Level(s) – Test report from France

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Title of publication	Level(s) – Test report from France		
Version	V1	**Date**	13/12/2019
Beneficiary	European Commission : DG-ENV, DG-GROW and JRC		
Client	DHUP (Ministries of Ecological Transition and Territorial Cohesion)		
Pages	79	**Language**	English
Dissemination	Alliance HQE-GBC		
Published by	Alliance HQE-GBC		
Website URL address	http://www.hqegbc.org/respect-environnement/levels/		
Keywords	Level(s), framework, indicator, building, sustainability, environmental performance, resource-efficiency, life cycle assessment, test, Europe, France		

Contents

Abstract

In July 2014, the European Commission released the Communication on Resource Efficiency Opportunities in the Building Sector - COM(2014)445. This Communication describes the need for a common European approach to assess the environmental performance of buildings throughout their lifecycle.

Since 2015, the European Commission, under the leadership of DG-ENV and DG-GROW, with the support of JRC, have been developed a common European framework in response to this need. A wide panel of stakeholders has been involded in a progressive and iterative process. Three main phases have been performed: definition of the main macro-objectives, definition of related indicators and writing the detailed methodology. France has been involved in this process from the beginnig.

This voluntary framework, including its related reporting format, was named Level(s). Based on detailed guidance documents published by European Commision (EC) and Joint Research Center (JRC) in August 2017 (draft beta V1.0), a two-year test phase was carried out in the Member States, which started at the end of 2017 and ended in September 2019.

This report presents the main lessons drawn from the Level(s) test carried out in France in 2018 and 2019 under the leadership of Alliance HQE - GBC France. The first chapter presents the Level(s) framework, the context of the French test, the motivation, the organisation and general feedback from the testers. We collected data and feedback on 9 case-studies. The 2nd chapter details the findings and feedback according to the 6 macro-objectives. Then a summary of strengths and weaknesses is given in the 3rd chapter, together with a comparison between Level(s), E+C- method and HQE certification, as well as suggestions for improvement. Conclusions chapter summarizes the findings and the main messages from French actors, gives a list of tracks for next steps and briefly presents a new European LIFE project on Level(s) dissemination in which Alliance HQE-GBC is involved. Some annexes complete the report.

France is eager to participate in the improvement of Level(s) framework, in particular on the idea of setting up principles of equivalence that would higly facilitate its spreading..

Positive feedback:

- Sharing a common language, knowledge and framework about sustainable buildings
- Strongly relies on LCA standards developed by CEN TC350, mainly EN 15804 and EN 15978.

Main suggestions for improvement:

- Level(s) for all building types and at any time of life cycle: need a methodology for renovated building and for mixed building, and other non residential type of building (e.g. school, hostel …)
- Examples of calculation would be appreciated for each indicator.
- Homogenize the perimeters in each level(s) and create generic data for first level(s) to be easily upgraded to the next level.
- Set up principles of equivalence

1 Part 1: General overview of the French test

1.1 Level(s): What and why?

1.1.1 The structure of Level(s)

The Level(s) framework was developed by the European Commission with the scientific and technical support of the Joint Research Center (JRC). This framework is the result of a large concertation and cooperation with different kinds of experts and stakeholders from EU countries, started in 2015. It is structured against 6 macro-objectives dealing with the main aspects and concerns regarding buildings sustainability. For environmental issues, the methodology is mainly based on LCA principles and standards, such as EN 15804 (at construction product scale) and EN 15978 (at building scale).

The aim is to get a common language in Europe about sustainable buildings performance with a harmonized set of core indicators and related methods, throughout buildings lifecycle.

The following Table 1 lists the 6 macro-objectives and related indicators and tools. Moreover, the environmental performances, including LCA according to EN 15978, are gathered in a seventh part called ”Overarching assessment tool”.

Table 1: Overview of Level(s) framework:
Thematic areas, Macro-Objectives, Indicators and Tools

Thematic area	Macro Objective	Indicator or Tool
Life cycle environmental performance	1: Greenhouse gas emissions along a buildings life cycle	Indicator 1.1 Use stage energy performance
		Indicator 1.2 Life cycle Global Warming Potential
	2: Resource efficient and circular material life cycles	Tool 2.1 Life cycle tools: Building bill of materials
		Tool 2.2 - Scenario 1 Building and elemental service life planning
		Tool 2.2 - Scenario 2 Design for adaptability and refurbishment
		Tool 2.2 - Scenario 3 Design for deconstruction, reuse and recyclability
		Indicator 2.3 Construction and demolition waste
	3: Efficient use of water resources	Indicator 3.1 Total water consumption
	Overarching assessment tool	Life cycle tool: Cradle to cradle Life Cycle Assessment (LCA)
Health and comfort	4: Healthy and comfortable spaces	Indicator 4.1 Indoor air quality
		Indicator 4.2 Time outside of thermal comfort range
Cost, risk and value	5: Adaptation and resilience to climate change	Tool 5.1 Scenarios for projected future climatic conditions: Protection of occupier health and thermal comfort
	6: Optimised life cycle cost and value	Indicator 6.1 Life cycle costs
		Indicator 6.2 Value creation and risk factors

Behind each indicator, there is often a sub-set of indicators. Figure 1 shows the Level(s) framework more in details.

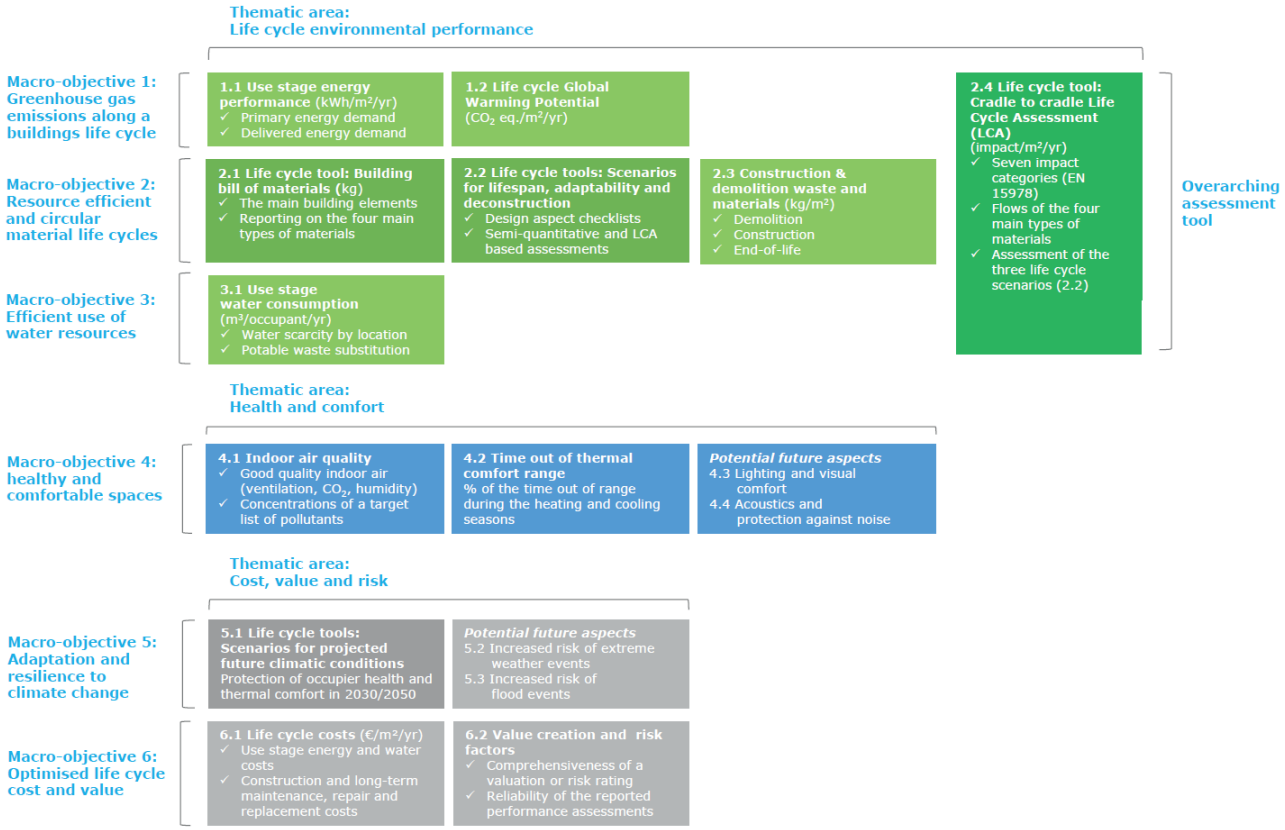

Figure 1: Level(s) macro-objectives and detailed related-indicators (Source: Level(s) framework, JRC, august 2017)

The scope of Level(s) covers offices and residential buildings, both new construction and renovation, although the methodology for renovation projects is not explicitely given. This last point would need improvement. implement the framework correspond both to different levels of maturity and different objectives. The following figure (2) explains the philosophy of these 3 levels.

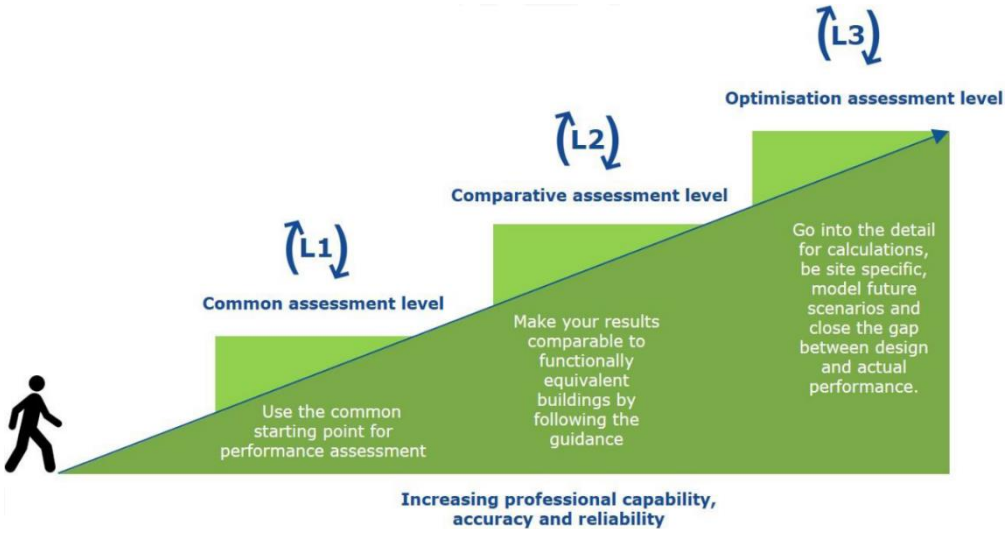

Figure 2: The three levels of performance assessment (Source: Level(s) framework, JRC, august 2017)

The framework is developed according to 3 levels, L1, L2 and L3, whose purpose is respectively minimum assessment, comparative assessment and optimized assessment. These 3 possible ways to

Description, detailed technical guidance and Excel reporting tool have been provided to testers. The two documents detailing the framework on L1, L2 and L3 levels were initially developed in English, but translations have been provided in French and 4 other languages. Some key documents are also available in six languages.

The two official websites for information on Level(s) project are :

- European Commission / DG Environment

  https://ec.europa.eu/environment/eussd/buildings.htm

- EC Joint Reserch Center (JRC, scientific and technical support for Level(s))

  https://susproc.jrc.ec.europa.eu/Efficient_Buildings/

1.1.2 Why France has been interested in testing Level(s) ?

Level(s) is an experimentation where the framework is tested in different countries. France was interested to know the level of knowledge in France and also in other countries about the subject of sustainable building. Level(s) could be a common language in Europe and France wants to feed this test with its own experience and experimentation in sustainable buildings.

In addition, French testers would see how to work with other tools, look at the building with a different eye because of different methodologies to answer the EC/JRC method.

Furthermore, in France another experimentation is also implemented in parallel, called “positive energy and low carbon experimentation” (E+C-). This experimentation is the first step before regulation in 2020 and can be used like a beginning of spread of Level(s) implementation in the French context. Indeed E+C- includes life cycle assessment in its method.

1.2 France: a future environmental regulation for 2020 based on E+C- experimentation

The current thermal regulation for new buildings, **RT 2012**, contains energy requirements expressed in terms of envelope efficiency (Bbio coeff.) and of primary energy consumption for regulated uses (Cep coeff.). Another requirement checks avoidance of thermal discomfort during summer (Tic, conventional indoor temperature).

In november 2016, the ministry for the Ecological and Inclusive Transition and the ministry of Territorial Cohesion, launched an **experimentation** based on a new methodology developed by CSTB and a working group of stakeholders, under the leadership of the ministries. The intention was to prepare the future regulation for new buildings, including not only energetic and summer comfort, but also progression towards low-carbon buildings. “Low-carbon” includes GHG emissions not only during operation but all along the **building life cycle**. This political orientation has given a name to the method and the experimentation: “**E+C-**”. A national Internet platform, the “E+C- Observatory” has been created for collecting the detailed results of full-scale case studies, including also economic data. The website[1]

[1] Website : http://www.batiment-energiecarbone.fr/ (French/English information but the detailed technical frameworks for energy and carbon calculation are not available in English).

hosting this observatory gives access to useful information and explains all methodologies regarding energy and carbon, in terms of calculation methods and performance levels. In parallel, a E+C- label was created, and the three main building certifications regarding energy and environment in France (HQE, Effinergie and BBCA) used E+C- method as a prerequisite.

In november 2019 **more than 1000 buildings** have tested the E+C- method and are documented in the Observatory.

During the E+C- experimentation, various LCA datasets may be used for calculation of environmental impacts: specific EPDs of construction products and equipment, complemented by default-generic datasets provided by the Ministry, to be used when specific data are lacking, all gathered in the French **INIES** database[2]. This latter also contains conventional data for equipment and services in order to perform building LCA studies, offering a certain level of simplification. It is also possible to use several EPD generators called “configurators” (Internet tools) for three construction industries: “SAVE” for steel products, “Bétie” for ready-mixed concrete and “DE-Bois”[3] for timber products. All these data need to be combined and processed in building LCA software tools complying with E+C- method. For the French experimentation, 8 building LCA tools (not only French ones) are officially recognized as E+C-compliant, in terms of method and of outputs.

1.2.1 E+C- methodology

Energy calculation method

The improvements in building energy performance being targeted by current – RT 2012 - and future regulations are based on a progressive process :

- reducing energy demand and improving efficiency of energy systems in order to limit consumption per building ;
- turning to renewable energy sources in order to reduce non-renewable consumption.

The method used for E+C- experimentation is based on three key indicators :

Bbio	indicator representing energy needs in terms of heating, cooling and artificial lighting
Cep	indicator representing energy consumption due to heating, cooling, artificial lighting and ventilation, as well as accessory sources.

[2] INIES website (free access): https://www.inies.fr/accueil/ (French) or https://www.inies.fr/home/ (English, but EPDs are presented in French).
[3] SAVE configurator: https://www.save-construction.com/
Bétie configurator: http://ns381308.ovh.net/ecobilan/login.html
DE-Bois configurator: http://de-bois.fr/
An EPD configurator has been recently developped by CERIB for prefabricated concrete elements, called Environnement IB.
For bio-based products an EPD configurator is expected by the end of 2019, called Akacia, developed by Karibati and EVEA Conseil, see https://akacia.evea-conseil.net/

BEPOS Rating	"BEPOS" is the French equivalent for "net zero energy" This indicator is established based on all equipment and devices used by the building, and distinguishes between renewable and non-renewable energy.

Environmental and Carbon calculation method used for E+C-

This evaluation is based on the principle of Life Cycle Analysis (LCA), and largely on the NF EN 15978 standard.

