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# Level(s) test phase analysis Annex 2: Findings from the verification process



*Draft consultation version*

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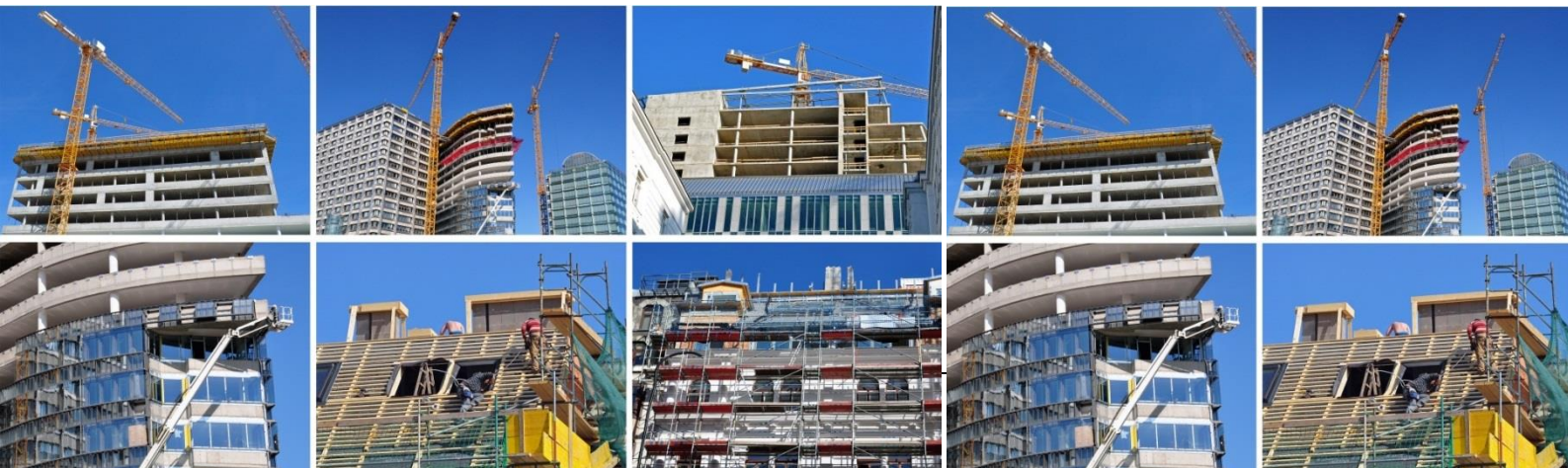

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# 1 INTRODUCTION

Verifications of a small sample (10) the over 130 registered Level(s) test projects have been carried out according to the methodology established by the Joint Research Centre's (JRC) B5 unit. This Section describes the verification process, test project selection and the interview questions used.

## 1.1 The verification process

The verification process for each project consisted of, first, a desk-based review of the test results, then followed up by a web-based interview with the testing team. Where necessary, further follow-up communication was used to clarify any outstanding points.

The testing teams included designers, contractors and clients and will be referred to as 'testing teams', 'testers', or 'Level(s) users' throughout this report. This overall report synthesises the findings from the verification process, including recommendations for improvements to Level(s) and and how it can be used.

## 1.2 The test projects selected for verification

Ten projects were selected to be verified and are noted in **Error! Reference source not found.**, in chronological order of the interviews, together with the country and main contact person. They were selected to, as far as possible within the limits of the number of interviews that could be carried out, represent a cross section of building and project types, test teams, level of professional experience, selected 'level' of testing and geographical locations from within the test community.

***Table 1: The Level(s) test projects selected to be 'verified'***

| | Name of the project | Country | Main contact person |
|---|---|---|---|
| 1 | Energy refurbishment of social housing building located in old city | Italy | Margherita Finamore |
| 2 | Greensquaregarden | Denmark | Brian Højbjerre Sørensen |
| 3 | Renovation Glategnies | Belgium | Sébastien Motte |
| 4 | Residence Le Gallium | France | Etienne Vienot |
| 5 | Edge Tech | Netherlands | Anja Köhler |
| 6 | Nuovo Centro Direzionale ENI | Italy | Margherita Santamicone |
| 7 | Eskolantie 4 and 6 | Finland | Marus Lukin |
| 8 | Tour des Jardins de l'Arche | France | Leticia Cruz and Lola Pialot |
| 9 | Perniön Terveyskeskus | Finland | Heidi Karlsson |
| 10 | Villa Vera | Spain | Paula Rivas |

Not all projects addressed all indicators and life cycle tools. When testers chose to address certain indicators, they were not always able to obtain results completely. The indicators tested and the cases where results were obtained are summarised in *Table 2*.

