption and rejection of the old building, for information**, either through the interface of the software, or in a supplemental document.

◀ **Screenshot of ELODIE, a French software compliant with the E+C- standard**

The interface of ELODIE software, allows to write comments about each contributor.



CALCULATION METHOD

The contributor “building site” covers the various **impacts of the renovation work site** of the building:

- **Energy consumption** of the building site (life basis, cranes and construction machinery),
- **Water consumption and rejection** of the building site,
- **Disposal and treatment of excavated soil waste**,
- **The restoration process and transportation of retained elements**. Indeed, some retained elements need a maintenance treatment before being reused in the project.
The calculation method of these impacts is detailed in the FAQ section ([click here](#)).

The calculation method of the impacts linked to the contributor is described in the “**CARBON ENERGY**” standard .



Environmental indicators

The Life Cycle Assessment allows to quantify the environmental impacts of a building through various indicators. The list of indicators of environmental impacts that can be calculated is as follows:

Indicator	Simplified name	Unit
Indicators for environmental impacts		
Global warming potential (GWP)	GHG emissions	kg CO2eq
Ozone depletion potential (ODP)		kg CFC11 eq
Acidification potential (AP)		kg SO2 eq
Eutrophication potential (EP)		kg PO4 eq
Photochemical oxidant creation potential (POCP)		kg C2H2 eq
Abiotic Resource Depletion Potential for elements; ADP_elements		kg Sb eq
Abiotic Resource Depletion Potential of fossil fuels ADP_fossil fuels		MJ, net calorific value
Air pollution		m3
Water pollution		m3
Indicators for resource use		
Use of renewable primary energy excluding energy resources used as raw material		MJ, inferior calorific value
Use of renewable primary energy resources used as raw material		MJ, inferior calorific value
Total use of renewable primary energy (primary energy and primary energy resources used as raw material)		MJ, inferior calorific value
Use of non-renewable primary energy excluding primary energy resources used as raw material		MJ, inferior calorific value
Use of non-renewable primary energy resources used as raw material		MJ, inferior calorific value

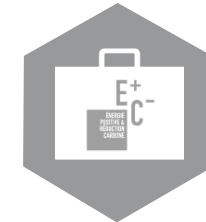
Total use of nonrenewable primary energy (primary energy and primary energy resources used as raw material)	Non-renewable primary energy	MJ, inferior calorific value
Total use of primary energy (primary energy and primary energy resources used as raw material)		MJ, inferior calorific value
Use of secondary material		kg
Use of renewable secondary fuels		MJ
Use of nonrenewable secondary fuels		MJ
Use of net fresh water	Use of fresh water	m3
Indicators for waste categories		
Hazardous waste disposed		kg
Non-hazardous waste disposed	non-hazardous waste	kg
Indicators for output flows		
Components for reuse		kg
Materials for recycling		kg
Materials for energy recovery (not waste incineration)		kg
Exported energy		MJ for each energy vector

: Indicators calculable by the simplified method

The list of environmental impacts complies with the "CARBON ENERGY" standard.

These indicators are those of the NF EN 15978 standard which has an additional indicator for radioactive waste.

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to access the **CARBON ENERGY** website
www.batiment-energiecarbone.fr
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Click on the logo



to access the **NF EN 15978** standard
French version only



Interpretation of results

When interpreting the results, you should pay attention to following:

- For the calculation of energy performance according to E+C- standard, **the BEPOS (E) indicator is different from LCA indicators – Total use of resources from primary renewable and nonrenewable energy**. Indeed, the BEPOS indicator does only include all energy consumption in the operational phase, while the environmental indicators take into account the whole life cycle of the building, which includes construction products and equipment, energy and water consumption as well as the construction work.
- To **get an order of magnitude of regular environmental indicators** for renovated buildings, it is possible to rely on the thresholds of the **E+C- experimentation** for the Climatic Change indicator. And for the other indicators, on the **results from the new and renovated HQE performance tests** carried out by HQE-GBC Alliance (all indicators).
- **LCA of renovated buildings applies to all environmental indicators**, each one being as important as the others. Before any study, it will be necessary to target the LCA issues, and identify the indicators to review in order to offer relevant conceptual choices to reduce their impacts. Indeed, **the weight of each contributors can vary significantly depending on the indicator under consideration**.
- Considering the possible variations in terms of completeness of LCA and the reliability of used data, the interpretation of results shall consider a **margin of uncertainty**.