Depending on the method used (simplified or detailed), the number of environmental indicators to be calculated may vary from 9 to 28. These environmental indicators are determined for each phase of a building's life cycle, and their calculation is broken down across four contributors (figure 3):

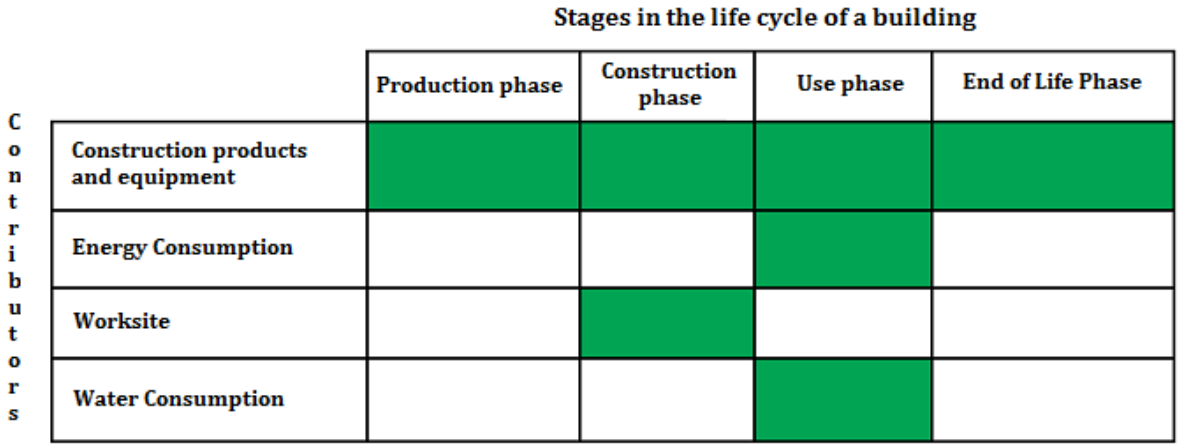

Figure 3:Stages in the life cycle of a building
(Source: Batiment Energie Carbone, February 2019)

The building's environmental impact is obtained by totalling up the environmental impact of each contributor. The environmental benefits of exported energy, and the re-use or recycling of products beyond the building's life cycle, may also be taken into account in the calculation.

For more information, see on Annex 5.1.

1.2.2 E+C- results

The main statistical figures 4 concerning projects gathered in the Observatory are given in the following tables. They are regularly up-dated on the website of the experimentation. All types of projects are mixed: E+C- labelled, certified like HQE or just auto-declared.

Contexte statistique

Opérations	744
Bâtiments	1023
Logements	5383
SDP total tertiaire	437 243 m²

Répartition des bâtiments

Bâtiments Tertiaire	148
Bâtiments de logements collectifs	260
Maisons individuelles ou accolées	615

Niveaux Énergie (E) et Carbone (C)

	C_0	C_1	C_2
E_0	54	51	-
E_1	55	64	4
E_2	172	360	43
E_3	40	114	58
E_4	5	2	1

Figure 4: E+C- Observatory – Overall statistics [4] (nov. 2019)

The Observatory contains a lot of residential buildings. Among tertiary buildings, offices are well represented, some teaching buildings are also present but the other types are very few. The performance table shows the difficulty to be efficient both in terms of energy and carbon. A significant number of projects do not reach carbon requirement so certain carbon thresholds will need to be refined.

Thanks to this E+C- experimentation, French professionnels gained experience on GHG emissions calculation over the building life cycle and progressively became more familiar with LCA data bases and tools. Training sessions dealing with energy-carbon methodology and LCA practice have been developed these last years, including qualification of “lead experts” called “Référents E+C-“. This situation is an excellent springboard for the preparation and implementation of the future regulation.

The **future Fench regulation for new buildings,** called **RE 2020**, “E” meaning environmental, is being prepared during 2019 and 2020, under the supervision of the two ministries (Ministry for an ecological and solidary transition, Minsitry of territorial cohesion and relations with local authorities), involving experts groups, concertation groups and an application group.

The recent works have specified the performance calculation methods, for energy and carbon, and will be followed by the requirements setting (thresholds, modulation factors, safeguards, etc.). The regulation texts will be released mid-2020. After an approval circuit, it is expected that this regulation will come into force at the end of 2020.

Finally, the methodology of the new environmental regulation RE 2020 will respect the overall philosophy of the E+C- method but will differ from it on several aspects. This is because some points have been analysed and discussed again among stakeholders, on the basis of new technical calculations and tests, and because of final political choices, in terms of method and of requirements.

[4] http://observatoire.batiment-energiecarbone.fr/statistiques/experimentation-en-chiffres/

1.3 Testing of Level(s)

1.3.1 Testing in EU and France

The European commission has developed Level(s): a reporting framework to improve the sustainability of buildings. In April 2018, a testing phase was opened. Over 20 countries and more than 130 buildings have been registered. It is important to note that France is one of the most active countries with 21 construction projects, 13 residential and 8 office buildings (figure 5).

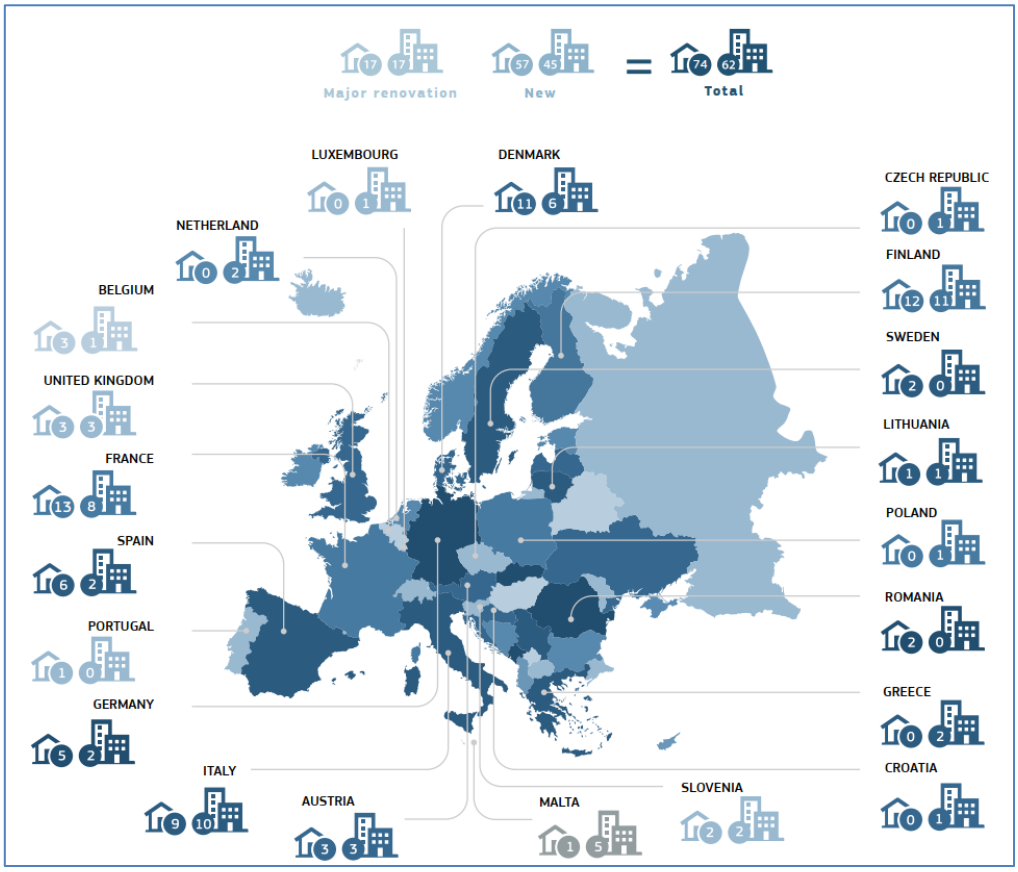

Figure 5: Number of case studies testing Leves(s) in Europe. (Source: European Commission, 2019).

In France, the Green Building Council, that is Alliance HQE-GBC, organized a national community. 14 out of 21 projects buildings joined it. At the time of writing, 4 gave up and 9 sent to us their results and feedback shown in table 2.

Table 2: List of case-studies and testers received in September 2019

Name of the project	Organism	HQE Certification	Type of project	Type of building
Tour Saint-Gobain	Artélia group	Certified	new	residential
Micheville Bât D	Bouygues Construction	Approache	new	office
MI Chuzelles	Cerema	Not certified	new	mix
Résidence Bon Pasteur	Cerema	Approach	renovated	office
Flow	Covivio	Certified	new	other
Les tours du Jardin de l'Arche	Egis	Certified	new	office
Meriadeck	Nobatek/INEF4	Certified	new	residential
EHPAD Port en Bessin	Vinci	Certified	new	residential
Armorique II	Lafarge Hoclim	Not certified	new	residential

The fact that some testers abandoned this experimentation was mainly due to lack of time. Indeed they preferred to focus on E+C- experimentation instead of Level(s) experimentation. The other reason was the time spent to understand the guidance and recalculate everything.

1.3.2 Scope of the test in France

For French testers, the aim was to test different indicators and compare EC-JRC experimentation and current studies performed in and for French market (table 3).

Table 3: Tested indicators and Tools of Level(s) in France according to the 9 buildings.
A colour code shows for each building which indicators and tools have been tested and at which level.
(Level 1: yellow, Level 2: blue, Level 3: green)

Building	1	2	3	4	5	6	7	8	9
Indicator 1.1: Use stage energy performance	L2	L2	L1	L1	L2	L1	L1	L1	L2
Indicator 1.2: Life cycle Global Warming Potential	L2	L3	L1	L1	L2	L1	L1	L1	L2
Tool 2.1: Life cycle tools: Building bill of materials	L2	-	L1	-	L1	-	L1	L1	L2
Tool 2.2: Scenario 1 -Building and elemental service life planning	L2	L1	L1	-	L1	-	L1	L1	-
Tool 2.2: Scenario 2 - Design for adaptability and refurbishment	L2	L2	L1	L1	-	-	-	-	-
Tool 2.2: Scenario 3 - Design for deconstruction, reuse and recyclability	-	L2	-	L1	-	-	-	-	-
Indicator 2.3: Construction and demolition waste	L2	L2	-	L1	L1	L1	L1	L1	L1

Indicator 3.1: Total water consumption	L2	L3	L1	L3	L2	L3	L1	L1	L1
Indicator 4.1: Indoor quality	L1	L1	L1	-	L1	L1	L1	L1	-
Indicator 4.2: Time outside of thermal comfort range	-	L1	L1	-	L3	L1	L1	L1	-
Tool 5.1: Scenarios for projected future climatic conditions	-	-	-	-	-	-	-	-	-
Indicator 6.1: Life cycle costs	-	-	-	-	-	-	-	-	-
Indicator 6.2: Value creation and risk factors	used	used	used	used	used	-	used	used	used
Cradle to cradle Life Cycle Assessment (LCA)	L2	L3	-	-	L2	L1	L1	L1	-

The testers implemented almost all indicators except those of macro-objectives 5 (resilience) and 6 (life cycle cost). In most of cases Level 1 was chosen, Level 2 was less frequently chosen, and Level 3 was rarely chosen, excepted for the water consumption indicator.

For this Level(s) test phase, it was allowed to choose for each indicator the level of assessment (L1, L2 or L3) but in the future, such a flexibility will be limited. Indeed, for consistency reasons, a single assessment level should be chosen for the whole assessment, because the level reflects the objective of the assessment (common, comparative or optimized).

The Level(s) framework was tested for different types of construction projects. Among these were 8 new buildings and one refurbishment. Building typologies were also diverse, as shown in figure 6 and 7.

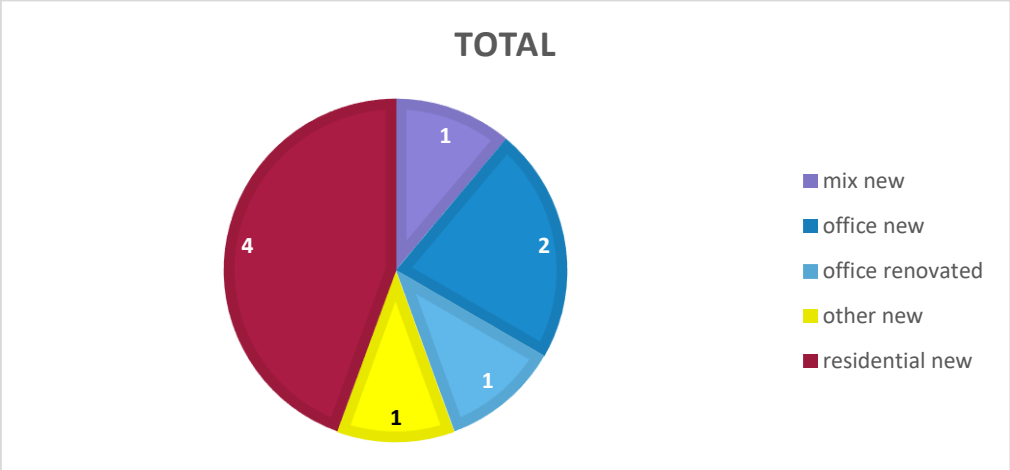

Figure 6: Typology of French projects in September 2019

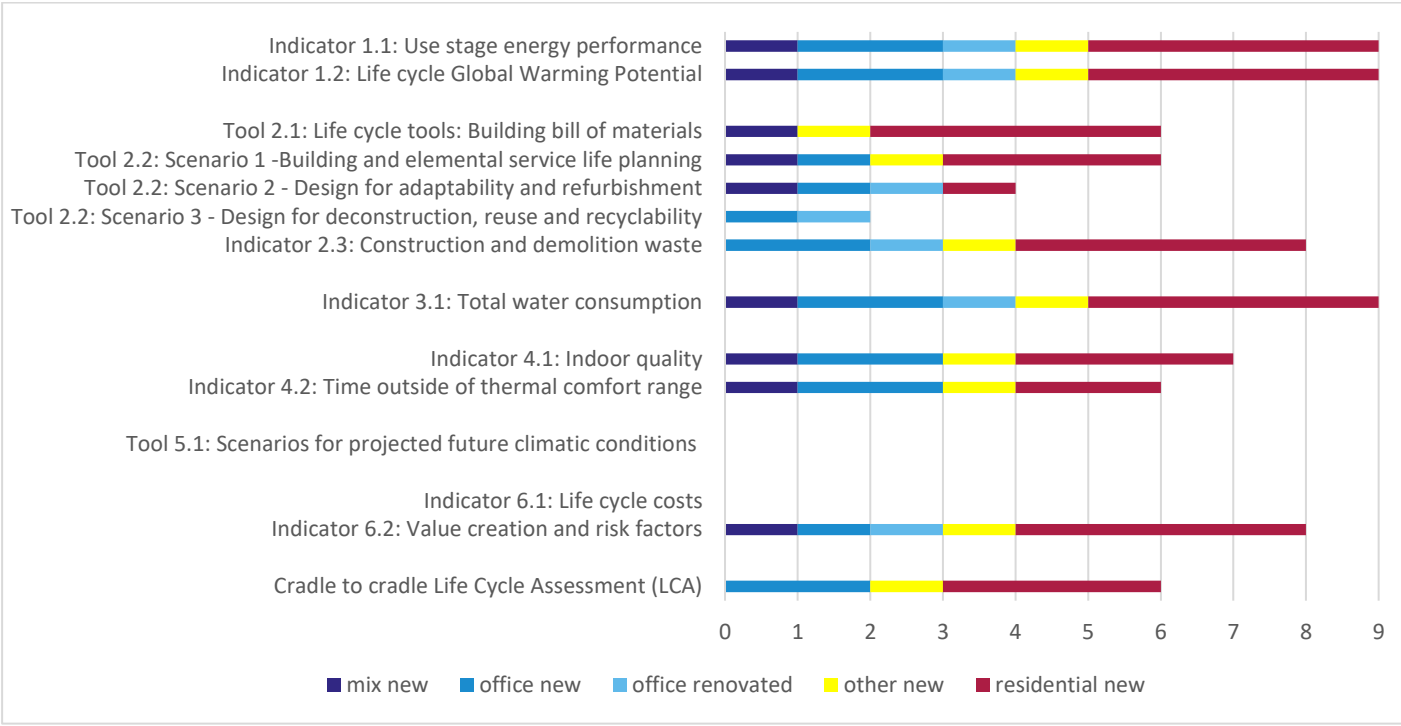

Figure 7: Calculation of indicators for each building type in September 2019

1.3.3 How the test was organised

After Level(s) seminary organized in France with European Commission in November 2017, Alliance HQE-GBC launched in June 2018 a call for testing Level(s) in France, supported by ministries.

With certifiers Certivéa and Cerqual, CSTB and ministries (DHUP), a Technical Committee was created, managed by Alliance HQE-GBC. Alliance HQE-GBC centralised testers' questions and gave answers with the help of the Technical Committee or JRC helpdesk.

Two workshops were organized:

- The first one at the beginning of the process (October 16th, 2018). The aim of this workshop was to explain the test and start to give some advice and identify adaptation that we can do because of our regulation.
- The second one just before the end of the test (May 20th, 2019). The aim of this workshop was to get feedback from every tester, namely to understand where were the difficulties, to see whether the tools are user-friendly, and to share experiences.