***Table 2: Results obtained for all 10 sample projects and all indicators / life cycle tools:***

| Test projects | 1.1 | 1.2 | 2.1 | 2.2 | 2.3 | 2.4 | 3.1 | 4.1 | 4.2 | 5.1 | 6.1 | 6.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Y | | | | | | | | | | | Y |
| 2 | Y | Y* | | | Y* | Y* | Y | N | Y | | Y | Y |
| 3 | Y | Y | | | | Y* | Y | Y* | | | | Y |
| 4 | Y | | | | N | | Y | N | N | | | Y* |
| 5 | Y | | | | Y* | | Y | N | | | | |
| 6 | Y | Y | Y | Y* | Y* | Y* | Y | Y* | Y* | | | Y |
| 7 | Y | Y | Y | N | | | Y | | | | | Y* |
| 8 | Y | Y* | Y | Y* | N | | Y* | Y* | Y* | | | Y |
| 9 | Y | Y | N | Y* | N | | Y | | | | | Y |
| 10 | Y | Y | Y | Y | Y* | Y | Y | Y* | Y* | Y | Y | Y |

a) **Y (yes): results were obtained;**
b) **Y*: results were partially obtained;**
c) **N (no): the indicator / life cycle tool was addressed but the testers were unable to obtain a result;**
d) **Blank: the indicator / life cycle tool was not addressed by the test team**

## 1.3 Interview questions

The standard set of questions asked to each Level(s) test team were the following:

*General questions about the project*

- Please introduce the technical roles, experience and training within the team
- Please describe the methodology for obtaining the floor area?
- How has Level(s) been used? i.e. expectations, motivations, the project, project stages
- How did you decide which indicators and level to work at?
- Have you been able to make use of the results? If yes, what for?
- Did you have to supplement your team's expertise with any external expertise requiring additional expenditure? *Please explain further*
- Do you think your needs/experience are representative of similar sized projects in your country?
- If you used it, how helpful were the helpdesk and forum offered in the testing phase?

*Indicator/life cycle tool specific questions, to be repeated for each indicator*

- Please describe the practical experience and the steps taken and tools employed to obtain the result for this indicator?
- Was a result obtained? If not, what were the reasons?
- Which were the main difficulties encountered and how have these been overcome?
- Did you encounter any problems, either in the methodology or using the reporting excel?
- **If the interviewer identified any gaps or errors in the submitted results, these are to be checked and further discussed with the test team at this point.**
- To what extent did you make use of existing data/results, or had to do something new?
- How did you use/follow the Level(s) guidance? Were you able to interpret and follow the guidance for your level? Did you have to make any short cuts/deviations from the guidance and why?
- Were you missing anything that would have helped with the process?

- Was it a useful exercise to calculate this indicator/life cycle tool? Were your expectations met? Did you learn anything from using the indicator/life cycle tool?
- Do you have a sense of how reliable the information that you obtained is?
- What modifications and supporting tools would you propose/recommend when revising the Level(s) beta guidance documentation?

# 2 SUMMARY OF FACTUAL OBSERVATIONS SPECIFIC TO THE INDICATORS AND LIFE CYCLE TOOLS

For each indicator and life cycle tool, observations are first summarised from the desk based review, followed by those made from the interviews themselves. The analysis has sought to answer the following general questions:

- what in the guidance were test teams able to follow?
- what work on the different indicators were they able to do?
- what were they not able to do as it was intended?

Broader horizontal observations relating to the design and use of Level(s) are summarised in section 3.

## 2.1 Indicator 1.1 – Use stage energy performance

### *2.1.1 Desk-based review observations*

While this indicator is often asking for data they already have (energy performance simulations for rating schemes or mandatory calculations), it is not always filled in correctly. The main confusion observed related to the difference between 'primary energy' and 'delivered energy' as well as what the 'exported energy generated' means. The fact that the total is not automatically calculated (column E) and the total primary energy is not automatically summed up (total primary energy = non-renewable primary energy demand + renewable primary energy demand – exported energy generated) and the fact that lines need to be added and described under 1.1.2 are probably also at the cause of some user errors that could be avoided.

### *2.1.2 Interview observations*

For indicator 1.1, the ventilation values were found to be difficult to dissociate from the HVAC values.

In terms of use of the reporting tool, the lines 22-27 in the Level(s) reporting excel are not clear to the users. Many users were confused on how to fill them in and sum the results (with positive or negative numbers for energy demand versus energy generated for example). The relations between rows 22 to 27 is not clear (see color coding) in the reporting tool, leading to the following questions:

- is the total primary energy demand the total of the non-renewable primary energy demand, renewable primary energy demand, and exported energy generated?
- Should the exported energy generated be a negative number in this summation?
- Why is column E (Total in kWh/m2/yr not automatically calculated when the users fill in the energy uses in terms of heating, cooling, ventilation, etc.?

The users did not always understand that they could add or delete lines under 1.1.2. Also, the difference between primary energy and delivered energy was not always known. This could be defined in the reporting tool (for example when hovering over the cells). In general, the rows 22 to 27 for indicator 1.1 in the Level(s) reporting

excel should be more automatized in order to prevent user errors. For example, if totals are not calculated automatically (e.g. Total kWh/$m^2$/yr of Natural Gas Heating), then these cells were sometimes empty whereas the separate results were filled in. Users expect these totals to be calculated automatically rather than having to manipulate the excel themselves to calculate the total based on what they filled in.