WARNING

A modification of the usage of the renovated building and/or an implementation of an extension modifies significantly the functional unit of the construction. Therefore, a before/after comparison will not always be possible and relevant.



FAQ



02 FAQ



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WHICH SOFTWARE CAN I USE TO MAKE MY RENOVATION LCA?

Any software compatible in the “CARBON ENERGY” standard and connected to the INIES database (French reference Database for environmental and health product and equipment data) can be used in the French context of the renovation LCA.

At the same time, there are 2 specific cases:

- 1- The software allows LCA calculation without integrating a RSET file. The energy consumption linked to the contributor ENERGY will be input by hand.
- 2 – Use of a LCA gateway software – energy calculation. The energy consumption will be linked and automatically fed into the LCA software.

For any additional information about software’s compatibility with the “CARBON ENERGY” standard and the support charter for the environmental calculation compatibility of the software, **click on the logo below**.



www.batiment-energiecarbone.fr/evaluation/logiciels/
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ARE THERE GATEWAY RATIOS THAT ALLOW GETTING FROM THE OLD NET FLOOR AREA (SHON) TO THE NEW FLOOR AREA (SDP) ?

*These values refer to French construction areas calculation methods which changed in 2012.

Yes, for that purpose, you must refer to the proposal issued by SOeS (Service de l'observation et des statistiques = Statistical and observation Department of the Ministry of Environment, Energy and Sea):

“The complex calculation modalities of the Net Floor Area (SHON) and the Floor Area (SDP) do not allow any simple relationship between these two types of measurement and need to refer to the plans of the construction project themselves to finally carry out two parallel assessments. The SOeS estimated a global transformation coefficient for each major building family in order to calculate the extrapolation of series of construction areas into floor areas. This coefficient was obtained by comparing distributions of construction areas before and after the reform for individual housing and collective housing. It was established by experts for office buildings and then extrapolated for the other nonresidential types of buildings, according to their mean area (figure 1). »

Figure 1 Used conversion coefficients SHON (Net Floor Area) / SDP (Floor Area)

	Floor Area (m ²) for 100 m ² of SHON
Individual housing	93
Collective housing and residences	94
Hotel accommodation	96
Office	95
Shops	95
Craft	94
Industry	97
Warehouse	96
Public services	96

Proposal of SOeS for the global conversion coefficient for each major building family from SHON to SdP

Source:

<http://www.statistiques.developpement-durable.gouv.fr/fileadmin/documents/Themes/Logement-Construction/Construction/en-savoirplus.pdf>



FOR A 'CORE AND SHELL' BUILDING (BASE BUILD), WITHOUT COMPLETIONS OR PARTITION WALLS, SHALL I INCLUDE THEM IN THE LCA CALCULATION?

It is important to consider the **same assessment perimeter for all renovation LCA**.

In case of a core and shell building where a range of other construction and fit out works are left to be completed before the building is occupied, it is important to include in the calculation **all products and equipment** (partition walls, technical equipment and completions...) **allowing usage of the building by its occupants**.

In order to include these elements in the renovation LCA assessment perimeter, there are two possibilities:

1 – As a first step, it is **possible to make assumptions**. These assumptions shall be **described and justified in comments** either in the interface of the software, or in a supplementary document. Using this method, it will be necessary to determine a plausible scenario for the arrangement of the areas with the future owner(s) of the construction.

2 – If no data is available, you will be asked to **use global lots from the simplified method** to take into account the impacts of the “forthcoming” elements of these lots.

Please note that this method also applies to any LCA conducted for **in-use buildings** and **fitting-out works**.



CLICK ON THE LOGO TO ACCESS THE METHODOLOGICAL NOTICE

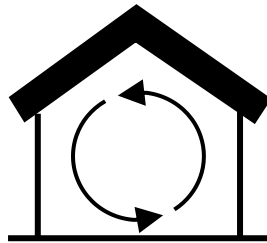
French version only



MY PROJECT HAS A NEW EXTENSION, SHALL I INCLUDE IT IN THE RENOVATION LCA CALCULATION?

The implementation of an extension for the renovated building shall be taken into account in the perimeter of the LCA, thus, it will be necessary to remain vigilant about the various calculation methods.