The data and results of each case study were delivered to Alliance HQE-GBC, using the Level(s) Excel reporting format, and forwarded to the JRC. In a second step, the testers were invited to answer the questions of the JRC survey (on-line process), with the assistance of Alliance HQE-GBC.

The presentation and promotion of the Level(s) test carried out in France and some other countries was made during the 8th international congress of sustainable building "Cities to be" organized by Alliance HQE-GBC and Novabuild, which took place on 12th and 13th of September 2019 in Angers. More information here: https://citiestobe.eu/

Three events took place during this congress:

- Conference session: “Towards a European framework of reporting of building environmental performance – 1st feedback of Level(s) testers”.
- Awards ceremony: delivery of Level(s) pilot attestations by Alliance HQE-GBC and European Commission to the testers (figure 8).
- Workshop: discussion about test conclusions, improvements needed and next steps, with the participation of an international panel involved in EU projects, some Level(s) testers, plus special guests as Josefina Lindblom (European Commission, DG-Environment), James Drinkwater and Audrey Nugent (WGBC, European Regional Network of GBCs) and Florian Piton (Housing, Urban-planning and Landscape Direction, Ministries of Ecological & Inclusive Transition and Cohesion of Territories).

The presentations made during the conference session and the workshop are given in annex 5.2.

Figure 8: Picture of French testers who received their award by Caroline Lestournelle (member of Alliance HQE-GBC board) and Josefina Lindblom (DG-ENV) on September 13th 2019

1.4 Overall feedback from the test

1.4.1 About the feedback

For a better understanding, most of testers are engineering consultants (or equivalent) and they are familiar with building-LCA. Each project study (building LCA, thermal study, …) was already realized before Level(s) experimentation with the help of current regulation, HQE certification or E+C- experimentation. The aim was to not recalculate again something usually done before. That’s why testers did not modify their calculation.

1.4.2 What were the expectations that motivated the use of Level(s)?

Some actors, as large building owners or large contractors, are working at an international level and were highly interested by harmonisation of environmental indicators at EU scale.

The design and engineering offices were interested in increasing their knowledge and skills, in order to be ready to sell new services to their clients.

The manufacturers of building products who are among the leaders in Europe wanted to be pioneers in experimenting and forming their own opinion on Level(s).

CEREMA was also present among the testers, it is a Public Scientific & Technical Center on Risks, Environment, Mobility and Land Use Planning, which acts as a support to public authorities (Ministries, local and regional authorities).

1.4.3 Feedback about the guidance documents

The difficulty to understand the guidance documents was reported by participants. The reporting tool was more intuitive than the guidance documents and was perceived as a stand-alone tool.

National common practices may differ from Level(s) methodology and this caused extra work. Most of test projects already contained lots of data – e.g. floor area, primary energy demand or bill of quantities – but with another format or unit.

It was difficult for all testers to have access to the standards mentioned in the guidance documents (e.g. tables on ventilation) and to identify all needed data to fill in the reporting forms.

It was not easy to juggle between parts 1, 2 and 3 and between levels L1, L2 and L3 in the 2 volumes of the guidance documents.

Examples of evaluation or calculation of each indicator would be necessary to facilitate understanding and application.

2 Findings and feedback, indicator by indicator

This feedbacks are made by French testers and improvement, suggestions by the technical committee. Some existing rules or tools used in France in certification or regulations are explained on this part to better understand what has been made by testers group.

2.1 Macro-Objective 1 - Greenhouse gas emissions along a buildings life cycle

Table 4: Tested indicators and Tools of Level(s) in France according to the 9 buildings for Macro-objective 1

Building	1	2	3	4	5	6	7	8	9
Indicator 1.1: Use stage energy performance	L2	L2	L1	L1	L2	L1	L1	L1	L2
Indicator 1.2: Life cycle Global Warming Potential	L2	L3	L1	L1	L2	L1	L1	L1	L2
Cradle to cradle Life Cycle Assessment (LCA)	L2	L3	-	-	L2	L1	L1	L1	-

2.1.1 Reference area unit

Area units are different in Level(s) and in usual French practice. In France, for E+C- global warming assessment, we have chosen the “floor area” known as ”Surface de Plancher” or “SDP”, which has been used since 2012 for urban-planning and construction permits. For the energy performance assessment we use a dedicated area. We currently don’t use IPMS. As the correspondence between the two area units is not explicit (a ready-to-use ratio does not exist) the testers have retained the French SDP. This issue of reference area unit has been reopened for RE 2020.

2.1.2 Energy in operation

In Level(s) 5 energy uses (the 5 ”regulated” uses) need to be filled in: heating, cooling, ventilation, hot water, lighting.

In RT2012 the same 5 energy uses are calculated. It was easy for testers to fill in.

E+C- experimentation goes further and include all energy uses , including users’ appliances (currently considered as fixed values).

For RE2020, what is emerging is to take into account all building-related energy uses (excluding users’ appliances).

2.1.3 Assumptions for calculation of GHG emissions through LCA

The reference study period for buildings is different in Level(s) and in E+C- method, respectively 60 years and 50 years. The debate was reopened in France and a reference study period has to be defined for RE 2020.

Level(s) asks for GWP sub-indicators which are not included yet in the current versions of EN 15804(+A1) and EN 15978: fossil, biogenic and LULUC (land use and land use change) GWP. These are introduced in the new version of EN 15804(+A2) to be published end of 2019, but its entry into force will be postponed (for a maximum of 3 years). So only one line of the GWP reporting format can be filled (instead of 5).

Building LCA is structured according to a series of architectural and technical ”lots” including Shell, Core and External Works (the latter are excluded in L1 and L2, included in L3). In E+C- we have the same perimeter, the building and the works on its plot of land (as in L3), but the lots are defined a bit differently. In building LCA modelling we often face a lack of completeness of the description. The higher completeness, the higher GHG emissions are ! There is a need to define a strict perimeter, with default values if there are no specific EPDs. It is confusing to have a building scope varying with the level, it seems better to adopt the same perimeter for all levels, with a default value for external works in L1 and L2. The inclusion of external works on the plot is questionned for the future RE 2020.

During operation, Level(s) considers GWP linked to energy and water use (upstream processes), but should also consider GWP linked to sewerage (downstream processes) and GWP due to refrigerant leakages.

In the Level(s) reporting format, results are expressed module by module, and not totally for the entire life cycle. In France results are generally expressed by contributor and in total, but not by life cycle phase. For the future RE 2020, they will also be expressed by life cycle phase.

Level(s) considers full life cycle for LCA calculation. Since its origin, the French INIES database has included full life cycle EPDs, that is calculated from cradle to grave. French experts are attached to that full perimeter in LCA studies.

The indicators of this macro-objective are already covered by our E+C- methodology because this latter addresses the same issues. The minor differences noticed between Level(s) and the French methodology would lead to extra-work if the objective is to benchmark results across Europe. At the current state, results are not stricto-sensu directly comparable.

The distinction between fossil, biogenic and LULUC GWP is not yet operational because too recently introduced in the revision of EN 15804. This distinction is somewhat artificial and misleading because GWP due to refrigerants leakages or GWP due to chemical reaction in cement manufacturing are not, strictly speaking, “fossil”, “biogenic”, or “land use and land use change” related.

Another point in Level(s) is that credits from “temporary carbon storage” are to be excluded. It is contradictory with the French law on the evolution of housing, planning and digital, called ELAN law, enacted in November 2018, requiring to take into account the effects of carbon storage in the LCA assessment in the future environmental regulation RE 2020 for new buildings. What is more, an indicator accounting for the biogenic carbon stored in the building materials during its service life is required by the law.

2.2 Macro-Objective 2 – Resource efficient and circular material life cycles

Table 5: Tested indicators and Tools of Level(s) in France according to the 9 buildings for Macro-objective 2

Building	1	2	3	4	5	6	7	8	9
Tool 2.1: Life cycle tools: Building bill of materials	L2	-	L1	-	L1	-	L1	L1	L2
Tool 2.2: Scenario 1 -Building and elemental service life planning	L2	L1	L1	-	L1	-	L1	L1	-
Tool 2.2: Scenario 2 - Design for adaptability and refurbishment	L2	L2	L1	L1	-	-	-	-	-
Tool 2.2: Scenario 3 - Design for deconstruction, reuse and recyclability	-	L2	-	L1	-	-	-	-	-
Indicator 2.3: Construction and demolition waste	L2	L2	-	L1	L1	L1	L1	L1	L1

This macro-objective is very relevant because resource efficiency and circular economy are crucial issues, both at product level and at building level. But it is challenging to address them in an harmonised and operational way.

Secondly, when the project is at the preliminary design stage, e.g. at the building permit stage, this macro-objective is difficult to implement because design choices are not complete, data are not available. It would be interesting to develop criteria adapted to early design stages. When the building is built or under construction, the indicators can be calculated and scenarios defined according to actual practice and feedback, so in that situation it is feasible to make the assessment.

2.2.1 Bill of materials

The Level(s) approach by material type and not by product family or by lot was rather surprising. As quantifying the masses of 4 main material types is not used in France and not easy to do, this was perceived as not relevant. In our opinion the best approach is to develop EPDs for well identified construction products and equipments and to aggregate them at the building scale through a structured list of architectural and technical lots. It is concrete, practical, and corresponds to the organization of professionnals (designers and contractors). LCA indicators as ADP (abiotic depletion potential) already include certain aspects of resource efficiency.

It is difficult and not always possible to know the exact nature of materials and related quantities included in construction products. Data sets gathered in INIES database don't always provide this information (for instance for default data sets). Sometimes materials are expressed in % and not in mass. Automatic arrangement of information according to the 4 main material types does not exist, so this exercise is very time consuming.

2.2.2 Service life planning

Service lifes for construction products, equipment and for the whole building are already defined and included in INIES database and in LCA tools for buildings. The renewal of each product during the life cycle of the building is calculated as a decimal number and automatically taken into account. Where appropriate, the LCA tools allow to reduce service lifes of products, but not to extend them.

2.2.3 Adaptability, deconstruction, reuse…

The tool chosen by a tester for scenario 3 and L2 was DGNB TEC 1.6, but this tool appeared as not clear enough.

Adaptability, reversibility and deconstructibility of buildings, anticipated at the design stage, are very important to make longer the service life of buildings and then reduce GES emissions and facilitate circular economy. In some French projects under the Level(s) test, a relatively simple adaptability study had been made by the architect, this is not a frequent practice to address this issue. Reuse is another interesting challenge. In France there are ongoing R&D works dealing with all these topics, as the permanent workshop on circular economy in the building sector supported by the Building and Energy Foundation funds (*Fondation Bâtiment Energie*) and managed by CSTB. There are also implementation initiatives and experimentations on reuse of building products on construction sites.

2.2.4 Other alternatives

When Level(s) framework allows the use of several tools for a same macro-objectif or indicator, on one hand it is positively perceived by testers, but on the other hand it makes difficult to compare two projects for which two different methods or tools have been used. This is a question especially for Level 2 whose aim is comparability and benchmarking in national scale.

Linked to the BWR 7 "Sustainable use of natural resources" of the Construction Product Regulation (CPR), this challenging macro-objective is not yet correctly covered in France, and Level(s) suggested tools appears as not well adapted.

The current test “HQE Performance” on circular economy, launched in 2019 by Alliance HQE-GBC, and R&D works supported by Building and Energy Foundation, will probably bring new answers in the next future to this macro-objective. We can also mention calls for tenders / call or projects launched by ADEME (French Environment and Energy Agency) on circular economy. Last but not least, certification bodies need to correctly address these issues through performance assessment methods.

To understand better, HQE Performance test is based on Building MFA. The Building MFA method, developed by EVEA and Cerqual, provides a visual representation of product and waste flows during the lifecycle of a building as well as making use of some of the lesser **used indicators in the EPDs**. It calculates circularity indicators that consider the complete lifecycle of a building operation (construction, maintenance, and deconstruction), as follows:

- Recycled materials (%)
- Reemployed/reused materials (%)
- Recycled waste (%)
- Reemployed/reused waste (%)

In addition to the above, a locality indicator (transport intensity) is calculated, which can be broken down into sub-indicators according to product origin and the product waste management plan. These indicators enable the LCA to take into account the impact of transportation associated with the recycling of waste as well as with product and equipment supply.

A diagram representing the perimeter of the system and the considered flows is shown below (figure 9):

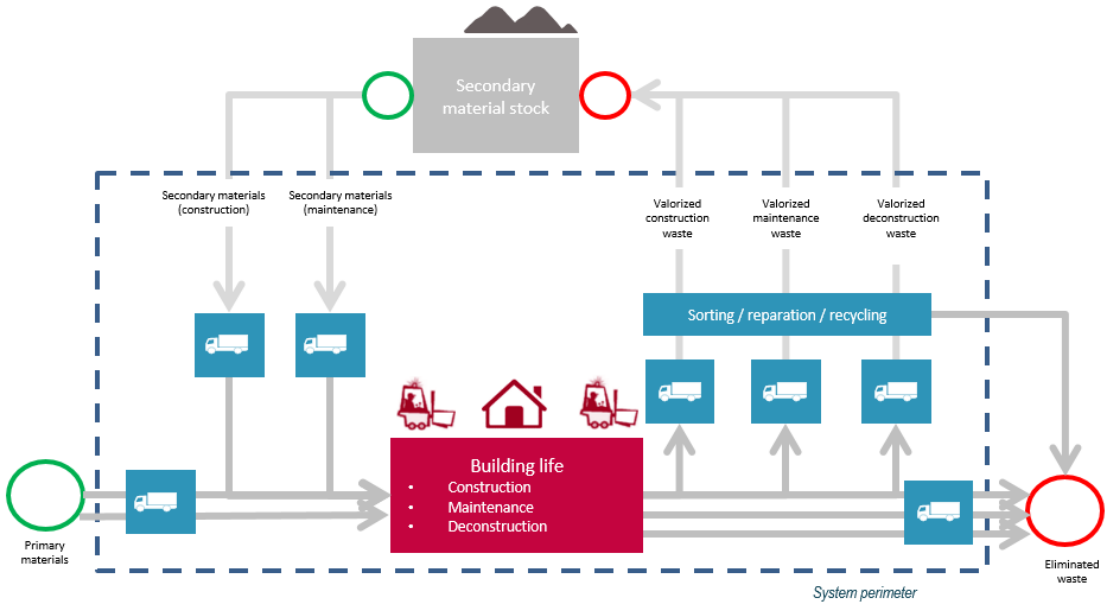

Figure 9: perimeter of the system and the considered flows

This method described in this abstract is supported by an MFA model constructed using Umberto software. The model shows product and equipment flows in all building work packages during a building’s construction, maintenance and deconstruction. It indicates for each product or equipment the ratio between secondary and primary materials used for its production. It also tracks for each product or equipment, at each building lifecycle stage, the amount of waste destined for landfill or incineration and

the amount of waste to be recycled or reused. This method can be used in the analysis of several types of construction projects (offices, collective or individual housing, etc.) including new projects and renovations.

2.3 Macro-Objective 3 – Efficient use of water ressources

Table 6: Tested indicators and Tools of Level(s) in France according to the 9 buildings for Macro-objective 3

Building	1	2	3	4	5	6	7	8	9
Indicator 3.1: Total water consumption	L2	L3	L1	L3	L2	L3	L1	L1	L1

2.3.1 Indicator 3.1 Total water consumption

For each level, there were different difficulties.

In **Level 1**, not all water uses are included in the calculation (e.g. dishwashing, rainwater). For testers, this is not representative of the use of water ressources.

In **Level 2**, some testers would like to change the number of occupied days in the building but it was not possible. They think the tool should accept to increase the number of days (but not to decrease it). The disadvantage is that the conditions of comparability would be modified… and it is contradictory with the objective of Level 2.

The **Level 3** appears to be the most interesting level despite the fact that rainwater is not taken into account. This is a limitation of this macro-objective.

With those different results, testers wonder about the benefit of these 3 scopes completely different between the 3 levels. Level 3 perimeter is larger than the two others, making any comparisons not relevant. This was disturbing for the testers.

2.3.2 Other impact non included in indicator 3.1

In HQE certification, in addition to drinking water use, the use of rainwater minimizing drinking water use is taken into account. Indeed, in the tool there is a simulation day by day mixing rainfall data and water tank size with uses profiles.

In E+C- experimentation, not only calculation of quantities of water is taken into account but also:

- Environmental impact of drinking water use (upstream processes)
- Environmental impact of wastewater treatment and rainwater management (downstream processes)

These processes represent about 5 to 10% of total GHG emissions of the building life cycle so it is not negligible.