## 2.2 Indicator 1.2 – Life cycle Global Warming Potential

### *2.2.1 Desk-based review observations*

This indicator makes use of several inputs:

(1) GWP – fossil
(2) GWP – biogenic
GWP – GHGs (1+2)
(3) GWP – land use and land transformation
GWP – overall (1+2+3)

However, many users did not fill in all rows for the Global Warming Potential (GWP). The row '(3) GWP – land use and land transformation' is often empty, probably because the definition is not clear to the users or because this is not given by the LCA tools used to calculate the GWP. Another issue is the definition of 'biogenic', which differs from one user/tool to another.

For this indicator, it did not appear to be clear to those filling out the reporting whether there was a distinction between Level 1, 2, and 3.

### *2.2.2 Interview observations*

For indicator 1.2, the term "biogenic" was not clear to the users. Land use and transformation was often not addressed. The modules to report on for both indicator 1.2 and tool 2.4 are not aligned with national databases such as, for example, the Danish databases.

## 2.3 Life cycle tool 2.1 – Building bill of materials

### *2.3.1 Desk-based review observations*

The Bill of Materials requires the definition of quantities. This was done by material type and is asked for in the headline totals to be reported in 'tonnes' (Cell 12G-K) while in the disaggregated reporting in kilograms (column F). Some users filled in actual units in column F (kg, $m^3$, etc.) and others interpreted this as 'number of units' (1, 22, etc.). Therefore, it is not clear what the users actually filled in as numbers in columns G to K. Also, the mass of different materials in Part 1 is given in absolute or relative (per $m^2$) values. It was also not clear if they account for the materials used over 60 years for example.

### *2.3.2 Interview observations*

For life cycle tool 2.1, the definitions of building elements and components and the unit of normalisation were not clear. It was also not clear whether the Bill of Materials includes upstream elementary flows or just the amounts of materials used.

In terms of use of the reporting tool, Columns G-K for indicator 2.1 indicate the functional unit to be kg, while column F indicates the unit chosen by the users. The division in categories also differs from the ISO standards and used LCA software. The divisions into levels 1, 2, and 3 are not always clear. This is also the case for the overarching LCA tool.

## 2.4 Life cycle tool 2.2 – Scenarios for lifespan, adaptability and deconstruction

### *2.4.1 Desk-based review observations*

For scenario 1, on lifespan, the building elements can be imported from 2.1. This importing process did not always work for all users.

### *2.4.2 Interview observations*

For scenario 1, the Reference Service Life (RSL) used by the testers for some products had to be altered to correspond to the example in Level(s).

In terms of use of the reporting tool, the import button for building elements from 2.1 did not work for all users in the reporting excel. The means to import the bill of materials was, as a result, unclear to several users. The possibility to add rows was not clear either.

## 2.5 Indicator 2.3 – Construction & demolition waste and materials

### *2.5.1 Desk-based review observations*

For this indicator, the data was often only filled in partially. Pre-estimates were rarely made. The difference between deconstruction and demolition might not be clear to the users. Some users identified 'Demolition: Module D-estimate' as the demolition of any pre-existing building that was demolished to make place for the building project the team is assessing, while others assumed this relates to the end-of-life demolition of their own project.

### *2.5.2 Interview observations*

It was not always clear if "demolition" encompasses the demolition of buildings that were on the site before or of the actual building after 50 years if it gets demolished.

## 2.6 Life cycle tool 2.4 – Cradle to cradle Life Cycle Assessment (LCA)

### *2.6.1 Desk-based review observations*

This tool is overlapping partially with the observations for indicator 1.2 (GWP). The use of non-metallic mineral resources was not always filled in but in general the reporting was complete.

### *2.6.2 Interview observations*

In terms of using the reporting tool, sheet 2.4 does not allow for the completion of non-mineral resources, nor does it have fields for level 2 and 3.

## 2.7 Indicator 3.1 – Use stage water consumption

### *2.7.1 Desk-based review observations*

This indicator was almost always filled in based on results obtained from the JRC water calculation tool, which was provided separately. The performance assessment report gave different results in Level 1, 2, and 3. The Water Exploitation Index (WEI+) is not always reported on. The optional reporting, for example for irrigation water use, was often filled in.

### *2.7.2 Interview observations*

It was not clear to the users why different results are obtained for the same questions for indicator 3.1 in Level 1, 2, and 3. It would be useful to have a list of Water Exploitation Indexes (WEI) as well as an explanation about what this index is. Some users did not know about the existence of the JRC water calculation tool. The availability of this water calculation tool was not made clear within indicator 3.1 in the reporting excel.