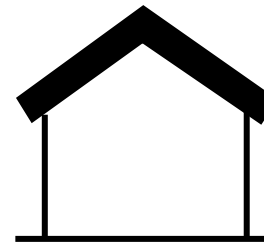
RENOVATION



Renovation LCA method

TH-C-E-ex calculation method

EXTENSION



New building LCA
E+C- standard method

TH-B-C-E calculation method



LIFE CYCLE ASSESSMENT
CALCULATION METHOD

REGULATORY ENERGY
CALCULATION METHOD

Click on the logo



to access the
implementing rules
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to access the
CARBON ENERGY site
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SHOULD SPECIFIC ENVIRONMENTAL DATA BE USED TO INPUT THE PRODUCTS & EQUIPMENT?

You can use all relevant environmental data...

But it is important to use the environmental data that is the closest to the modelled CPE (Construction Products and Equipment)...
And the choice of the environmental data shall comply with the following order of priority:

PRIORITY WHEN SELECTING DATA

CONSTRUCTION PRODUCTS AND EQUIPMENT

- 1 - Environmental (and health) product declaration (FDES / EPD) and individual Profile Environmental Product (PEP)
- 2 - Environmental and health product declaration (FDES / EPD) and collective Profile Environmental Product (PEP)
- 3 - Default Generic Environmental Data Modules (MDEGD)
- 4 - Global values for the simplified lots

Priority order of environmental data:



CLICK ON THE LOGO TO
ACCESS THE INIES
DATABASE

French version only



IS IT POSSIBLE TO USE EHPD CONFIGURATORS FOR MY RENOVATION LCA?

The EHPD configurators generate environmental data that are compliant with **NF EN 15804+A1 European standard** and its national complement. They are therefore **compatible with the “CARBON ENERGY” standard** and **recognized by the INIES Database**.

They are thus usable in the renovation LCA framework.

CLICK ON THE LOGOS TO ACCESS THE CONFIGURATORS

French version only





IS IT POSSIBLE TO NEGLECT ENVIRONMENTAL IMPACTS OF AN ELEMENT IF ITS SERVICE LIFE IS RATHER LOW?

If the service life of an element is rather low, it is possible to overlook its environmental impacts.

There are two cases:

1 – For all retained or removed elements having a Reference Service Life lower or equal 50 years, if their remaining service life is equal or less than 10 % of the RSL of the element, it is possible to overlook the impacts.

Example: Assuming an element with a Reference Service Life of 30 years, if its remaining service life is ≤ 3 years, the environmental impacts of the element can be overlooked.



2 – For all retained or removed elements having a Reference Service Life over 50 years, there is no possible simplification.



HOW DO WE CALCULATE THE BEPOS BALANCE INDICATOR (E) OF THE E+C- STANDARD IN CASE OF RENOVATION?

The same method than for new buildings available in the “Carbon Energy” standard must be used for new buildings – Assessment method for energy and environmental performance of new buildings

The **BEPOS balance** indicator is defined by the difference, expressed as primary energy, between:

- the amount of neither renewable nor recovered energy used by the building,
- and the amount of renewable or recovered energy produced and injected in the network by the building and its immediate area.

The renewable or recovered energy is that defined in article R.712-1 or the French energy code.

Click on the logo



to access the
CARBON ENERGY site
[www.batiment-energiecarbone .fr](http://www.batiment-energiecarbone.fr)

French version only



HOW DO I RETRACE THE HISTORY OF MY BUILDING?

Retracing the history of a specific building is often complex, thus **some leads may provide indications** about the past of the construction products and equipment

- An owner change,
- A tenant change,
- A change of usage of the construction,
- Renovation work...

Some documents or administrative documents may also provide data about the history of the construction:

- The final implementation file (DOE = Dossiers des Ouvrages Exécutés),
- The waste diagnostic, mandatory in case of renovated projects,
- Diagnostic of resources, optional document allowing the identification of potential recoverable/reusable construction products and equipment for the project...

Finally, exchanges with the **actors of the construction** may help retracing the history of the construction:

- Project owner,
- Operator of the building,
- Architects,
- Engineers of design offices structure, technique and finishing...



IF I DO NOT HAVE THE HISTORY OF THE BUILDING, WHAT VALUE OF REMAINING SERVICE LIFE SHOULD I TAKE INTO ACCOUNT FOR THE DEPRECIATION OF THE PRODUCTS & EQUIPMENT?