2.4 Macro-Objective 4 – Healthy and comfortable spaces

Table 7: Tested indicators and Tools of Level(s) in France according to the 9 buildings for Macro-objective 4

Building	1	2	3	4	5	6	7	8	9
Indicator 4.1: Indoor quality	L1	L1	L1	-	L1	L1	L1	L1	-
Indicator 4.2: Time outside of thermal comfort range	-	L1	L1	-	L3	L1	L1	L1	-

2.4.1 Indicator 4.1 Indoor air quality

Design indoor air conditions: It was difficult or impossible for testers to find information on categories in EN 16798 about ventilation rate, CO_2 concentration and relative humidity (there exist numerous parts under EN 16798). In France we are not using these categories, only quantitative results are asked for. With an easy access to the tables included in this standard, this assessment does not require an extra work.

Target air pollutants for source control: The knowledge of pollutant emissions is not possible at design stage. The French testers responded not with precise figures but with the help of the heath label of construction products, graduated from A+ to C class, once the product is clearly identified.

The use of the health label of products in HQE certification is more efficient and easier to implement, because the health class is included as additional information in INIES EPDs (called FDES, 'S' meaning health). Indeed, the "Grenelle" environmental Act of July 12th 2010 stated that all construction and decoration products made available on the market, for indoor use, must be provided with a health label reflecting the level of VOC emissions (10 chemical substances including formaldehyde + Total VOC) from January 1st 2012. A 2011 Decree and related Order have defined the list of concerned products and the label specifications (figure 10).

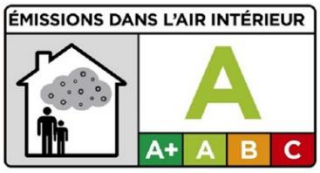

Figure 10: Product health label informing on VOC emissions in indoor air

The so-called ELAN Act n° 2018-1021 of 23 november 2018, in its article 178, states: "*A Decree in the Council of State defines: 1° For construction products and equipment, the procedures for calculating and formalizing the information necessary to comply with the requirements referred to in Article L. 111-9, in particular: […] d) For certain categories of products and equipment, their impacts on the indoor air quality of the building*". This article applies to new buildings. The Decree is not published yet.

2.4.2 Indicator 4.2 Time out of thermal comfort range

The present situation in France is the following:

- In the thermal regulation RT 2012 for new buildings: the indicator Tic (conventional indoor temperature) is calculated on a hot sequence of days in summer. The requirement is : Tic < Tic_{ref} . Calculation method and conventional assumptions led to critics, so this indicator will evolve next year.
- In the thermal regulation RT-Ex for existing buildings under refurbishment: the indicator Tic (only in "overall' regulation part, not in "by element" regulation part) is calculated with Tic < Tic_{ref}
- HQE certification: For premises without mechanical cooling, the indicator is a percentage of time, over the year and for occupation periods, during which the operative temperature is out of an interval of comfort, or during which thermal comfort conditions are out of a polygon on the Givoni diagram (in the case where air movements can be created in the room). The requirements (in % of time) vary according to the French climatic zones.
- E+C- experimentation: optional DIES indicator (developed some years ago by CSTB) which takes into account both the duration of discomfort (hours) and its intensity (based on PPD – cf.

ISO 7730) with consideration of adaptive comfort, the result being expressed in “weighted hours”

– Future RE 2020 : a new thermal comfort indicator (with a threshold or requirement to meet) will be included, close to the DIES indicator tested in E+C- but expressed in degree-hours.

Apart from the regulatory calculation, thermal comfort is generally assessed through dynamic thermal simulation, as it is the case for HQE certification. In ‘normal’ cases, it is not a frequent practice to implement such a simulation. When it is done, it is easy to calculate either a % of time of discomfort or a number of hours. However, a duration of discomfort is not really representative of its intensity.

It is important to note that Level(s) requires 4 values of the time out of range (in %) :

- For winter (heating season) and for summer (cooling season),
- For premises without mechanical cooling and for premises with mechanical cooling,
- Optionally, translation of the 4 results into a normative category (from I to IV)

Most of time, when a dynamic simulation is done, it is only to identify overheating in summer in premises without mechanical cooling, because it may be critical. In the 3 other situations, there are solution-oriented requirements. In France, the thermal environment categories are rarely used. So we prefer to choose our national calculation methods instead of default EU ones.

The future indicator for RE 2020, inspired by DIES, should bring an interesting answer to Level(s) expectations. In addition, it is envisaged that if discomfort exceeds a certain limit, a fictive cooling system will be considered.

2.5 Macro-Objective 5 – Adaptation and resilience to climate change

Table 8: Tested indicators and Tools of Level(s) in France according to the 9 buildings for Macro-objective 5

Building	1	2	3	4	5	6	7	8	9
Tool 5.1: Scenarios for projected future climatic conditions	-	-	-	-	-	-	-	-	-

This macro-objective was not implemented by our French testers because of lack of time and lack of weather data. Indeed, there are no prospective weather data, harmonized and declined for the various French climatic regions or locations. For comparison or benchmark purposes, it is important to share consistent files, based on the same methodology, to address 2030 and 2050 weather conditions.

The calculation of thermal comfort conditions in 10, 20 or 30 years is a good way to assess the resilience of the new and renovated buildings regarding global warming, for the health and well-being of people. The testers were interested in this topic, they found it relevant. This brings added value to the sustainability assessment of buildings.

Currently, to address this issue on a voluntary basis, some actors make dynamic simulations with 2003 weather data. That year, a long and intense heat wave occurred in summer, especially in August, having led to 15 000 premature deaths in France. Some R&D works are ongoing, for example in standardization, to progress on harmonized weather files including climate changes. In non-cooled spaces, we probably need risk-oriented methods to address occupier health risks.

<u>Specifications for adequate weather files:</u>

- Public and transparent data sources,
- Anticipating 2030 and 2050 climate,
- Data needs: air temperature, solar irradiation, humidity, wind
- Harmonized method of projection across EU
- But also distinguishing diverse local/regional climatic conditions in each country

2.6 Macro-Objective 6 – Optimised life cycle cost and value

Table 9: Tested indicators and Tools of Level(s) in France according to the 9 buildings for Macro-objective 6

Building	1	2	3	4	5	6	7	8	9
Indicator 6.1: Life cycle costs	-	-	-	-	-	-	-	-	-
Indicator 6.2: Value creation and risk factors	used	used	Used	used	used	-	Used	used	used

This macro-objective 6 was not selected by French testers.

2.6.1 Indicator 6.1 Life cycle costs

To do a life cycle cost, a database is needed and for this test, French testers thought about European Commission database but this one is not free. The high cost of it can be a barrier for people.

Furthermore, testers are not necessarily the owner of the building. That's why the testers do not necessarily know when is planned maintenance and replacement. It is difficult for them to anticipate the operation and maintenance costs of the building and so to implement this macro-objective.

The reel aim is information access. The interpretation differs due to, among other things, the variability parameters

A free LCC tool is made available by the French government at: http://www.coutglobal.developpement-durable.gouv.fr/. The trouble is the availability of valid input data. Conventions are needed to fix some calculation parameters influencing the result.

The E+C- experimentation asks for detailed costs of all technical lots of works through a precise template. Some economic data were collected, not numerous, but there is a certain regional variability, so interpretation and generalization are difficult.

2.6.2 Indicator 6.2 Value creation and risk factors

Testers are used to make risk analysis because of in HQE certification:

- Calculation methods are relatively well framed and established
- Project-related data, assumptions and results must be explicitly justified
- Input data for LCA: in E+C- method, priority is given to specific EPDs (verified and recent) corresponding to precise industrial products or equipment, if no such data, then EPD generators / configurators may be used, and default-generic data are allowed only if specific EPDs or configurated ones are lacking
- It is allowed to propose an "equivalence principle" (another approach or method addressing the same issue of concern, its validity being submitted to an expert).

So, the quality of data and results is not assessed as such, but this concern is addressed indirectly.

3 Summary of strengths and weaknesses – Suggestions for improvement

3.1 Strengths and weaknesses

The development and implementation in France of HQE certification and E+C- method have influenced in a certain extent the Level(s) test in France, as some issues are already dealt with in our national schemes.

Despite the fact our testers were relatively familiar with LCA practice at the product or building scale and HQE certification, the appropriation of the Level(s) methodology through the guidance documents and implementation on actual projects was perceived as complex and time-consuming. For some issues, there already exists a French method, for instance in HQE scheme, and some indicators or sub-indicators don't seem very appropriate regarding sustainability. Moreover, the lack of availability of some data is a barrier.

The feedback has led to some statements and conclusions expressed below in terms of strengths and weaknesses. The workshop we organised on May 20th 2019 with French testers helped a lot in establishing them.

3.1.1 Strengths

Level(s) enables all European states to share a **common language**, knowledge and framework about sustainable buildings. It is a core set of macro-objectives and indicators established by consensus after a step by step process involving all types of stakeholders.

Level(s) framework, for its environmental assessment part, **strongly relies on LCA standards** developed by CEN TC350, mainly EN 15804 and EN 15978. France, as well as other countries like Finland, UK, The Netherlands, Belgium, Germany, etc. has invested a lot of time for 15 years or more in the elaboration of these standards and in the devolpment of compliant databases (INIES[5]) and tools. Recently and presently CEN TC350 worked and continues to work on the revision of these standards under a revised EC mandate. The new EN 15804(+A2) is complete and the revision of EN 15978 has started this year (2019). In France, regulation on construction products claiming environmental properties and future energy and environment regulation for new buildings (RE 2020) relies greatly on these standards. France is also involved in several initiatives like Eco-Platform for harmonised practice. French actors who are involved both in Level(s) and CEN TC350 are happy that JRC will become soon a participating member in CEN TC350, it will allow for better cooperation and mutual enrichment between Level(s) and this TC.

The Level(s) framework deals with consensual and crucial environmental issues as energy, climate change, materials, waste, water, includes health and comfort issues as many certification schemes, but

[5] ***INIES*** *is the French reference database for construction products and equipment EPDs (respectively called "FDES" and "PEP"). In september 2019, INIES included 1497 FDES and 737 PEP, that is more than 2200 specific datasets, all verified, corresponding to more than 100 000 commercial references of products. The database also includes about 60 environmental declaration of services ("DES", conventional data) and almost 750 default generic environmental declarations ("DED" provided by the Ministry). As a whole, INIES contains more than 3000 data sets..*

also includes some new and tricky topics like **resilience, risk and value, quality of data**. It is a good point these **challenging topics** are discussed at European level, they can bring added-value to sustainable buildings assessment.

Data quality in LCA and other assessment methods is an important issue, and several approaches may be used. This topic is under study in CEN TC350, there is currently a joint task group (WG1+WG3) dealing with data quality, under the EN 15978 revision. This is an advantage of Level(s) to address this issue with an explicit method on results and data reliability, included in the Macro-Objective 6.

The three assessment levels, **L1, L2 and L3 allow different assessment objectives**. It is an answer to the requests of some stakeholders when elaborating Level(s): indeed, it appears necessary to adapt Level(s) to diverse skills, actors' maturity and assessment objectives. However, it complexifies the appropriation and application of the framework.. For the French testers, L1 and L2 are the most popular, and the objective of comparability of L2 was appreciated if comparison is on the same region/country with same methodology and for improvement to upgrade to Level 3.

Due to the **French E+C- experimentation** (launched end of 2016), and to several initiatives like ADEME "LCA communities", **building LCA practice has increased in France**, so that calculating the carbon footprint all along the life cycle of a building does not appear today as a challenging task to the testers.

The **helpdesk** held by **JRC**, as well as the **webinars** organised by **JRC** in order to support testers in the appropriation of the framework and of the reporting rules, were appreciated by the testers.

3.1.2 Weaknesses

The **guidance documents** and related methodology were considered **complex** and difficult to understand. The split into two documents obliges the testers to navigate from one to the other very often, especially when the assessment level is not chosen yet. It was not easy to get familiar with the assessment requirements. Finally the reporting tables were perceived as more explicit and intuitive than the guidance document especially about the results expected.

Implementing the framework was very **time-consuming**, especially gathering some data and making additional calculation and studies. Despite the fact that some studies were already performed, as the building LCA, the Level(s) test needed a lot of time, and some issues were not assessed because of lack of time. One tester achieved a total of 132 hours spent for appropriation of the method and implementation on a case-study where all calculations were made already.

For some issues, for example macro-objetives 2 and 6, application requires **additional work** or studies, and consequently additional costs. This may be a barrier for some professionals, accentuated if the added value of the new indicators is not understood.

Definitely, the necessity to establish the **bill of materials** and their breakdown into 4 categories, following the Eurostat data structure, is not easily applicable and the added-value is not proven. If the idea is to provide national data on materials consumed for construction and renovation to Eurostat, it would be more relevant to ask each year manufacturers of construction products and equipment, because they know the composition of their products and their sales figures in each country. Furthermore, the amount of materials arranged in the 4 categories (fossil energy materials, non-metallic

mineral materials, metal materials and biomass based materials) does not contribute to a sustainability assessment. LCA indicators (cf. EN 15804 and 15978) include two ADP indicators (abiotic depletion potential), one for fossil fuels and one for elements, taking into account resources scarcity. These 2 indicators, even if they are neither perfect nor including all materials, are part of the 7 LCA indicators described in the “Overarching assessment tool 7: cradle to cradle LCA”. What is relevant for us is to consider products on their entire life cycle, not only raw materials. We may “think materials” for background data or heavy industry, but not for end products. From raw materials to an end product, there are a lot of additional processes to include, if we take the example of complex products like a boiler or a window. The French INIES database contains EPDs of construction products and equipment, with limited data on their composition, and very few data on raw materials. The building LCA is obtained with the sum of products and equipment EPDs on their entire life cycle (all modules A, B and C). So calculating the amounts of materials seems to us not easy and irrelevant.

We have understood the rationale behind the **three assessment levels L1, L2 and L3**. What was disturbing is the **variation of the perimeter** of the system from one level to another. This feature was noticed in the macro-objective #3 (water) and also in the macro-objective #1 where the perimeter is different in L1 and L2 for LCA. Certainly the comparison of the results between the 3 levels is not an objective of Level(s), but for French actors it is disturbing because in France we are used to working at **constant perimeter** and for simplified application we use default or fixed values. This methodological point is an advantage when targets are to be set, because the targets don’t depend on the assessment level. This is not the case with Level(s) as it is today, and it will be confusing to juggle with different targets according to the perimeter or assessment level considered.

The **L3** level is interesting for most of macro-objectives and would allow to go further than a normal assessment, but according to the testers, it would be too time consuming.

The six macro-objectives of Level(s) form a relevant set of core indicators, but some testers regret that the following **topics are not integrated yet**: other health issues, biodiversity, different water resources, radioactive waste.

For certain indicators, we have in France well established methods and calculation rules, sometimes included in our regulation, which differ a little or more significantly from Level(s) ones. It is not obvious to establish a rigorous bridge between the different methods, but they deal with the same issue, giving different results (when the reference service life for the buiding is 50 or 60 years) or using an indicator expressed in other terms (as for thermal comfort for instance). In order to avoid double working, allowing a “**principle of equivalence**” would be efficient. French stakeholders are interested in working with EC on this issue.

Regarding sustainability, **renovation of buildings** is a big challenge for the coming years. Level(s) is well explained for new construction, but the methodological points linked to renovation of buildings are not detailed, especially when dealing with life cycle assessment. Level(s) should evolve on this topic, if possible hand-in-hand with CEN TC350 / WG1 where this topic is on the table for the revision of EN 15978.

The Level(s) framework **refers to several standards** without giving operational contents, so the users have to read the standards contents separately or to buy them. This is a barrier in the appropriation and application of the framework. From another point of view, standards may evolve every five years and it is logical and cautious that a framekork refers to a standard, in general the more recent version. However, testers would prefer a stand-alone guidance document as far as possible. To solve this problem, a way of progress would be to facilitate access to standards in general.

Some input data are **not compatible with the provided Excel sheet** (different square meters, different partitioning of building). More flexibility is necessary.

Despite the efforts made by JRC and the support provided by Alliance HQE-GBC and its technical committee, the testers would like more **educational support and training**.

3.2 France, already ready for Level(s)?

According to new French market, building LCA is a more and more common practice now with « E+C- » testing and it will be mandatory in 2020. Based mainly on EN 15978, the french method calculates all the environnemental indicators of the european standard : energy, water, waste, ressource depletion... here are about a dozen LCA building sofware on french market, wich use EPD. Even if EPD realization is still a volontary procedure, INIES database counts about 2000 EPD based on EN 15804. Renovation market is less in advance on these subjects but renoved building LCA methodology exists and was tested on severals buildings in 2018/2019.