In terms of use of the calculator and reporting tools, an inconsistency was observed in the reporting excel: the non-potable water is asked for in Level 1, while the JRC water calculation tool does not provide this information when Level 1 is chosen. In the JRC water calculation tool, a bug was detected in cells Q8-13: the results do not work for Belgium. Moreover, the water calculation tool did not allow to select the 'no irrigation' option.

## 2.8 Indicator 4.1 – Indoor air quality

### *2.8.1 Desk-based review observations*

The indoor air quality indicator was rarely filled in completely. For 4.1.1, the standards to be used for reporting lead to confusion. Some users noted that these standards were not available to them or that the national standards they use were not included in the drop down menus. For 4.1.2, the target air pollutants for source control and how to complete the table was not clear: should the users fill in ranges or numbers; target values or actual values? The test users all answered this question differently, often leaving at least one column empty (e.g. Lowest Concentration of Interest), probably due to a lack of data/knowledge.

### *2.8.2 Interview observations*

It would have been useful for testers to have look-up tables from the standards EN 16798-1 and EN 13779 for the indoor air quality classes [1].

In terms of use of the reporting tool, the standards that had to be used by some teams were not provided as options in the dropdown menu. Several test teams had to use national guidelines rather than European standards. In the reporting sheet, the guidance notes provided in the excel erroneously refer to VOCs. It is also unclear whether ranges, numbers and targets versus actual values are required.

## 2.9 Indicator 4.2 – Time out of thermal comfort range

### *2.9.1 Desk-based review observations*

The time out of thermal comfort range was generally filled in correctly when addressed. Some users could not fill in some cells in Part 2 and 3 which related to the time out of range with and without mechanical cooling, as well as the classification of the comfort range according to an EN standard.

### *2.9.2 Interview observations*

In terms of use of the reporting tool, the time out of range is not indicated in most of the building energy consumption simulation software available. Data on this is therefore difficult to obtain. Moreover, it is not clear why parts 1 and 3 of the reporting do not follow the same standards.

## 2.10 Life cycle tools 5.1 – Scenarios for projected future climatic conditions

### *2.10.1 Desk-based review observations*

Only one test used this indicator, reporting only on the worst case 'medium high' climate projection.

### *2.10.2 Interview observations*

Results from simplified thermal modelling was used, which rarely indicate the time out of range. It was considered that the inherent uncertainty may be bigger than the temperature variation in 2030 and in 2050.

## 2.11 Indicator 6.1 – Life cycle costs

### *2.11.1 Desk-based review observations*

This indicator was only used by two testers. When reported on this indicator appeared to be straightforward to use and was filled in correctly. The total divisions by life

*[1] Permission to reproduce and provide to testers the relevant EN standard look-up tables for indicator 4.1.1 was provided to JRC midway during the test phase, after some testers had compiled their results.*

cycle stage and in one-off costs, annual recurrent costs, and projected non-annual costs were possible to fill out.

#### *2.11.2 Interview observations*

The rate of inflation and discount rate to use were not clear to the users. Also, it is not clear whether end-of-life costs refer to any demolition/deconstruction before the building is built or at its anticipated end-of-life.

### 2.12 Indicator 6.2 – Value creation and risk factors

#### *2.12.1 Desk-based review observations*

The reliability rating component of the indicator is filled-in automatically by the reporting excel tool when users have filled in the reliability scores of each indicator. However, some boxes were still coloured in red even when they had been addressed by the user. This indicates that there is a bug in the excel reporting tool. Whilst most testers completed the reliability rating under each indicator the value creation aspect was generally not completed.

#### *2.12.2 Interview observations*

It was not clear whether this rating aspect was included in Level 1 or not. In general, the guidance for making ratings of all the indicators is not clear enough yet. The users suggested that a clarification is needed on what the different ratings mean. The process to obtain the 'reliability rating' is too subjective according to most users. A more objective methodology is needed.

In terms of using the reporting tool, it does not update automatically every time according to the users. The reliability of the life cycle scenarios 2.2 and indicator 2.3 are not automatically updated in the 6.2 reporting sheet, indicating a bug in the excel.

## 3 SUMMARY OF FACTUAL OBSERVATIONS RELATED TO THE OVERALL USE OF LEVEL(S)

In this section, broader horizontal observations made from the interviews are presented and summarised under common headings that could be identified. These observations largely relate to the testers experience of the design and use of Level(s).

### 3.1 Reporting on performance using Level(s)

#### *3.1.1 Time and expertise entailed in reporting*

Teams did not expect that Level(s) would be as *time-consuming*. They believe Level(s) should be less time-consuming than existing certificates such as WELL or BREEAM, which is currently not the case. The knowledge and manhours required for Level(s) are huge.

#### *3.1.2 User friendliness of the guidance documents*

The user-friendliness of the guidance needs to be improved: the language is too technical, the guidance is too long and data gathering for some indicators is too time-consuming.

The Level(s) guidance has *too much (repetitive) text* and is lacking a clear, user-friendly "step by step" indication of how to fill in the reporting tool. Guidance should be more straightforward to help compiling the data and results. The guidance is written in a *too technical language*. The guidance is too massive, indigestible, and not precise and clear enough.