The calculation of the **remaining service life** requires the knowledge of the history of the construction, maintenance and replacements done to estimate the implementation date of the element in the construction.

If no data is available, it is possible to consider that the remaining service life is equal to half of the Reference Service Life of an equivalent product available on INIES database. The assumptions for choosing the values shall be described and justified as comments in the interface of the software, or in a supplementary document.

EXAMPLE : Assuming an element with a Reference Service Life of 30 years

If I do not have any information about the origin of the element, I consider its **remaining lifetime as 15 years** (Reference Lifetime/2). The impacts to take into account for the element are :





IF I DO NOT HAVE THE MEASUREMENTS OF THE CURRENT BUILDING, ARE THERE RATIOS IN ORDER TO EASILY QUANTIFY THE PRODUCTS & EQUIPMENT?

In case of lacking detailed data, a *simplified method* is possible.

This method provides *global impact values* per typology of building and per lot.



LOTS 1 TO 7

CLICK ON THE LOGO TO ACCESS THE METHODOLOGICAL NOTICE



LOTS 8 TO 12

CLICK ON THE LOGO TO ACCESS THE CARBON ENERGYSITE

www.batiment-energiecarbone.fr/evaluation/documentation

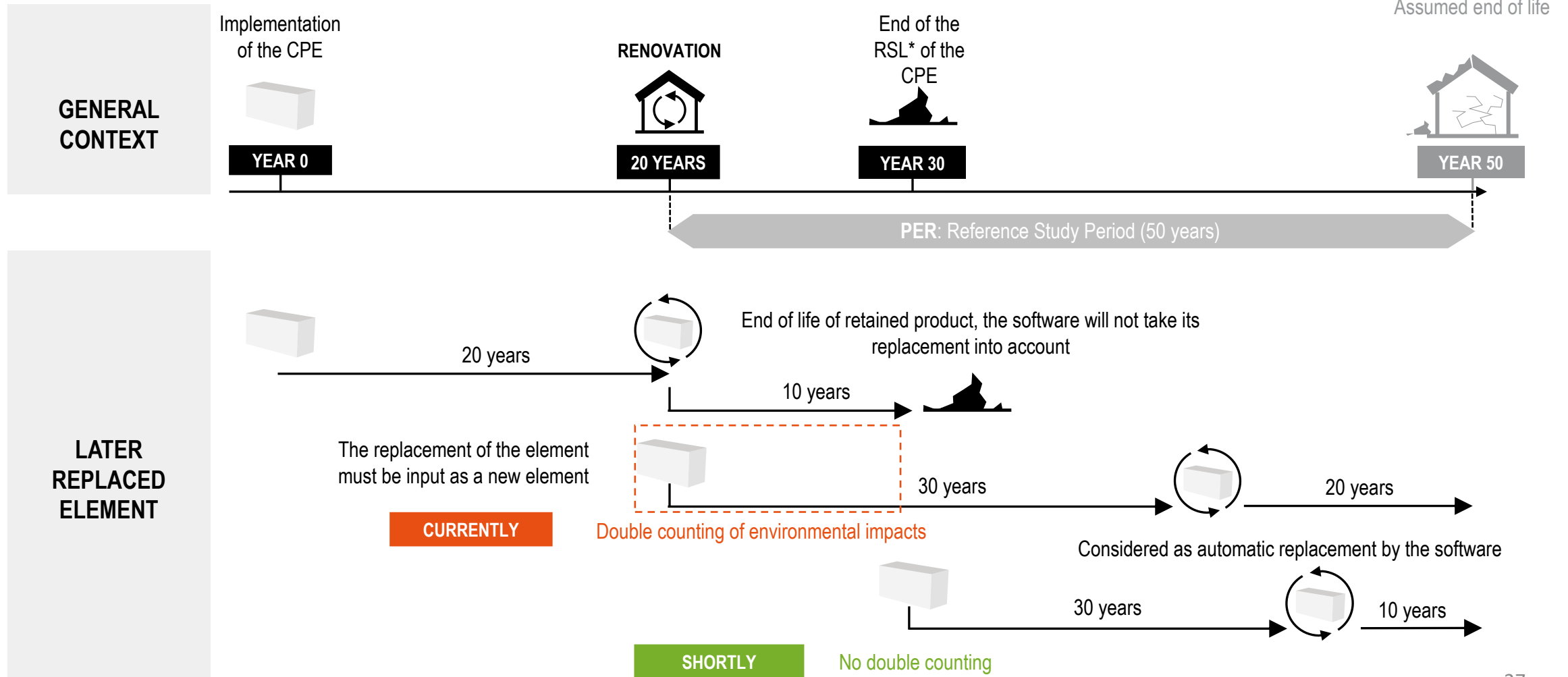


HOW DO I INPUT LATER REPLACED ELEMENTS?