Ventilation and thermal performance are mastered subjects with our thermal regulations. We also have a regulation about product VOC émission label and indoor air quality assessment is upgraded in HQE building certification . HQE Performance protocol exists to measure indoor air pollutants since 2013.

Water is also a mastered subject for new projects, HQE certification has developed a tool to estimate building's water consumption by taking int account the use of rainwater with a day by day simulation, mixing rainfall data and water tank size. In E+C- experimentation, calculation of quantities of water is also assessed, taking into account the environmental impact of drinking water use, of wastewater treatment and rainwater management.

HQE certification schemes, for new or refurbishment projects, allows to highlight good practices about resilience to climate change/hazards or relative global cost by offering methods to assess its.

France moves forward on the circular economy subject by testing material flow analysis (MFA method) using french EPD. An HQE Performance testing phase has been carried out in 2019 on severals new and refurbishment buildings.This method allows to calculate indicators of circularity : recycled materials, reused materials, recyclable waste, transport intensity,...

Figure 11 summarize the state of play of the Level(s) macroobjective in the French market and Annex 5.3 (in French) show the alignment between HQE and Level(s).

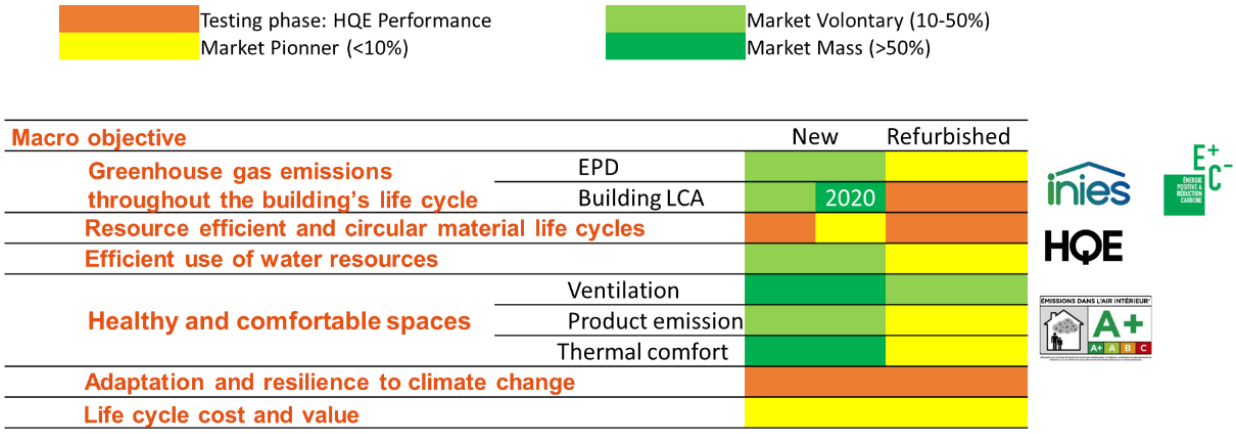

Figure 11: state of play of the use of the Level(s) macroobjectives in France

3.3 Suggestions for improvement

The areas of improvement that we recommend are:

- Continue to have 6 macro-objectives based on European standards but not to impose the calculation methodology too stricly, especially if it is already fixed by a regulation of the country.
- Have appropriate data:
    - give priority to **EPDs** (compliant with EN 15804) for quality data: manufacturer-specific, verified, recent, full life-cycle data, adapted to the national context, easily accessible;
    - build public **weather data** that are sufficiently detailed for the assessment of resilience by **2030** and **2050**;
- Do not go towards the results but insist more on the **transparency** of the method: perimeter, sensitivity of the calculation model to the influential parameters, inclusion of certain phenomena (for example, consider rainwater recovery and use in the M.O. No. 3) and create a reporting checklist;
- Include **waste water treatment** (sewerage) and **refrigerant leakages** into the perimeter because they lead to significant environmental impacts.
- Avoid different evaluation perimeters according to L1, L2 or L3 levels, because it is a source of confusion. It seems important to us to **homogenize the perimeters**, this would also have the advantage of clarifying the understanding of the performance thresholds that could be associated with the indicators in the different countries (avoiding several thresholds linked to L1, L2 and L3 for the same indicator);
- Specify the **methodological rules** for the application of Level(s) to **renovated buildings** because it is a big issue. One of example in France is the Alliance HQE-GBC methodology.

Adopted in early 2019, this method evaluate the environmental impacts of renovated buildings, following a methodological work with a working group and a test period in 2017[6];

- Include concrete **examples** of assessment for each indicator into the guidance document, so as to be more pedagogic and explicit ; with a “tank” of modelling and results on more than 100 buildings in Europe after the phase test, it would be relatively easy to select some of them as examples.
- Have a more **flexible reporting grid**, which can be completed and adapted, rather than entering values in the boxes of a tool that is too formatted and too closed;
- Do not impose a single tool, since Level(s) is not yet 100% successful and robust, but rely on **local or national tools** that have been proven;
- Allow the use of "**principles of equivalence**", especially in terms of methods and tools, to avoid double-calculations without real added value. This would be useful and relevant in relation to French regulations (for example the RE 2020) and HQE certification schemes (when a practice has already been put in place for a significant share of the French market through certification);
- Establish **rules for the right to use the Level(s) brand** and **rely on national actors for dissemination**. Indeed, if the aim is to properly spread Level(s) in Europe, it is important that the use of the Level(s) mark and logo is framed and protected (to prevent it from being used for greenwashing and lose value). It is also essential that the European Commission relies on recognized national players, in particular GBCs and certifiers, to disseminate it and rapidly scale up its use.
- Level(s) should be concentrate on 2 different levels: one on the use phase and the other on life cycle.
- Articulate normalization standards and Level(s) methodology. If there is no standard, set up working groups to work on it.

3.4 Achieving a regulation on LCA for new buildings: success factors

In France, an important step has been taken with the experimentation of the E+C- method and its adoption in labels and HQE certification. It is a real challenge to integrate the LCA of buildings into the regulations and it will be a great leap for professionals.

We believe several conditions must be met to achieve this:

- First of all, a solid foundation constituted by a standardized methodological framework, translated into an operational method associated with a contextualized and reliable database for input data;

[6] Resources of the HQE-GBC Alliance for the study of renovated buildings LCA: http://www.hqegbc.org/respect-environnement/acv-indicateurs/acv-batiment-renovation/ Press release of February 2019: http://www.hqegbc.org/wp-content/uploads/2019/02/CP_Alliance_HQE-GBC_ACV_Re%CC%81novation_Fev_19.pdf

- Then one or more tools to facilitate the calculation of the LCA of buildings, producing standardized outputs, understandable for stakeholders, interpretable for decision support using scales or benchmarks;
- Regional threshold and target values, to respectively ensure a minimum regulatory level of performance and/or reward with labels or other recognition signs,, ensure an optimal balance between environmental ambitions to achieve carbon neutrality in 2050 (among other objectives) and acceptable additional construction costs, introduce progressiveness in the requirements.

The dynamic around these 4 elements must be achieved through a set of actions, starting with a voluntary approach and gradually moving to a regulatory approach:

- The implementation of a label, certification, and/or experimentation to test the approach and tools with a group of voluntary professionals/member states, assess the maturity of the whole, improve the robustness and effectiveness of the 4 elements;
- Increase awareness of the environmental challenges to be met and the climate emergency, develop training for stakeholders in concepts, methods, tools, databases, interpretation of calculated indicators, feedback;
- Show the benefits of the approach in terms of new constraints, in the short and long term, in terms of real estate value, sustainability, risk reduction, and ultimately give stakeholders the desire to invest and progress, in particular in relation to an ambitious carbon trajectory;
- Have a policy of wide dissemination of tools and practices (guides, case studies, etc.) so that the assessment of environmental impacts through LCA is accessible to all professionals, with acceptable time and cost;
- Publish and launch the regulations once the previous steps have been validated, and support them with training, workshops to share experiences, guides and various aids.

The following figure (12) illustrates this logic of moving from a voluntary and limited approach to a regulatory and massive approach using a triangle of 4 elements and a loop of actions. If one of the elements of the triangle fails or if certain actions are not effective, it will not succeed. All actors in the construction sector have a role to play in promoting the success of this transformation.

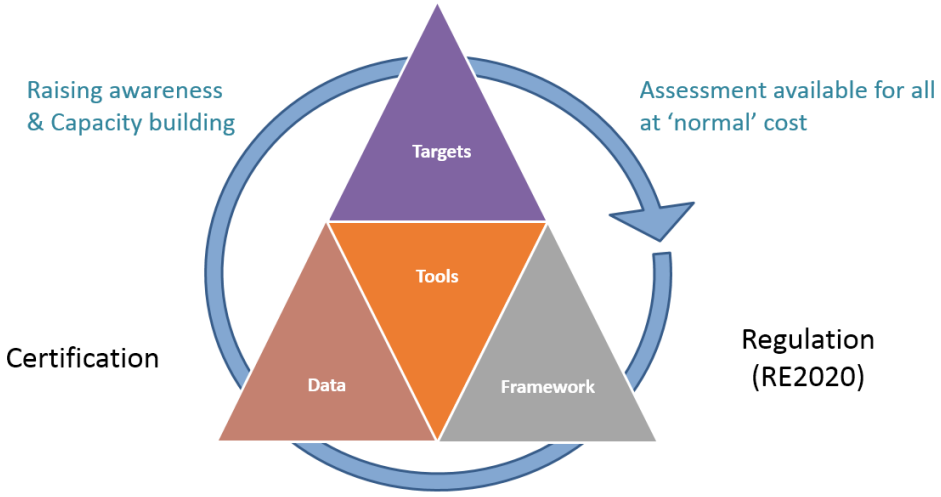

Figure 12: Success factors for the integration of building LCA from experimentation to regulation

With regard to Level(s), and by extending the reflection to the 6 macro-objectives, the European Commission will have to study in detail the feedback from the test phase in the various EU countries, draw lessons for the future. If possible, it should assess the maturity of the 4 elements and the action loop, for the Level(s) instrument itself and in each EU country.

4 Conclusion and next steps

4.1 Conclusion

The Level(s) framework, with its 6 macro-objectives, helps **sustainability thinking** and **reinforces design choices**. It has **several themes in common with French regulations, labeling and certification schemes**. Moreover, Level(s) allows for **long-term thinking**, including **resilience**, and does not forget the **reliability of the data and results** to make the assessment more credible.

It is **essential to develop this tool for the renovation of buildings**, specifying the methodological rules in this case.

Regarding environmental impacts, it is important to use **specific data** for products and equipment, that means, among other things, data **adapted to the French context** and **recent**. Data on raw materials are not enough, we must consider the **finished product** over its **entire life cycle** (all EPD modules). Indeed a product is considered as a whole and is sometimes not possible to separate and recycle it even if raw materials could be. The scenarios and the background data must correspond to the current French context (transport distances and modes, energy sources used at different stages, environmental impacts of the national electric kWh, end-of-life scenarios occuring in France, etc.).

When there is **no specific EPD** for a product or equipment, **generic data** may be used by default.

We have already strong tools, regulations and practices on some of Level(s) macro-objectives but **not exactly the same** if you go through technical details.

So applying Level(s) framework, as it is today, can imply:

- to **do twice an evaluation** on a same macro-objectif

- make **additional** calculation just **only to have a European statistic** (cf. surface area, bill of materials …)
- it is not possible to compare different buildings in different countries because the weather is different, soil is different…

with no added value towards the sustainability of the project (or less value for exemple on Efficient use of water) **and additional costs.**

That is why LEVEL(s) :

- would benefit form the experience of the sector/ member states by including "principles of equivalence" and formalize it ;
- could become a common language as it shows the road and improves knowledge.

For example, this principle of equivalence could be as follows:

- The countries who have no requirement and tool at national scale could use those available in Level(s).
- The ones who have already sustainable certification schemes and tools for one or more macroobjectives could continue to work with, but those should be acceptable by JRC as an equivalence. These methodologies or tools could feed Level(s).
- The others who have regulations in one macroobjective or more would continue using them and JRC and national authorities would consider merging Levels and national tools when they would review them.
- For those different cases, the reporting format would be the same and would mention the perimeter of the study and the methodology used.

4.2 Next steps

The European network of Green Building Councils (WGBC ERN) wants to be very involved in supporting the EC in the dissemination of Level(s) in the different Member States. Beyond the aspects of awareness and promotion, we outline below a strategy declined in concrete actions.

The European network of GBCs, key stakeholders (public and private) and volunteering Member States should, for the next steps, identify concrete actions to accompany the EC (with the help of the JRC) in the operational improvement and deployment of Level(s) in the various European countries. This network could play the role of facilitator and effective relay (in both directions) between the GBCs of the different countries and the EC, while also formulating recommendations, in the light of feedbacks and actions. Beforehand, in each country, it is important to draw lessons from the test phase and share them between GBCs as well as with the EC and the JRC.

Here are some actions that could be implemented by the European network of GBCs (as a network or at the level of the GBC of each country) helped by JRC and national authorities:

- Creation and animation of national communities of actors to help the training and support of professionals in the practice of life cycle calculations and associated tools, as well as the tools of other macro-objectives (dynamic simulation, life cycle cost ...);
- Assistance to an action plan : identification and prioritization of the issues to be solved and obstacles to be removed following the test phase, including identification of weak points or delays in various countries, research and proposal of resources and appropriate means to move forward, according to contexts;
- Recommendations to help gradually remove the methodological hurdles ;
- Building on existing R&D structures, public and private, possible work in network, in order to progress on certain methodological or technical questions ;
- Support equivalence principles between Level(s) and the indicators of national regulations ;
- Support to certifiers to help the convergence of Level(s) and their technical frameworks ;
- Support for the production of EPDs (with the assistance of manufacturers) ;
- Operational support, stakeholder liaison, project setup, to fill the gaps found during the test : for example need of weather files for 2030 and 2050 to meet the macro-objective of resilience, bridges between surface units , formalization of a harmonized evaluation approach adapted to the renovation of buildings, etc. ;
- Suggestions to improve Level(s) tools to avoid extra or duplicate time that does not add value, and reduce assessment time and costs ;
- Facilitation of exchanges and sharing of experiences between countries to improve, accelerate, support the practical implementation of Level(s), to increase visibility of feedback from the most advanced countries to guide the progress of other countries ;
- Identification of possible mutualizations between GBCs or between countries in order to optimize efforts ;
- Organization of feedback from various stakeholders to the EC and related recommendations ;
- Work with the EC to develop a medium-to-long term roadmap for the deployment, extension and use of Level(s) in Europe;
- Communication in different forms or formats, adapted to different targets, taking into account the specificities of different countries.

A new project has been accepted by LIFE programme, which aims to accompany the deployment of Level(s) by 8 national GBCs, including Alliance HQE-GBC. Led by the Spanish GBC, this project was launched on October 29th 2019 in Spain (kick-off meeting). It will last 2 years.

This initiative is a great opportunity to implement some of the actions listed above.

This project is divided into 4 phases:

- Phase 1: Aligning green rating tools with Level(s)
- Phase 2: Identifying and overcoming data challenges
- Phase 3: Incorporating Level(s) LCA and LCC Indicators into Public Procurement
- Phase 4: Rolling out capacity building programmes

The Annex 5.2.2., which is the presentation prepared for the Level(s) workshop of the “Cities to be” congress, gives at the end more details on this LIFE project and its 4 phases.

To sum up, France is **eager to participate in the improvement of Level(s) framework and a new test phase**, in order to progress towards a sustainable European built environment.