The guidance was mainly used to understand definitions. However, some definitions in the guidance are not clear. For example, the definitions of the difference between unregulated and regulated energy uses, diversion for reuse and recycling, diversion for other material recovery operations, etc. were not understood by the test teams. Definitions could be provided when hovering over the cells in the reporting tool rather than in a separate document.

### *3.1.3 Access to data*

The main difficulties always concerned the lack of data. Not all stakeholders have access to the same kind of data. For example, city representatives might lack data/knowledge for reporting the environmental performance of their projects. The complexity of reporting all indicators and life cycle tools in Level(s) requires a multi-disciplinary team.

Levels 2 and 3 were considered to require too much time for data collection. Generally, at these levels the indicators require a lot of data and need for additional expertise from engineering offices. Not all stakeholders can afford this additional expertise. For example, collectives or public entities were not able to do so. Not all building projects are in the appropriate stage to give data. In those tests that reported after occupation of the building data was difficult to obtain. Deconstruction data is difficult to predict.

### *3.1.4 Performance assessment as a certification*

Teams were expecting Level(s) to be used as a *certification* tool. However, Level(s) does not fit their certification aims. The Level(s) methodology does not let users know whether their building is 'good' or 'bad' in terms of sustainability. Level(s) does not give feedback on the actual environmental performance of their building based on the results obtained. This makes it unclear to users what the purpose is of the time-consuming process of filling in the many details on their built project. They asked if their performance results could be assessed either through:

a) a comparison to an actual market benchmark, or
b) a rating score (cfr. LEED Platinum, BREEAM outstanding, etc.).

### *3.1.5 Languages and definitions*

Language is a barrier to using the guidance. Some teams suggested to translate Level(s) documents and tools in EU languages for better understanding [2].

Although many are already provided, more and improved definitions of technical terms and concepts are still needed, such as: exported energy, deconstruction versus demolition, whether demolition refers to a previous building or an end-of-life of the actual building, WEI, reliability scores, etc. These definitions could be given in pop-up windows next to the cells or the red guidance notes visible when hovering over the cells in the excel reporting tool provided as a help for reporting the environmental performance of the projects for Level(s).

### *3.1.6 How the framework and 'levels' work*

The difference between '*indicator*' and '*life cycle tool*' is not clear.

Level 1, 2, 3 are not considered incremental in terms of difficulty. The users thought that the 'level' should give an indication on the progressive difficulty / time required to gather data. It is not clear to the users whether Level 3 is more detailed or if it is to assess design improvements.

### *3.1.7 Use of European standards*

Many indicators and tools refer to European standards. However, most users of Level(s) use national standards and norms in their daily practice. They asked for an overview of country-specific norms and standards.

The teams suggested that alignment with national policies, tools (e.g. TOTEM in Belgium), labels (e.g. E+/C- in France, A+ in Belgium), and data should be ensured. This alignment would facilitate the use of existing data from mandatory software/databases nationally. The Level(s) guidance would then be translated with references to these standards, data, and tools from each country. At least, the guidance could specify European standards together with applicable national standards for each indicator. National translations would be useful.

Also, the European standards used in Level(s) are not available freely. The users of Level(s) asked if these standards, or at least extracts from them, could be made available to them for using them in Level(s). In general, more guidance is also needed on how to use the standards.

### *3.1.8 Reliability of the results*

Testers were asked whether they had *'…a sense of how reliable the information that you obtained is?'*. The response depended on the indicator or tool. In general, the level of reliability was considered to relate to whether they have used real/measured

[2] *The part 1-3 guidance is currently available in English, German, Spanish, French, Italian and Polish.*

data for the project, whether the team were LCA/sustainability experts or not, and which tools they were using. Most testers found it difficult to assess the reliability of the information they obtained. The following observations could be made by indicator and tool:

- For indicator 1.1, the reliability is related to well-known differences between energy simulations and reality and on the software/tools used in each country;
- for indicator 1.2 and 2.4, the testers often didn't know how reliable their information was (especially the geographical representativeness) and usually depended on the databases and tools they used (e.g. TOTEM, OneClickLCA) so that the results are as reliable as the database/tool;
- for indicator 2.1, the data used was considered reliable but the division into the reporting tool's categories then introduced difficulties for some;
- for indicator 2.2, users trusted the LCA or certification tools they had been using;
- for indicator 2.3, it depended if they had a third party such as BREEAM/LEED doing or verifying the calculations for them;
- for indicator 3.1, they had trust in the JRC water calculation tool;
- for indicator 4.1, testers didn't know how to verify the information material suppliers provided and the reliability depended on the available norms in the different member states;
- for indicator 4.2 and 5.1, not many testers were sure about their results depending on the weather data and most couldn't fill in part or all of the information;
- for indicator 6.1, the life cycle cost data was considered very reliable as they have a clear idea about the cost;
- for indicator 6.2, many testers considered this quite subjective even though it was intended to assess, in part, the reliability of results.