“Later replaced elements” are components that are preserved during the renovation and replaced when they reach the end of their service life (RSL) during the reference study period (PER)*

CURRENTLY, the input of later replaced elements as new elements in the current software leads to counting twice the environmental impacts.

SHORTLY, the LCA software will integrate the LCA renovation module. Therefore, this double counting of environmental impacts, presently identified, will be corrected.





HOW DO I TAKE REUSED ELEMENTS INTO ACCOUNT?

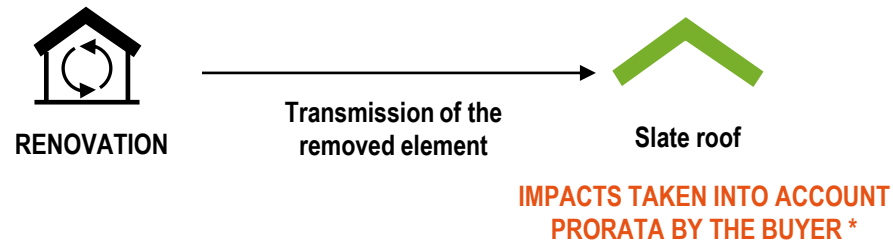
In general, the buyer of the reused element(s) also inherits the environmental impacts. Therefore, it is important to distinguish two cases:

CASE 1 – Transmission of the reused element

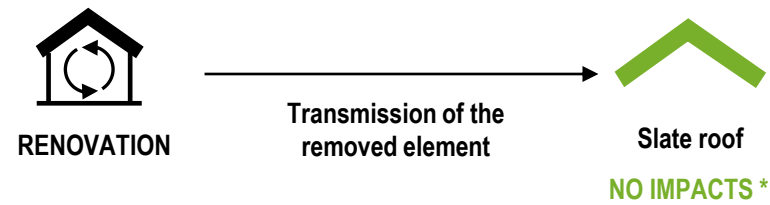
EXAMPLE

At renovation of the building, the slate roof is removed and reused in another ongoing construction project. Therefore, the removed element is not anymore property of the renovated building, and the buyer of the reused element inherits its environmental impacts.

OPTION 1 – THE ELEMENT IS NOT DEPRECIATED



OPTION 2 – THE ELEMENT IS DEPRECIATED

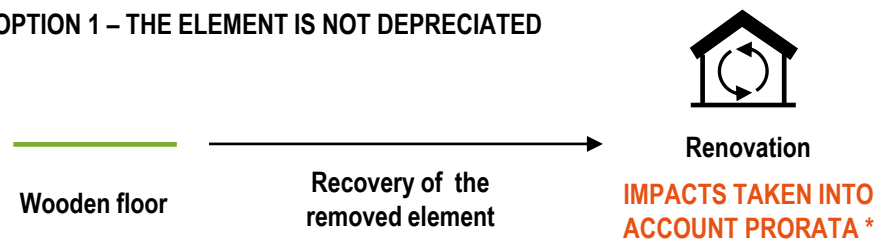


CASE 2 – Recovery of the reused element

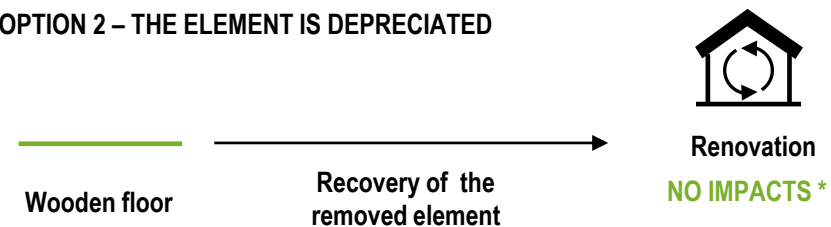
EXAMPLE

The renovated building recovers and reuses a wooden floor coming from the deconstruction of another building. Therefore, the element becomes property of the renovated building, it is thus important to consider the impacts of the reused CPE in the project. In case of a depreciated CPE (Achieved service life > RSL) no impact has to be considered.