5 ANNEXES

5.1 Slides of E+C- experimentation – 29/11/17

Towards **positive energy** and **low carbon buildings**

From a thermal to an environmental regulation framework

Technical baselines

Levels to reach – Energy and Carbon footprint

Experimentation and label

Comparison: LEVEL(S) / E+C-

Towards **positive energy** and **low carbon buildings**

E+ C−

ÉNERGIE POSITIVE & RÉDUCTION CARBONE

The French Experimentation for new buildings

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From a thermal to an environmental regulation framework

➢ **1st step : Broad consultation of the construction sector**

➢ *April 2015 - July 2016*

➢ **2nd step : National volontary trial programm for new constructions: residential + office building**

➢ *Started in November 2016*

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From a thermal to an environmental regulation framework

The French Law (Transition Energétique pour la Croissance Verte LTECV) encourages new buildings to be low energy (positive energy buildings) and low carbon

Low energy buildings

➢Reduction of the non renewable energy consumption

➢Development of efficient solutions (insulation, thermal systems, …)

➢Development of onwn use of renewable energy and its exportation towards the network

Low carbon buildings

➢ Reduction of the GHG emissions on the whole life cycle of the building

➢ Elaboration of an optimal CO2 balance between the impacts of construction products/devices and energy impact

A challenge for innovation and skills development in the building sector

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Towards **positive energy** and **low carbon buildings**

From a thermal to an environmental regulation framework

Technical baseline

Energy

Carbon

Levels to reach - Energy and Carbon

Experimentation and label

Comparison : LEVEL(S) / E+C-

Technical baseline

A technical baseline has been established on a shared basis with a large panel of stakeholders

This baseline lays down the rules for

- Energy calculations
- Environmental assessment (definition of assumptions for the LCA of buildings)

Baseline available on
www.batiment-energiecarbone.fr

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Technical baseline – Energy

RT 2012

Bbio	Needs of energy during the operation for the building: heating (air and domestic water), cooling and lighting
Cep	Energy consumption during the operation of the building: heating (air and domestic water), cooling, ventilation and lighting

BEPOS Balance = $\sum$

$kWh_{ep}/m^2_{SRT}/an$

All uses of energy are considered

(=uses other than RT2012 including energy consumed by equipment owned by the occupants)

Non renewable energy consumption

Drivers

- Reduction of energy consumption
- Increase of the onwn use of renewable energy

Exported renewable energy in the network

Driver

- Integratation in the network of the local production of renewable energy

Technical baseline – Carbon

Carbon means GHG emissions related to energy use in operation + embodied carbon in construction products and devices during the reference study period

Based on a LCA environmental assessment

- All environmental impacts are calculated (multi-criteria assessment – NF EN 15804+A1 / PEP 3rd edition and NF EN 15978)
- For each step of the life cycle of the building (multi-steps assessment)

Reference study period
50 years for all types of buildings

Objectives

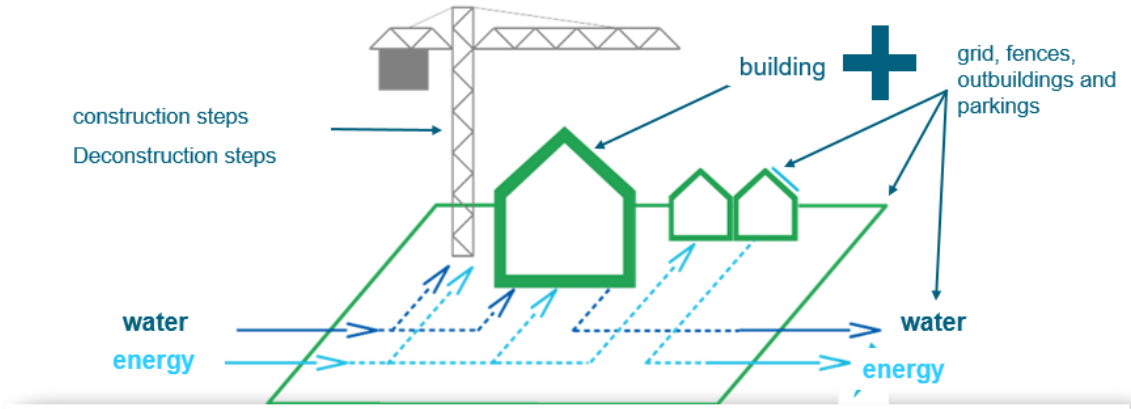
- Limit the transfer of impacts between the various steps of the LCA
- Identify drivers to reduce environmental impacts (optimization)

Prerequisites

- A repeatable assessment
- An operating/quick and reliable assessment

Technical baseline – Carbon

Which boundaries for the environnemental assessment?



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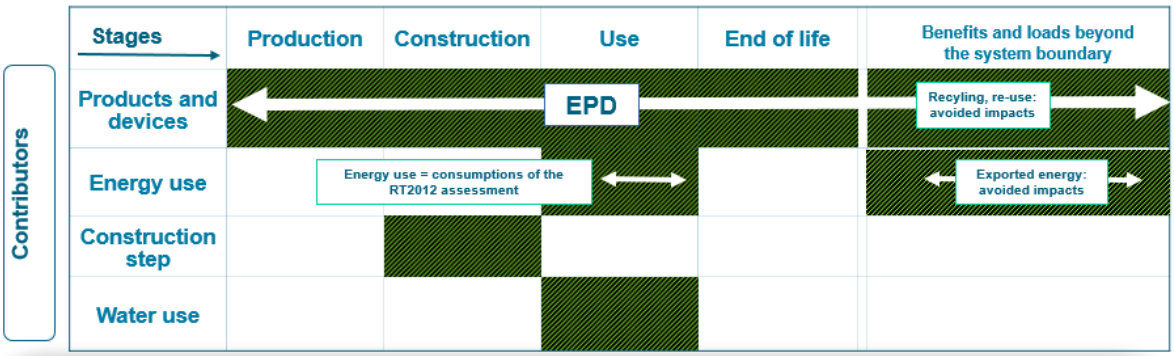
Technical baseline - Carbon

Computed stage

Building LCA

Reference study period = 50 years



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Technical baseline - Carbon

Comprehensive building description

A comprehensive method

- Using EPD for 1 to 13

1. External works (works sections, includings roads, distribution and collective service or utilities plus landscaping)
2. Foundations and infrastructure
3. Superstructure - Masonry
4. Roofing - Framing - Zinc works
5. Partitioning - Lining - Suspended ceilings - Interior woodwork
6. Facades and exterior joinery
7. Floor, walls and ceilings coverings - Screed -Paintings - Decorative Products
8. HVAC (Heating - Ventilation - Cooling - DHW)
9. Sanitary facilities
10. Electrical and communications power systems (high current and low current)
11. Safety of people and buildings
12. Lifts
13. Equipment of local electricity generation

Technical baseline - Carbon

Which indicators are calculated?

CO2 indicators

- **Eges** measures GHG emissions of the whole building during the reference service life period
- **Eges$_{PCE}$** construction products and equipments (CPE) => measures GHG emissions of products and equipment

\+ **All other** NF EN 15804+A1 / PEP 3rd edition and NF EN 15978 **indicators**

= **27 calculated indicators**

Expression of results
by m²floor (SPD) and for 50 years

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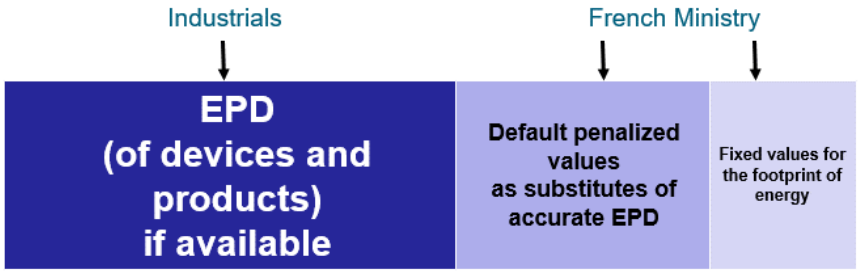
Technical baseline - Carbon

Which input data for the environmental assessment?



2 goals of the French authorities

➢ **Increase** the amount of **EPD** (NF EN 15804+A1 / PEP 3rd edition with an independent third party review) provided by industrials

➢ **Improve** the **quality** of those data and their **consistency** with the methodology of the environmental assessment of buildings

Technical baseline - Carbon

Which database for the assessment ?

Environmental and health reference data for building

http://www.inies.fr/home/

Geographical representativeness

The INIES database is run by the **supervisory board** and the **technical committee**

- The **supervisory board**, chaired by the French Ministry ensures that the database operates ethically and professionally
- The **technical committee** oversees the collection and processing of data as well as database content updates

1 database – 2 rewiewing programs

- INIES for FDES (EPD of products)
- PEP ecopassport (EPD of equipments)

EPD are verified by an independant third party reviewer

Quality?

1) A procedure exists to control reviewers competences (managed by INIES SC)
➢Professional experience (professional 4 years, construction sector 2 years, LCA practice, EPD, critical review, verification in construction sector…)
➢Profeciency testing
➢Renewal every 3 years

2) INIES committees may arbitrate verification conflicts

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Technical baseline - Carbon

Digitalisation of data and web services for operating LCA

INIES Database - EPD in **XML format**

Industrial softwares for data – to adapt EPD to specific data settings

connected

connected

connected

LCA softwares validated by the Ministry for the E+C- assessment

Technical baseline - Carbon

How to use these digital EPD for building LCA ?

1 - 2 days operating assessment

- Human skills
- Digital data
- LCA Softwares

Industrials

Ministry

The French technical organisation allows to share the responsibilities and skills among a chain of stakeholders up to the final objective Building's LCA

INIES Base

EDP

Default values

Fixed values

connected - XML data

LCA softwares for buildings

Compatible with the technical baseline

Designers & LCA consultants

XML data

E+C- Buildings database

Collects all LCA buildings operations

Contracting owner

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Towards **positive energy** and **low carbon buildings**

From a thermal to an environmental regulation framework

Technical baseline

Levels to reach – Energy and Carbon

Experimentation and label

Comparison : LEVEL(S) / E+C-

Levels to reach – Energy and Carbon

Energy

Energy 1
Energy 2

Reduce energy consumption AND/OR use renewable energy

- **Housing buildings**
  Between -5% and -10% of non renewable energy compared to current RT2012 regulation
- **Office buildings**
  Between -15% and -30%

Energy 3

Reduce energy consumption AND use renewable energy

- **Housing buildings**
  -20% of non renewable energy and +20 kWh/m²an of renewable energy
- **Office buildings**
  -40% and +40 kWh/m²an of renewable energy

Energy 4

Positive energy target

Renewable energy production compensates all uses of non renewable energy consumption (the indicator "BEPOS Balance" is < 0)

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Levels to reach – Energy and Carbon

Greenhouse gas emissions

- One threshold for all the contributors: use phase, products and devices, water consumption, construction
- One threshold for the contributor "construction products and devices" in order to ensure a minimum effort for this contributor

Carbon 1

- Enable efforts between the energy consumption and the building process
- None constructive way is excluded

Carbon 2

- Strengthen CO_2 reduction by optimizing choices related both to the use phase (energy consumption) and the building process

Towards **positive energy** and **low carbon buildings**

- From a thermal to an environmental regulation framework
- Technical baseline
- Levels to reach – Energy and Carbon
- **Experimentation and label**
- Comparison : LEVEL(S) / E+C-

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An *in situ* Experimentation and label

3 tools to ensure the deployment of buildings LCA, data quality and repeteability

Technical baseline + levels

+

Label

+

Database + stakeholders community

An *in situ* Experimentation and label

Assessment of the technical and economical feasibility of the methodology and the performance levels

- Apply the methodology on real cases
- Fix the "cost optimal" targets
- Calibrate relevant performance levels able to promote innovation without excluding constructive modes and energy vectors
- Expect learning of the LCA concept applied to the building sector (LCA of products and devices, LCA of buildings, development of software, ...)

How ?

- Capitalize on building operations (representative of the building sector) thanks to an observatory and a data basis
- Collect studies about the relevancy of the methodology and targets (various working groups are launched)
- Involvement of stakeholders in the governance of the Experimentation

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An *in situ* Experimentation and label

Objectives

- Guarantee the quality
- Represent a control
- Promote the best building solutions

Requirements

- Both energy consumption and GHG emissions are assessed
- Gradual requirements
- Specific thresholds adjusted to each kind of building, localization, ...
- Six certifying bodies have contracted with the French State

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An *in situ* Experimentation and label

www.batiment-energiecarbone.fr

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Towards **positive energy** and **low carbon buildings**

From a thermal to an environmental regulation framework

Technical baseline

Levels to reach – Energy and Carbon

Experimentation and label

Consistency LEVEL(S) / E+C-

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Global overview of Level(s) - Macro-objectives

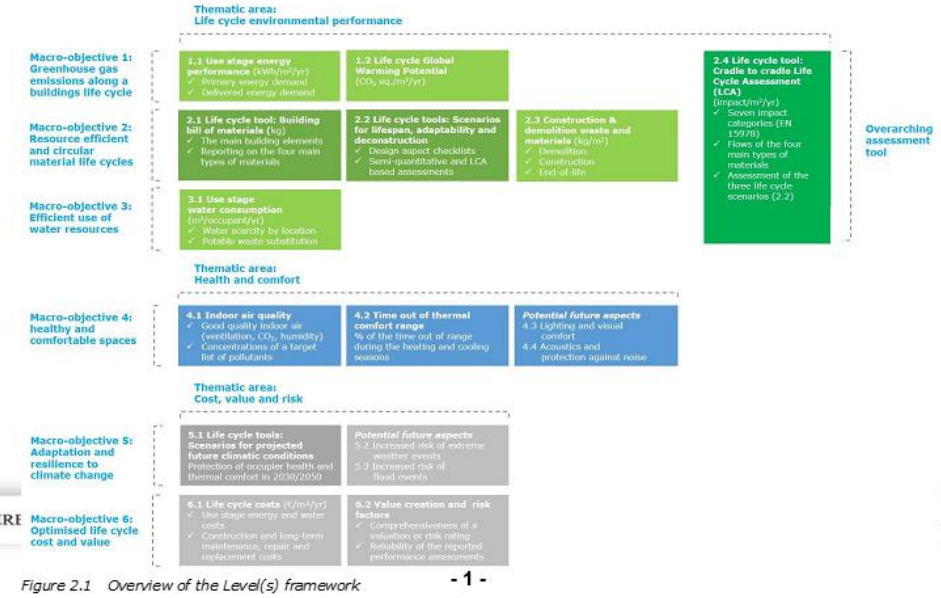

Figure 2.1 Overview of the Level(s) framework

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Macro-objective 1: Use stage energy performance (operating stage)

LEVEL(S)	E+C-
Unit: kWh/m2/an **Indicator 1:** Primary energy demand over 5 conventional energy uses Separate quantification of renewable exported energy **Indicator 2:** Final energy demand **Static or dynamic method** **Complementary requirements:** air permeability measurement, network tightness, infrared monitoring, … **Surface:** useful internal floor area from international IPMS	**Unit: kWh/m2/an** **RT2012 indicators:** Bbio, Cep (primary energy demand over 5 uses), … **BEPOS Balance:** primary non-renewable and renewable demand over all uses Towards a **dynamic method** **Surface:** SHON-RT2012 (necessity to clarify the difference with IPMS)

Macro-objective 1: Life cycle global warming

LEVEL(S)	E+C-
Quantification of global warming potential according to EN15978 over the whole life cycle **Cradle to grave approach** **Reference study period:** 60 years Discrete replacement rate of equipments/products **Limited number of GHGs** taken into account **Generic data** (not contextualized)	**Quantification of all LCA indicators** of EN15978 over the whole life cycle **Cradle to grave approach** + module D **Reference study period:** 50 years **Perimeter:** building + plot Decimal replacement rate of equipments/products **Exhaustive number of GHGs** taken into account **Specific data** provided by the industrials (FR EN 15084 + CN for products and PEP Ed. 3 for equipments). Contextualization to the French context.