### *3.1.9 Errors and inconsistencies*

Errors were reported in the description of the life cycle stages in Table 2.3.1 Life cycle stages of the Level(s) guide part 3 (page 38 and 39). An inconsistency between the definition of Module D in the EN standards and the Level(s) guidance was also detected.

## 3.2 Reporting tool (excel) issues

### *3.2.1 User friendliness of the tool*

According to test teams, the tool is *too technical*. A more user-friendly tool should be designed. Straightforward indications on how to fill in the reporting tool are needed. They would prefer to have these indications within the tool rather than in a separate guidance document. For example, the red guidance notes in excel could be used to help clarify the inputs more.

The water calculation tool was much more appreciated for its ease of use and how it helped to fill in indicator 3.1 and was often cited as an example of an easy tool compared to the reporting excel spreadsheet.

An *example of a filled-in excel form* would be useful to the users.

### *3.2.2 Visuals*

Users suggested to include more drawings and photos of the relevant project being reported on, as well as a more detailed project description within the reporting tool, going beyond the format that is currently reproduced from the part 3 guidance document. Visually, testers have suggested to make Level(s) more user-friendly by making the *chart types and size more uniform in the reporting tool*.

The visuals should also make clear whether users need to scroll sideways or downward in the reporting tool. The *colour coding* should be clearly indicated. Many users did not see what the difference was between yellow, green, and red cells. For example, should the red cells be the sum of the green cells (e.g. indicator 1.1) and if yes, why is this not automatic? Some testers suggested to go towards a more straightforward and simpler tool that would look like the survey they had filled in for evaluating the test phase.

Users expected to understand how their building performs with Level(s). Architects would like to see the *performance of their building*, compared to a reference building, compared to a benchmark, or as a rating score, in a visual way.

### *3.2.3 MacOS compatibility*

The Level(s) reporting excel is not compatible with MacOS, which is used by many architects and Level(s) test users.

## 3.3 Supporting services and tools

The JRC helpdesk was found to be *helpful*, especially when the questions test users asked were submitted to the helpdesk via the national Green Building Councils (GBC). The users particularly appreciated the helpdesk communication of the 26th of March 2019, which made look-up tables taken from EN 16798-1 and EN 13779 available for indicator 4.2, available on the link: https://susproc.jrc.ec.europa.eu/Efficient_Buildings/docs/190326_Indicator_4_1_EN16798_look_up_tables.pdf. The users recommended that these look-up tables should be included in the Level(s) guidance.

The users were confused about where to find information on the internet. Links need to be updated as they did not all work. One webpage including all the tools and documents (e.g. www.levels.eu) is needed.

Reference was made to the availability of tools and softwares that had been used for specific indicators. Test teams suggest to give free access to such tools through Level(s). The following comments and references were made:

- Additional tools such as OneClickLCA (€1000) were purchased.
- Direct access to the Lifetime Home Revised Criteria and to the DGNB TEC1.6 calculation tool would be useful.
- It would also be good to include a list of building energy modeling software that can be used.
- An explanation about tools that include BoM/LCA/BIM should be included.

The list of LCA tools and databases that is being developed and maintained by the JRC in parallel to the Level(s) verification phase was also referred to.

# 4 OVERALL CONCLUSIONS OF THE VERIFICATIONS

This report discussed the verification of building projects taking part in the Level(s) test phase, as a sub-task within JRC's responsibilities for analysis of the Level(s) test phase. The aim of the verification was to analyse the process of obtaining results for the different indicators, with a focus on whether the guidance could be successfully used as envisaged by the JRC. The conclusions have been grouped under common headings that could be identified.

## 4.1 Indicator-specific barriers and process issues observed

Not all projects were able to address all indicators and life cycle tools. All testers were, however, able to generate results for at least a number of indicators and life cycle tools. A range of indicator-specific barriers and issues have also been identified from the verification of the ten sample projects. The overall picture in terms of the testers' use of the indicators and life cycle tools is summarised in **Error! Reference source not found.**.

In overall terms, the indicators and life cycle tools can be seen to fall into two broad categories, based on the success rate and how well they worked or not:

- Those that generally worked well and would need rather limited "modifications": 1.1, 1.2, 2.1, 3.1, 6.2
- Those that were found to be more difficult and would require a rethinking of how they are specified and/or how the reporting works or maps onto/or can make use of data/information from the project: 2.2, 2.3, 4.1, 5.1, 6.1

The main motivation for testers to report was the potential to report on their environmental performance using a uniform European tool. In terms of test phase support that helped in obtaining results, the following was identified:

- the feedback of the helpdesk on definitions, methodologies, tools, and data to be used;
- the availability of look-up tables from European standards made available during the test phase;
- the alignment with existing LCA tools;
- the provision of the water calculation tool by the JRC (for indicator 3.1).