OPTION 1 – THE ELEMENT IS NOT DEPRECIATED



OPTION 2 – THE ELEMENT IS DEPRECIATED



* The impacts linked to the transport and refurbishment are to be filled in in the contributor CONSTRUCTION WORK

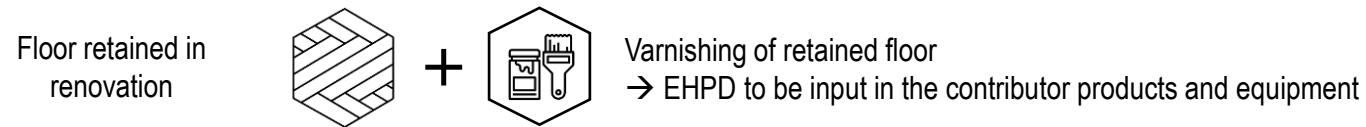


HOW TO TAKE INTO ACCOUNT, FOR A RETAINED ELEMENT, A MAINTENANCE TREATMENT OR A RESTORATION PROCESS (SANDBLASTING, SANDING, PAINTING...)?

The more cumbersome the maintenance or renovation process is, the more important it is to take it into account in the calculation of environmental impacts. The calculation method of environmental impacts linked to a restoration process is done as following:

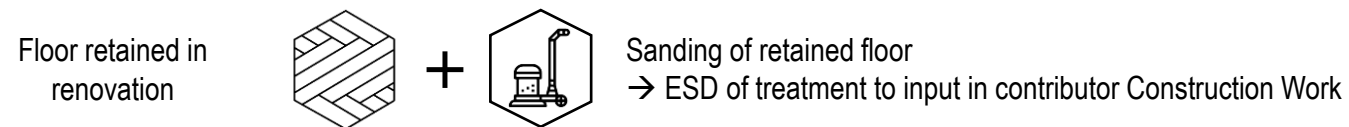
OPTION 1

If the process leads to addition of material, it will be necessary to input the EHPD corresponding to this maintenance product in the calculation software (i.e. varnish, paint, ...).



OPTION 2

If the retained element undergoes a physical action (sanding, sandblasting, ...), it shall be stated as comment in the contributor construction work and taken into account using a future Environmental Service Declaration (ESD) of treatment. Potential transportation to a processing center should also be taken into account.



NOTE

In order to avoid double counting of environmental impacts, it is recommended to analyse phases B2 - Maintenance and B3 – Repairing the life cycle of the restored element. Indeed, the steps B2 and B3 of the life cycle of the element can take into account the impacts linked to a maintenance process. This data is available in the Environmental and Health Product Declarations (EHPD) for the products, and Profile Environmental Product (PEP) for the equipment.



GLOSSARY



- ◆ **Remaining Service Life:** The remaining Service Life is the difference between the RSL of the element and its already achieved service life in the initial building, that means remaining Service Life = Reference Service Life – achieved Service Life.
- ◆ **RSL:** The Reference Service Life is the theoretical service life for the CPE. It is mentioned in the Environmental Product Declaration (EPD or FDES).
- ◆ **Programmatic entity:** A programmatic entity is a group of spaces with the same activity, under the responsibility of the same project owner.
- ◆ **FDES or EPD:** EPD = Environmental Product Declaration. FDES is the French equivalent of EPDs. FDES stands for Environmental and Health Product Declarations (FDES = Fiche de Déclaration Environnementale et Sanitaire). FDES include health indicators as well as environmental impacts.
- ◆ **PER:** (Période d'étude de référence) The Reference Study Period is the duration of the study for which the life cycle analysis is done. For all buildings, it is a conventional value decided equal to 50 years. The beginning of the reference period shall match the delivery of the refurbished or renovated construction.
- ◆ **CPE or element:** Construction Products and Building Equipment.
- ◆ **BEPOS indicator :** BEPOS is an energy performance indicator of the Carbon Energy Standard (Bâtiment à Energie Positive = Positive Energy Building). It is defined by the difference, expressed as primary energy, between the amount of neither renewable nor recovered energy used by the building and the amount of renewable or recovered energy produced and injected in the network by the building and its immediate area.