Macro-objective 2: Resource efficient and circular material life cycles

LEVEL(S)	E+C-
Life cycle tool: Building bill of materials (BoM) Reporting on the Bill of quantities for the building, as well as for the four main types of materials used	**All physical building description (quantities)** **EPD : FDES (NF EN 15804+CN) and PEP (XPC-08-100-1 / 3rd edition)**
Construction and demolition waste and materials kg waste and materials per m2 of total useful floor area (per life cycle and project stage reported on)	**LCA waste indicators (kg/m2SDP for 50 years) : cradle to grave (EN15978)** Hazardous Non hazardous
Overarching assessment tool: Cradle to grave Life Cycle Assessment 7 environmental impact category indicators / per m2 / per year Reference service life : 60 years	**All LCA indicators of EN15978 (indicators / per m2 SDP for 50 years)** Reference service life: 50 years

Macro-objective 3: Efficient use of Water resources

LEVEL(S)	E+C-
Total water consumption (m3/occupant/yr) Focus on common sanitary devices/fittings and water consuming appliances (default values possible) Usage factors and default occupancy rates (irrigation excluded) Defined baseline scenarios (total/potable/non potable)	**Contributor « Water use » = all uses of water during the service life of the building (consumption and reject)** Focus on common sanitary devices/fittings and water consuming appliances (default values and correction values for water reducing consumptions devices) Usage factors and default occupancy rates (irrigation included) Defined baseline scenarios (total/potable/non potable) **2) LCA indicator on water use (EN15978)**

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Macro-objective 4: Healthy and comfortable spaces

LEVEL(S)	E+C-
Indicator of indoor air quality Good quality indoor air: Parameters for ventilation (rate), CO2, humidity, benzene, PM, radon, mould Target list of pollutants: Emissions from construction products and external air intake. (VOCs, LCI, F)	**French regulations on :** Ventilation systems and rates Asbestos, lead, radon and carbon monoxyde Indoor air emissions from products
Time outside of thermal comfort range % of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons	**French regulation RT2012 : thermal comfort indicator (Tic)**

Conclusion LEVEL(S) / E+C-

Consistency

- Voluntary test phase (1.5 - 2 years)
- Common language to track the levels of sustainability performances over the whole life cycle
- Quantification of multiple indicators (not only GHG emissions)
- Making the business starts with a good basis, transfers of practices
- Basis of existing standards
- Possible use at different stages of a building project

E+C- specificities

- Regulatory framework/baseline (RT2012)
- Levels for both Energy and Carbon
- Global costs assessment
- Massification: support of a future rule, needs of stability in methods and data

-Overall consistency for the Energy and assessment of LCA indicators
-Easy transfer of E+C- buildings in Levels with some adjustments (bridges)
-Opportunity of sharing feedbacks

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Macro-objective 6: Optimised life cycle cost and value

LEVEL(S)	E+C-
Indicator of life cycle costs Euros per square metre of useable floor area per year (€/m2/yr) (LCC ISO 15686-5, study period of 50 years) Type of costs by life cycle stage	**Request form on costs from project master (test phase)** Overall cost

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5.2 Slides of "Cities to be" – 13/09/2019

5.2.1 Slides of Level(s) French experimentation – conference session

Lucile BERLIAT-CAMARA : l.berliat@cergual.fr

Level(s) in figures

136 in Europe

21 in France

14 joined French Community

8 sent

Total

FRANCE

Lead by Alliance HQE GBC FRANCE

French Team

- **Technical committee:**

MINISTÈRE DE LA TRANSITION ÉCOLOGIQUE ET SOLIDAIRE

MINISTÈRE DE LA COHÉSION DES TERRITOIRES ET DES RELATIONS AVEC LES COLLECTIVITÉS TERRITORIALES

Alliance HQE GBC FRANCE

CSTB le futur en construction

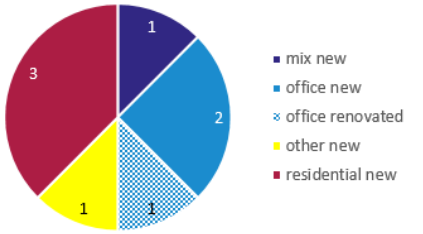
CERQUAL QUALITEL CERTIFICATION

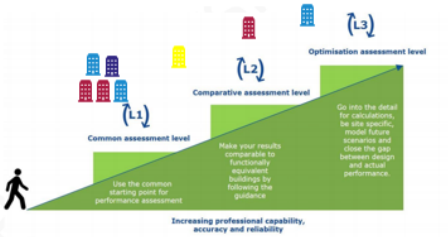
CertiVéA

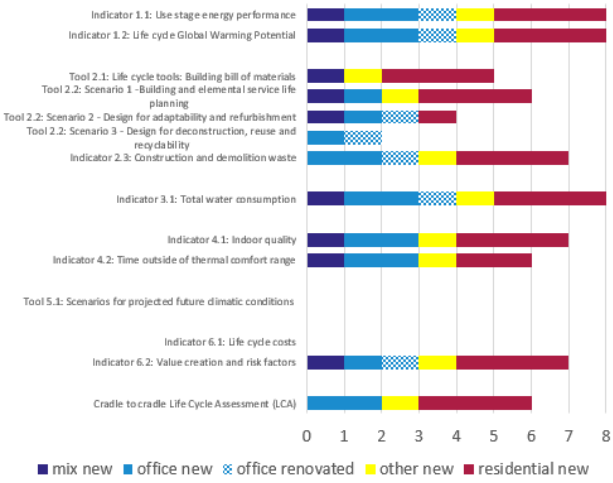
- **Testers**
  - Experts of LCA Building and in HQE Certification
  - Conceptors, engineering consultants, public service

Name of the project	Organism	HQE Certification
Tour Saint-Gobain	Artélia group	Certified
Micheville Bât D	Bouygues Construction	Certified
MI Chuzelles	Cerema	Not certified
Résidence Bon Pasteur	Cerema	Approach
Flow	Covivio	Certified
Les tours du Jardin de l'Arche	Egis	Certified
Meriadeck	Nobatek/INEF4	Certified
EHPAD Port en Bessin	Vinci	Certified

The 8 French projects



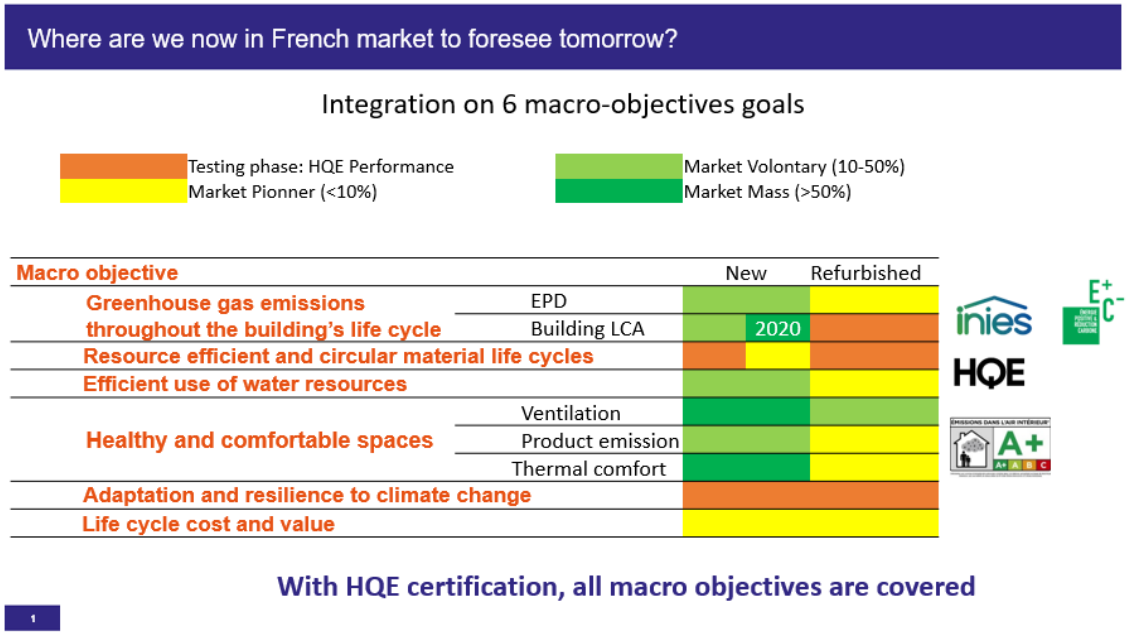




A successful experiment?

French objectives	Realised
Having the same technical requirement in all countries	-
Comparison between Level(s), E+C- (French Carbon label), and HQE	++
Skill improvement for testers	+
A mainstream use	---

Waiting for general feedback from other countries



5.2.2 Level(s) experiment feedback and improvement – conference session

Nadège OURY : noury@hqegbc.org

Revised Agenda

Time	Agenda
14.00 -14.05	Welcome and Introduction – Florian PITON, French Government
14.05 - 14.20	Testing Level(s) - How France is ready for Level(s)? – Nadège OURY, Alliance HQE-GBC; Sylviane NIBEL, CSTB
14.20 - 14.40	Improving Level(s) – Group discussion
14.40 – 14.50	Level(s) Implementation Project – Audrey NUGENT, WorldGBC
14.50 – 15.00	Closure – what next for Level(s) – Josefina LINDBLOM, European Commission

TESTING LEVEL(S) – HOW FRANCE IS READY FOR LEVEL(S)?

Sylviane NIBEL – CSTB
Nadège OURY – Alliance HQE-GBC

Alliance HQE GBC FRANCE

Macro-objective 1: Greenhouse gas emissions along a building's life cycle

- Indicator 1.1 Use stage energy performance

For New Building

RT2012 includes :

- Heating
- Cooling
- Hot water
- Lighting
- Auxiliaries (including ventilation)

E+C- experimentation:

- Other use (lifts, car parks, activity-related devices)

- Indicator 1.2 Life cycle Global Warming Potential

E+C- experiment:

- Building Ref. Study Period: 50 years
- Data: EPDs and default generic data (DGD) from INIES database
- Perimeter: all building products and equipment
- For all life cycle stages
- GWP-overall

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Macro-objective 1: Greenhouse gas emissions along a building's life cycle

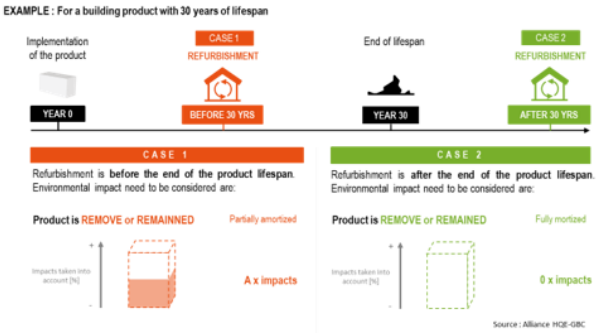
- Indicator 1.1 Use stage energy performance

  Rtex overall regulation includes :
  - Heating
  - Cooling
  - Hot water
  - Lighting
  - Auxiliaries

- Indicator 1.2 Life cycle Global Warming Potential

  E+C- addendum developped with HQE
  Performance test:
  - Building Ref. Study Period: 50 years
  - Data: EPDs and default generic data (DGD) from INIES database
  - Perimeter: all building products and equipment
  - For all life cycle stages
  - GWP-overall
  - Smoothing / Amortization method

For Refurbishment



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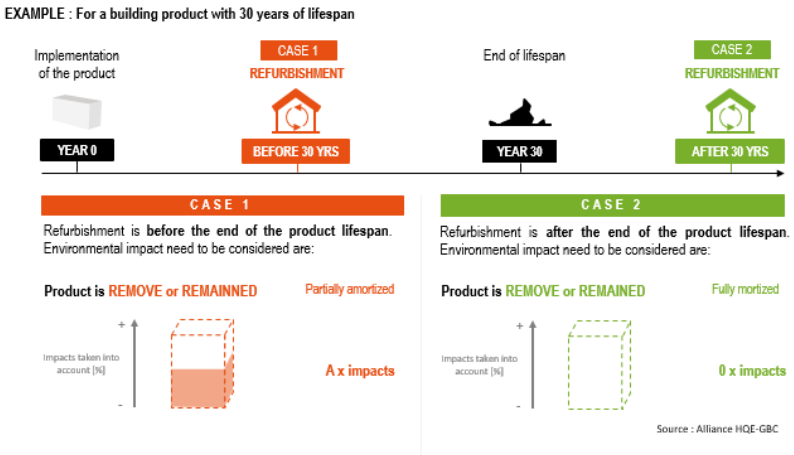

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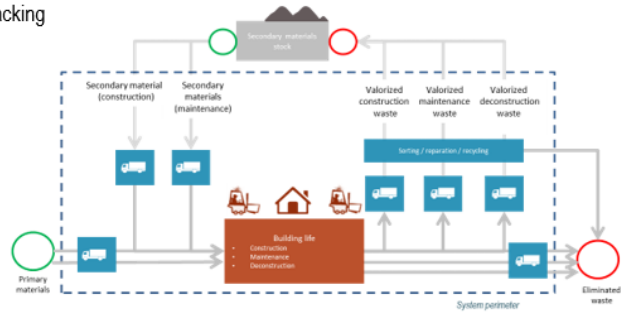
Macro-objective 2: Resource efficient and circular material life cycles

For New Building and refurbishment

- Tool 2.1 Life cycle tools: Building bill of materials
- Tool 2.2 - Scenario 1 Building and elemental service life planning
- Tool 2.2 - Scenario 2 Design for adaptability and refurbishment
- Tool 2.2 - Scenario 3 Design for deconstruction, reuse and recyclability
- Indicator 2.3 Construction and demolition waste

Material Flux Analysis

- Product and equipment **flows tracked** at building level, for each building life-cycle stage
- Product, equipment and waste **transport** intensity tracking
- Compatibility & connectivity with building LCA :
  - Same perimeter, building LCA results as an input for the MFA model
  - Same database : the **INIES database** (French EPD database) - FDES & PEP indicators and information, with some additional data digitalization



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Macro-objective 3: Efficient use of water resources

For New Building and refurbishment

- Indicator 3.1 Total water consumption
  - HQE Certification: water calculator
    - Drinking water use
    - Use of rainwater minimizing drinking water use (simulation day by day, mixing rainfall data, water-tank size and uses profiles)
  - E+C- experiment:
    - Environmental impact of drinking water use (upstream processes)
    - Environmental impact of wastewater treatment and rainwater management (downstream processes)

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Macro-objective 4: healthy and comfortable spaces

For New Building and refurbishment

- Indicator 4.1 Indoor air quality
  - French Decree (2011-321): all construction and decoration products made available on the market must be provided with a label reflecting the level of VOC emissions

  - ELAN law, art.178: *"For construction products and equipment, the procedures for calculating and formalising the information necessary to comply with the requirements referred to in Article L. 111-9, in particular: […] For certain categories of products and equipment, their impacts on the indoor air quality of the building"*
- Indicator 4.2 Time out of thermal comfort range
  - RT 2012: Tic
  - RT-Ex: Tic (only in "overall' regulation part, not in "by element" regulation part)
  - E+C- experimentation: DIES (considers both the duration of discomfort (hours) and its intensity (PPD – cf. ISO 7730) → result in "weighted hours"

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Macro-objective 5: Adaptation and resilience to climate change

- Tool 5.1 Scenarios for projected future climatic conditions: Protection of occupier health and thermal comfort

  Work in progress

  Need weather files :
  - Public and transparent data sources,
  - Anticipating 2030 and 2050 climate,
  - Data needs: air temperature, solar irradiation, humidity, wind
  - Harmonized method of projection across EU
  - But also distinguishing diverse local/regional climatic conditions in each country

  French practice (on a voluntary basis):
  - Relevant, issue, but weather files not harmonized, e.g. use of measured 2003 data (long and intense heat wave)
  - In non cooled spaces, we probably need risk-oriented methods to address occupier health risks

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Macro-objective 6: Optimised life cycle cost and value

- Indicator 6.1 Life cycle costs
  - A free tool made available by the government: http://www.coutglobal.developpement-durable.gouv.fr/
  - E+C- experiment: asks for detailed costs of all technical lots of works (some economic data were collected, but high regional variability, difficult to interpret)

- Indicator 6.2 Value creation and risk factors

  HQE certification:
  - Calculation methods are relatively well framed and established,
  - Project-related data, assumptions and results must be explicitly justified
  - Input data for LCA: priority is given to specific EPDs (default-generic data are allowed only if specific EPDs are lacking)
  - It is allowed to propose an "equivalence principle" (another approach or method addressing the same issue of concern, validity submitted to an expert)
  - So, the quality of data and results is not assessed as such

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On which themes did you have issues ?

Macro Objective	Indicator or Tool
1: Greenhouse gas emissions along a buildings life cycle	- Indicator 1.1 Use stage energy performance
	- Indicator 1.2 Life cycle Global Warming Potential
2: Resource efficient and circular material life cycles	- Tool 2.1 Life cycle tools: Building bill of materials
	- Tool 2.2 - Scenario 1 Building and elemental service life planning
	- Tool 2.2 - Scenario 2 Design for adaptability and refurbishment
	- Tool 2.2 - Scenario 3 Design for deconstruction, reuse and recyclability
	- Indicator 2.3 Construction and demolition waste
3: Efficient use of water resources	- Indicator 3.1 Total water consumption
4: Healthy and comfortable spaces	- Indicator 4.1 Indoor air quality
	- Indicator 4.2 Time outside of thermal comfort range
5: Adaptation and resilience to climate change	- Tool 5.1 Scenarios for projected future climatic conditions: Protection of occupier health and thermal comfort
6: Optimised life cycle cost and value	- Indicator 6.1 Life cycle costs
	- Indicator 6.2 Value creation and risk factors

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Go in one of 3 groups to think about solutions?