The main barriers identified by testers for not addressing indicators or obtaining results were:

- the lack of data;
- the time-consuming aspect of some calculation procedures;
- general confusion on definitions and steps to be taken due to the technical and extensive nature of the guidance;
- access to relevant standards and tools.

The testers also insisted that Level(s) would be used even more if the reporting tool could moreover could give feedback on the performance assessment of their project

through benchmarking, comparison to a reference building or a performance score (e.g. similar to rating schemes).

*Table 3. Overview of the observations for the indicators and life cycle tools*

| Indicator or life cycle tool | Were testers able to obtain results? | Observed barriers and process issues |
|---|---|---|
| Indicator 1.1 – Use stage energy performance | • All the selected testers were able to generate results; | • The definition of the different energy demands and how to calculate the totals in the reporting tool were a source of significant confusion.<br>• Clarity is needed on alignment with national calculation methods and whether national data can be used. |
| Indicator 1.2 – Life cycle Global Warming Potential | • 7 testers addressed indicator 1.2 and obtained results (at least for part of the life cycle stages); | • Lack of clarity in the definitions of land use and land transformation as well as biogenic GWP,<br>• These aspects are not aligned with commonly used LCA software. |
| Life cycle tool 2.1 – Building bill of materials | • The tool was addressed in 5 of the selected test projects and the BoM was reported on by 4; | • The main difficulty related to the division of the bill of materials into the elements and parts,<br>• This structure did not correspond to actual bill of quantity divisions given to contractors. |
| Life cycle tool 2.2 – Scenarios for lifespan, adaptability and deconstruction | • One or more tools were addressed in 5 of the selected test projects; | • Testers lacked data or specific information on component lifespans, adaptability aspects and deconstruction aspects.<br>• For the scenario on lifespan, the main issues encountered related to importing the building elements from existing bill of quantities or models and the overall reference service life (60 yrs) not being aligned with national figures. |
| Indicator 2.3 – Construction & demolition waste and materials | • 7 testers addressed indicator 2.3 but only 4 reported results; | • A lack of data hindered the calculation of indicator 2.3, and more planning and research is needed on demolition, construction, and end-of-life data for practitioners to understand what is needed and how to collect it. |

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|---|---|---|
| Life cycle tool 2.4 – Cradle to cradle Life Cycle Assessment (LCA) | • The overarching assessment tool 2.4 was addressed – through the use of an LCA software – in 4 out of 10 projects and results were obtained for all aspects except for the 'use of non-metallic mineral resources' in 3 projects and the 'use of renewable primary energy resources used as raw material' in 1 project; | • An LCA software tool had to be used to obtain results, with the exception of 'use of non-metallic mineral resources' and the 'use of renewable primary energy resources used as raw material' which are not always part of the LCA software tool outputs – *see the issues identified for tool 2.1*.<br>• Questions about access to tools such as LCA software and databases arose. Additional costs were incurred for purchasing certain software and databases. |
| Indicator 3.1 – Use stage water consumption | • All testers (except one) were able to obtain results; | • Indicator 3.1 was straightforward thanks to the user-friendly water calculation tool provided by the JRC, but might require more definitions (e.g. WEI). |
| Indicator 4.1 – Indoor air quality | • 7 testers intended to address the indicator but only 4 reported partial results; | • For sub-indicator 4.1.1, there was confusion relating to the standards to be used and lack of access to the look up tables was a barrier. National standards had to be used as references in some cases.<br>• For sub-indicator 4.1.2, there was significant confusion relating to how the target air pollutants should be reported. The data requested was not always available. It was also unclear whether the fields were for target or actual values. |
| Indicator 4.2 – Time out of thermal comfort range | • 5 testers addressed the indicator 4.2 and of those, 4 were able to report at least either the percentage of time out of range (%) or the temperature range (°C); | • This indicator was considered straightforward when the data or simulation tools were available to testers.<br>• Some problems were experienced obtaining the time out of range output required, as not all simulation models or methods automatically provide it. |

| | | |
|---|---|---|
| Life cycle tools 5.1 – Scenarios for projected future climatic conditions | • 1 tester addressed the tool and obtained (estimated) results; | • For the tester, the tool was considered straightforward when the data or simulation tools were available.<br>• Obtaining a result was reliant on their skill and knowledge, as in the end it was made as an estimation. |
| Indicator 6.1 – Life cycle costs | • 2 testers addressed this indicator and obtained results; | • This indicator appeared to be straightforward to use and to report in the format provided.<br>• Greater clarity is needed on the assumptions to be used - the inflation and discount rates to use were not clear to the users.<br>• Greater clarity is needed on whether end-of-life costs refer to any demolition/deconstruction before the building is built or at its anticipated end-of-life. |
| Indicator 6.2 – Value creation and risk factors | • All testers (except one) obtained results for reliability rating component but the value aspect was not addressed; | • The reliability was automatically filled in within the reporting tool, but there were some minor bugs in the import of the data from other worksheets that need to be fixed.<br>• There is a need for more objectivity in making the reliability scores as they were felt to be a little vague and subjective to assess.<br>• To address the value aspect would have required professional input based on knowledge of the relevant method used in the locality. |

## 4.2 Test team capacity and support to use Level(s)

The main reason why most testers participated to the Level(s) test phase to was form part of the development and use of a European assessment tool. Some indicators made different stakeholders (e.g. architects) think about environmental impacts in a broader sense compared to business-as-usual constraints. Testers realised that technicians at construction firms need improved sustainability assessment skills and training in order to use Level(s).