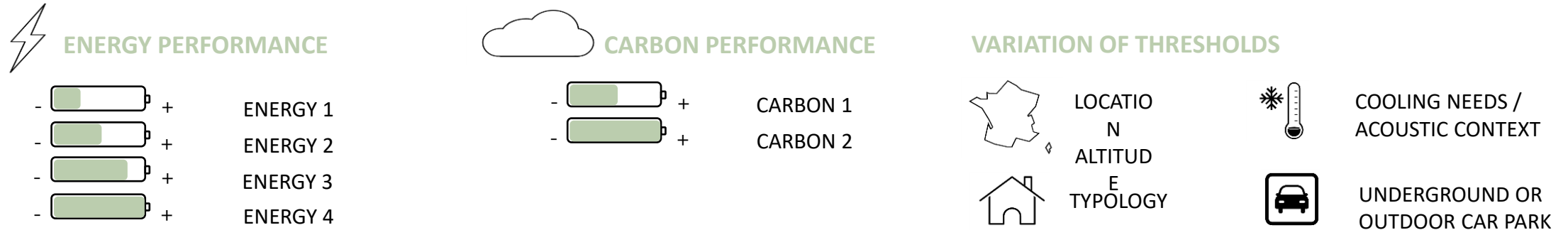
◆ “CARBON ENERGY” STANDARD / E+C- STANDARD:

The “Carbon Energy” standard (or E+C- standard) is a French environmental certification and methodology which aims to assess energy performance and whole life cycle carbon footprint of buildings. It was first developed for new buildings in order to prepare the new Environmental Regulation (RE2020) which will be released in 2021. More information in the [dedicated French website](#).

BUILDINGS TYPOLOGIES



EVALUATION OF ENERGY PERFORMANCE AND CARBON FOOTPRINT : PERFORMANCE LEVELS



◆ **INIES DATABASE :** French reference Database (for environmental and health product and equipment data) can be used in the context of the renovation LCA.

◆ **ELODIE SOFTWARE :** ELODIE is a French LCA software developed by the CSTB (Scientific and Technical Buildings Center) using FDES / EPDs/ PEPs from the INIES Database. Other compatible LCA softwares exist : EQUERRE, ARCHIWIZARD, VIZCAB, CLIMAWIN....



Alliance HQE-GBC acknowledges all actors who participated in the definition and completion of the Life Cycle Assessment method for renovation.

The actors of the HQE Performance 2017



The members of the WG environmental indicators of Alliance HQE-GBC.

And in particular:

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- Mathilde LOUËRAT, CSTB
- Sylviane NIBEL, Certivéa
- Jean-Christophe VISIER, CSTB

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AIA Environnement



What does a sustainable development approach provide to a project?

This question, always in our mind, sharpens our vigilance and allows us to always be source of proposals, having a critical and constructive spirit, to find adapted and appropriate solutions for the contextual issues of a project.

Because sustainable development and life cycle are closely linked together, we support the actors of a project since its beginning – phases of programming and conception of territorial strategies – until its implementation and operation.

Successive alerts about depletion of our resources and increase of the world's population lead us to be aware of the necessity to take a careful look at the preservation of our environment and to question the role of man in our societal organisations. Our collective responsibility to ensure the ongoing existence of mankind and of our planet changes our role as citizens. This change of paradigm shall inspire architecture and engineering of construction.

AIA Environnement was created to support these transitions by regrouping committed multidisciplinary staff (Architects / Engineers / Urbanists) relying on the expertise of the AIA Life Designers organisation.

Alliance HQE-GBC



Alliance HQE-GBC France is the alliance of professionals for a sustainable quality of life. It brings together unions, professionals federations, companies, local authorities and professionals individually. Buildings, urban planning and infrastructures through all stages of their life cycle – construction, operation, renovation – are at the core of its DNA, in a transversal vision combining quality of life, respect of the environment, economic performance and responsible management.

Thanks to its voluntary initiatives in France and abroad, the alliance acts for the general interest to innovate, increase knowledge, disseminate best practices and represent the sector of sustainable quality of life.

Alliance HQE-GBC is the French member of the World Green Building Council (World GBC), global network of sustainable building professionals in more than 74 countries.

Since 2010, Alliance HQE-GBC promoted the environmental performance as part of the strategic priorities of his prospective project "Lets build HQE Performance together".



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Drawn up by:



ENVIRONNEMENT

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