- **3 different groups:**
  - Group 1: Macro-objective 1 and 4 – facilitated by Audrey Nugent
  - Group 2: Macro-objective 2 and 5 – facilitated by James Drinkwater
  - Group 3: Macro-objective 3 and 6 – facilitated by Sylviane Nibel

- **Please answer those questions:**
  - Which information are crucial in those macro-objectives?
  - How can we do to develop those macro-objectives step by step?
  - Which data/tools do we need?

You have until 14.45

- **Summary for all (5 minutes for each group)**

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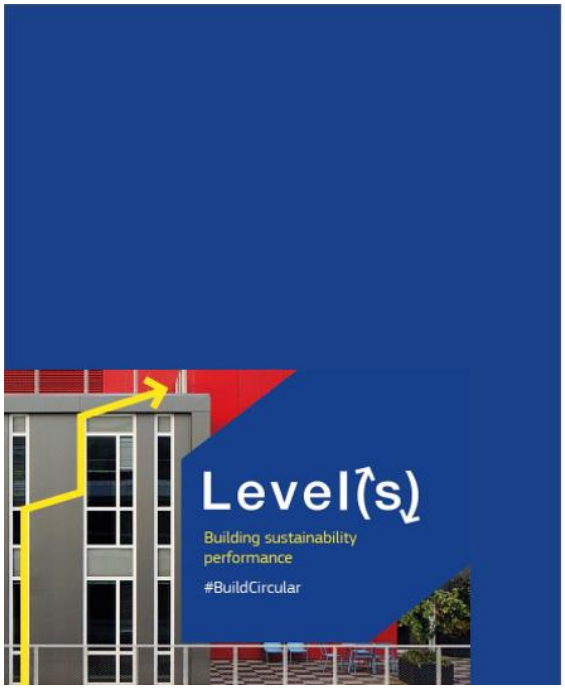
LEVEL(S) IMPLEMENTATION PROJECT

Audrey Nugent - WorldGBC

Alliance HQE GBC FRANCE

WORLD GREEN BUILDING COUNCIL

GBC Level(s) Project



Background

- GBCs have called for European policy that goes beyond energy for 6+ years
- Contributed to the developing, consulting and now testing of Level(s)
- Developed Level(s) implementation strategy that identified some of the key actions that are needed to help mainstream Level(s)
- Challenging for most European companies to apply the indicators within Level(s) - particularly the key indicators on LCA,LCC and IAQ, due a lack of data and a lack of expertise in the industry.
- 8 GBCs used this implementation strategy as a basis for the project which will involve working with stakeholders from the public, private and certification schemes to explore how the key Level(s) indicators on LCA, LCC and IAQ can be implemented on a pan-European scale.

Project Participants

Phase 1 : Aligning green rating tools with Level(s)

Aims:

- Link Level(s) key indicators to Europe's leading green building certification schemes such as DGNB (DE), HQE (FR), Verde (ES), BREEAM-NL, GBC Condomini, GBC Home and LEED (IT).

Outputs

- 8+ major EU green building certifications schemes (over 100 million m2 of buildings certified to date) will be aligned with the key Level(s) indicators
- Streamlined templates for Level(s) reporting will help generate comparable life cycle performance data, enabling learning and benchmark setting over long-term
- Briefings for building professionals on how Level(s) and the national schemes are linked

Phase 2 : Identifying and overcoming data challenges

Aims

- Support the development of quality data on the environmental and health impact of construction products
- Support the development of quality data on pollutants contained in construction products that impact IAQ
- Improve the quality of LCA and LCC across Europe by developing a system for quality control, review and verification of building level LCA and LCC.

Outputs

- Report recommending the most suitable available data to be used directly or data which could be adapted for use in a particular country.
- Report recommending ways to facilitate the use of IAQ Level(s) indicators for specifiers and green building certification schemes
- LCA/LCC Verifier Checklist
- Report on best practice and recommendations for disclosure of information on IAQ Pollutants in products standardised form for disclosure of IAQ pollutants

Phase 4 :Incorporating Level(s) LCA and LCC Indicators into Public Procurement

Aims

- Work with public authorities and government's to understand the technical and legal issues of incorporating the key indicators

Outputs

- Best practice guide on incorporating the indicators into public procurement.
- +25 public authorities sign a Commitment/statement of intent to incorporate the Level(s) key indicators into their public procurement criteria (for authorities)
- +25 major companies will sign a Commitment/statement of intent to take action that supports mainstreaming of these indicators into procurement and wider industry practice (for companies).
- 'Commitment' scheme for public authorities to communicate their leadership in doing this, signaling a shift to the wider market.

Phase 4 Rolling out capacity building programmes

Aims

- Roll out capacity building programmes as educational activity of the GBCs targeting public and private sector, including product manufacturers.

Outputs

- Capacity building sessions for professionals and building contractors attend
- Capacity building sessions targeted at product manufacturers to mainstream EPDs and IAQ assessment
- Capacity building sessions on public procurement for public authority staff (across 8 national authorities, 11 regional authorities and 80 local authorities) attend capacity building sessions on public procurement

WORLD GREEN BUILDING COUNCIL

Any Questions?

WORLD GREEN BUILDING COUNCIL


CLOSURE – WHAT NEXT FOR LEVEL(S)?
Josefina Lindblom – European commission
Alliance
HQE
GBC FRANCE


THANKS FOR YOUR ATTENTION
Alliance
HQE
GBC FRANCE

5.3 Slide of HQE and Level(s) (in French) – 29/11/2017

Alliance HQE GBC FRANCE

L'alliance interprofessionnelle pour un cadre de vie durable

Alliance HQE

La démarche HQE™ certifiée en France et à l'International

2016

QUELQUES CHIFFRES CLÉS HQE

1 logement neuf sur **4** certifié en France par Cerqual

Présence de HQE dans **24** PAYS

14% de bâtiments tertiaires neufs certifiés en France par Certivea

France en cumulé (depuis création)
- 29 521 331 m² en non-résidentiel soit en unités certifiées en 2016 (1 588 *constructions, 242 rénovations, 370 exploitations)*
- 39 949 889 m² pour l'habitat soit en logements certifiés *(399 963 constructions, 55 510 rénovations)*
- 50 opérations d'aménagement
- 7 Infrastructures

Hors France en cumulé (depuis création)
- 4 153 456 m² en non-résidentiel soit 194 unités certifiées
- 3 843 112 m² pour l'habitat soit 26 966 logements certifiés
- 4 opérations d'aménagement

Référents certification HQE™ (en cumulé)

France
- 197 référents non résidentiel
- 45 référents maitrise d'œuvre NF Habitat / NF Habitat HQE

Hors France
- 165 référents

10

Alliance HQE

Le cadre de référence du bâtiment durable de l'Alliance HQE GBG

Alliance HQE

1.1.1 Primary energy demand

- Bilan énergétique sur l'ensemble des usages (**Bilan BEPOS** en kWh/m^2_{SRT} .an) entre les consommations d'énergie primaire non renouvelable et la production exportée d'énergie primaire en exploitation tous usages immobiliers et mobiliers selon la méthode PEBN .
- Calcul de la Consommation d'Energie primaire (**Cep** en kWhEP/m^2.an) en phase d'exploitation selon la méthode RT2012 (méthode dynamique)
- Calcul indicateur ACV Energie primaire non renouvelable (en kWhep/m^2sdp) selon la méthode PEBN (Label E+C-, EN 15978)
- Contrôle des mesures en réception (test perméabilité à l'air des bâtiments, perméabilité des réseaux de ventilation)
- Commissionnement pour le non-résidentiel.

Alliance HQE

Life cycle Global Warming Potential

Evaluation des émissions de gaz à effet de serre sur l'ensemble du cycle de vie (**Eges** en kgeqCO2/m²sdp) selon la méthode PEBN (Label E+C-, EN15978, EN 15804)

- Total des impacts sur 50 ans par m2 de SDP
- Six gaz pris en compte par le protocole de Kyoto, à savoir :
  - CO2 : Dioxyde de carbone
  - N2O : protoxyde d'azote
  - CH4 : méthane
  - HFC : hydrofluorocarbures
  - PFC : perfluorocarbures
  - SF6 : hexafluorure de soufre.

2.2 Life cycle scenario tools: Life span, adaptability and deconstruction

Résidentiel

- Adaptabilité du logement ->Rubrique FL
- Potentiel de transformation/de démontabilité -> Rubrique DEC
- Produits recyclés->Rubrique REM
- Dépose sélective->Rubrique Déconstruction (DCN)

Non-Résidentiel

- Définition des durées de vie du bâtiment et des zones à adaptation fréquente.
- Dispositions prises pour une adaptabilité du bâtiment pour un même usage
- Dispositions facilitant la mutabilité vers un autre usage
- Dispositions facilitant les extensions vers un volume bâti plus important

2.3 Construction and demolition waste

Tous les types de déchets sont pris en compte (dangereux, non dangereux dont inertes et radioactifs éliminés en kg/m²sdp) :

- déchets d'activité
- déchets d'entretien et maintenance
- déchets de chantier
- et quantités de déchets sur tout le cycle de vie (issues de l'ACV avec Méthode PEBN Label E+C-, EN 15978)

2.4 Cradle to grave Life Cycle Assessment

Calcul et capitalisation dans l'observatoire des indicateurs environnementaux selon les normes EN 15804 / 15978 et sur un PER de 50 ans.

Tous produits et équipements du bâtiment, y compris VRD.

Valorisation du module D si c'est un bénéfice (coeff 1/3 pour les produits).

6 logiciels sont désormais disponibles aux acteurs (ClimaWin, OneClickLCA, ELODIE, novaEQUER, ThermACV, Béa)

3.1 Total water consumption

Résidentiel

Réduction des consommations d'eau : robinetteries de qualité, système de détection de fuites, équipements économes, récupération et réutilisation des Eaux de Pluie

Non résidentiel

Estimation de la consommation d'eau potable en m3/m²sdp.an (ou en UF/m².an)

Bilan entre consommation et récupération d'eau en m2 (ou par personne en option) pour les différents usages internes du bâtiment en exploitation, y compris nettoyage, restauration… et d'arrosage. Phase d'exploitation.

Utilisation d'un outil excel avec un calcul du bilan consommation et récupération à pas journalier.

4.1 Indoor air quality

Résidentiel

- Produits et matériaux de construction, revêtements de mur et de sol, peintures et vernis, sont étiquetés A, au sens de l'arrêté du 19 avril 2011
- Ventilation : VMC (DTU 68.3), DIAGVENT 2 autocontrôle de l'installation Ventilation DF : filtres M5/M6/M7
- Classe A/B Mesures de perméabilité des réseaux aérauliques, Mesures débit/pression sur site
- Pollutions extérieures (radon, sols):Mesures de traitement
- Mesures QAI : Protocole HQE Performance

4.1 Indoor air quality

Non-Résidentiel

- Phase conception, simulation (statique) en fonction de l'usage, de la ventilation et de la classe d'émission des matériaux en contact avec l'air et du mobilier : fCOV totaux et formaldéhyde
- A la réception, mesure des débits de ventilation et soit calcul soit mesure qualité de l'air intérieur avec des valeurs à atteindre qui dépendent du Haut conseil de santé publique (formaldéhyde et benzène), OMS (WHO) et ANSES (dioxide d'azote), particules 2,5 (OMS). Le radon est pris en compte dans les zones à risques par la règlementation française.
- En exploitation, mesure qualité de l'air intérieur avec des valeurs seuil du Haut conseil de santé publique (formaldéhyde et benzène), OMS (WHO) et ANSES (dioxide d'azote), particules 2,5 (OMS). Le radon pris en compte selon règlementation française.
- Adaptation du système de ventilation et des filtrations en fonction de l'air extérieur

4.2 Time outside of thermal comfort range

Résidentiel

- Calcul du nombre moyen d'heures en dehors de la zone de confort<80/70/60h en été
- Facteur solaire des baies optimisé, surventilation nocturne, végétalisation, confort en mi-saison

Non résidentiel

- Limite de temps d'inconfort à 2% au-delà du polygone tenant compte de 5% d'insatisfaits incompressibles (cf. ISO 7730).
- Pas de différence entre période chaude et froide, le calcul se fait sur l'ensemble de l'année.

OPTIONAL : **Lightning and visual confort**

Résidentiel

- Accès et qualité éclairage naturel,
- Eclairage artificiel optimisé
- Risques d'éblouissement réduit

Non résidentiel

Conformité à la future Pr EN 17037 (éclairage naturel des bâtiments).

Indicateurs retenus :

- Autonomie en lumière de jour
- Indice de rendu des couleurs (Ra)
- Éblouissement d'inconfort en éclairage artificiel (UGR)
- Éblouissement d'inconfort en éclairage naturel
- Accès aux vues
- Maîtrise de l'ambiance visuelle par les usagers

Alliance HQE

OPTIONAL : Acoustics and protection against noise

Résidentiel

Respect de la réglementation,

Qualité des produits,

Bruits de chocs et d'équipement réduits,

Réverbération des circulations communes diminuée

Non-résidentiel

DnT,A,tr : Isolement vis-à-vis des bruits aériens extérieurs

DnT,A : Isolement vis-à-vis des bruits aériens entre locaux

L'nTw : Bruit de choc

LnAT : Bruit d'équipement

Tr : Temps de réverbération

Alliance HQE

5.1 scenarios for projected future climatic conditions

Résidentiel

- Résilience par rapport aux aléas climatiques (Vagues de chaleur, Pluies intenses; Mouvements de terrain; Sécheresse): identification et analyse de risques
- Exigences en termes de confort thermique en cas de scénario caniculaire
- Choix constructifs et/ou organisationnels permettant la prise en charge d' effets d'aléas climatiques sur l'opération

Non-résidentiel

- Rien pour le moment mais facile à faire si l'on dispose de fichiers météos prédictifs 2030 et 2050.

6.1 Life cycle costs

Résidentiel

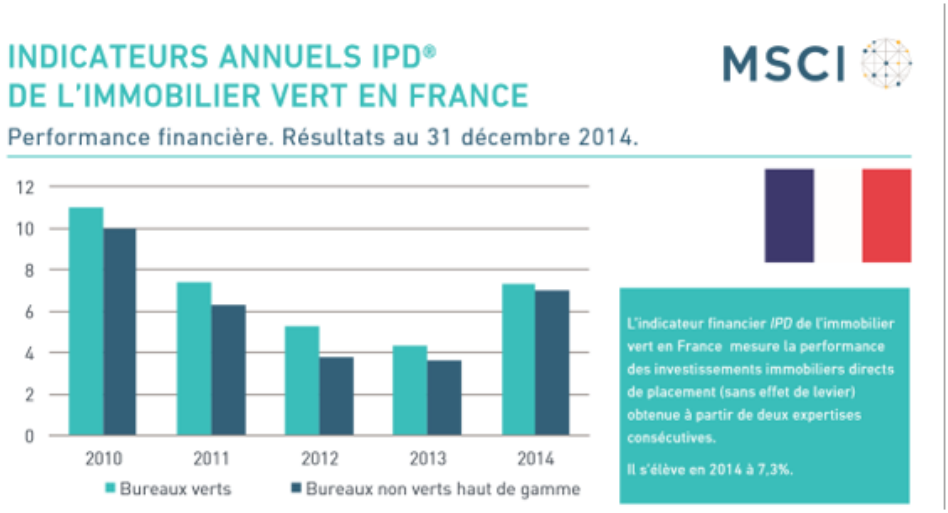
- Maitrise des consommations et des charges: estimation prévisionnelle des charges d'exploitation du bâtiment en €TTC/m²/an, contrôle de cohérence sur poste énergétique et conso d'eau.
- Etude d'approvisionnement en énergie (RT2012)
- Etude en cout global (sur installations de chauffage/ECS, enveloppe du bâtiment) suivant ISO 15686-5

Non-résidentiel

- Maîtrise des charges de fonctionnement
- Maîtrise des charges d'exploitation
- Maîtrise des charges de gros remplacements
- Recours à des analyses en coût global

6.2 Value creation and risk factors

Pas demandé à l'heure actuel mais études démontrent la création de valeur



Alliance HQE

Conclusions

Les méthodes utilisées ne sont pas toujours les mêmes

Mais

Tous les thèmes de LEVEL(S) sont traités à l'exception de la création de valeur et des facteurs de risque

donc

Des passerelles peuvent être étudiées pour alimenter l'expérimentation

Il est possible de faire des expérimentations sur de grands nombres

Nous pouvons aider des pays qui n'ont pas cette expérience et ces outils

Alliance HQE