Often, the indicators and life cycle tools most closely related to performance assessments which are already commonly asked for in practice, in national standards, or in well-known rating schemes such as LEED or BREEAM, were reported on (e.g. use stage energy performance). Indicators and life cycle tools that were considered to be more novel or to require extra data gathering or processing were often not addressed (e.g. scenarios for lifespan, adaptability, and deconstruction).

The overarching LCA assessment tool (2.4) and life cycle GWP indicator (1.2) were addressed by teams who had an LCA software or expert available within their team. The use stage water consumption was often calculated with the water calculation tool provided by the JRC. The scenarios for projected future climatic conditions were only addressed by one team, as it required knowledge of how to adapt an existing thermal simulation.

When the test teams used the JRC helpdesk, it turned out to be very useful. The national GBCs were also helpful. The meetings, webinars, and conferences were much appreciated. It would be useful to have all contact information, tools, and documents on one page (e.g. www.levels.eu).

## 4.3 Horizontal aspects of Level(s) that could be improved

The following conclusions apply to the framework as a whole, including its design and the specification of each of the indicators and life cycle tools:

### *4.3.1 Design and definition of the framework*

The difference between an ‘indicator’ and a ‘life cycle tool’ was not clear. The difference between Levels 1, 2, and 3 was also not clear in most cases.

### *4.3.2 User friendliness of the guidance documents*

In general, test teams complained that the reporting excel tool was not user-friendly enough and that the guidance had too much text. A more straightforward guidance, with an example of how to fill in the reporting excel tool, was asked for.

### *4.3.3 Language and definitions*

The language was also too technical according to the users, especially since many of them speak other EU languages than English. Some teams asked for a translation in EU languages.

Definitions are not always clear, which can lead to user errors. This might be due to the fact that users do not take the time to look up definitions in the guidance, considering the high number of pages and its technical language. Perhaps the important and simplified definitions can be given in the red guidance notes attached to certain cells, directly in excel.

### *4.3.4 Determining sustainability performance*

The main difficulty for filling in the reporting excel tool was the unavailability of data or the man hours required to gather data and to process it in the right format for Level(s). Moreover, the willingness to allocate these manhours to the Level(s) reporting was low considering the results of Level(s) did not give an indication of a buildings performance in terms of overall sustainability.

A useful addition to Level(s) and a strong incentive to use it would therefore be if users could compare the results calculated by the testers to a reference building or benchmark. This would allow for a building to be given a rating score (cfr. LEED, BREEAM) that would help them improving a design project or simply tell them how 'sustainable' their building project is. The test users suggested that this should be done in a visual way.

### *4.3.5 User friendliness of the reporting tool*

The visual layout of the reporting excel tool can also be improved to make it clearer to users at which Level they are working, what they should fill in and how the results relate to each other. The colour coding can be indicated more clearly. The chart types and sizes can be further standardised.

### *4.3.6 Use of European standards*

The European standards referred to in Level(s) are not always available to the users. Moreover, most of the tester use national standards instead. It would be useful to describe the alignment of the national standards with the European ones or with Level(s). This could be done by the national governments or Green Building Councils for example.

## 4.4 Overall conclusions

In conclusion, most testers were able to submit results for indicators and life cycle tools which are already commonly reported on (e.g. use stage energy performance). The main issues faced in using less familiar indicators and life cycle tools related to the lack of data, time-consuming calculations, unclear definitions, and lack of access to standards and tools.

At a horizontal level, a number of design and process issues will need to be addressed before Level(s) can be consistently used to make performance assessments. These issues led to observed problems with:

- the quality and consistency of the reported results,

- the comprehensives of the reported results,
- the ability to obtain results for whole/parts of the indicators or life cycle tools, and/or
- testers' confidence to even start using an indicator or life cycle tool.

The testers interviewed were pro-active in putting forward suggestions for how to address these issues – and these have been summarised in the preceding sections. They mainly relate to: the time and expertise required, access to data and standards, national interpretation of the requirements, consistent definitions and the need for more user friendly guidance and reporting.

The main incentives for testers to participate in the test and to use Level(s) were the uniformity it offers across Europe, the alignment with already existing methods and tools nationally, the guidance of the helpdesk including look-up tables from standards, and auxiliary tools such as the water calculation tool and the automatically reported indicator 6.2. Testers mentioned that feedback on their performance assessment and on the sustainability of their building would increase their motivation for participation. To do so, there is however a need for benchmarking.