ARCHITECTS' COUNCIL OF EUROPE
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Assessing the Role of Architecture in Building Performance as Defined by the EU Level(s) Scheme

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Contents

Background

The Architects' Council of Europe (ACE)

The Architects' Council of Europe (ACE) is the representative organisation for the architectural profession at European level. Its membership currently consists of 43 Member Organisations, which are the regulatory and professional representative bodies in all EU Member States, Accession Countries, Switzerland and Norway. Through them, the ACE represents the interests of 600.000 architects from 31 countries in Europe.

The ACE has actively contributed to the development and promotion of Level(s). Dr. Judit Kimpian, Chair of the ACE Sustainability Work Group, took part in the Steering Committee set up by DG ENVI. In June 2018, ACE organised a webinar[1] to raise EU architects' awareness about the tool and inform them about the ongoing testing phase.

Objective of the study and methodology

The present study aims to contribute to the testing phase of Level(s) by mapping out the barriers encountered by architects in getting data to carry out a Level(s) assessment and in interpreting them correctly as part of the architectural design process.

The study is based on interviews with professionals who are either themselves involved in the pilots or are coordinating several pilots from three countries (UK, DE, DK) identified by the ACE. The purpose of the report is to summarise a holistic, architectural perspective of Level(s) and its potential to improve sustainable architectural quality in buildings. It is envisaged that this report will provide the basis for future research on this topic.

The work of the consultancy has been supported by experts from the ACE Sustainability WG (expert supervision) and the ACE Secretariat (project coordination).

[1] https://www.ace-cae.eu/activities/events/2018/webinar-levels

Introduction

The Architects' Council of Europe has actively campaigned for opening up the sustainability discourse to a more holistic approach, considering environmental impacts beyond energy consumption and across the whole lifecycle of buildings.

ACE is deeply committed to the development and testing of Level(s).

The EU commission has developed Level(s) as a framework for assessing core sustainability objectives and indicators of buildings in a lifecycle perspective. A number of ACE member organisations have been involved in the pilot phase and this report summarises the feedback from these, emphasising the architectural perspective. It describes the broader context for Level(s), and offers a detailed analysis of the reporting metrics. It discusses the transformative role of architecture to create environments that are healthy, comfortable, valuable and use minimal natural resources – and examines how a framework such as Level(s) could help improve sustainable architectural quality.

Level(s) can be used by professionals in the building sector and possibly be integrated in certification systems or implemented as a methodology and toolset in national policies for the built environment, once it is ready for use in practice.

ACE warmly welcomes Level(s) as a very important EU initiative with great implications and potentials towards creating a better and more sustainable built environment. Increased harmonization of core sustainability assessment methods across Europe will likely support collaboration, growth and competence-building across borders. But most importantly it can stimulate a more 'value-creating' and 'resource-optimized' built environment from a life cycle perspective, which is fundamental in the EU's shift towards a green circular economy.

ACE's goal is to support the development of Level(s) along the innovation track from research-based methods to successful application in practice on market terms. With this report, ACE offers its assistance, expertise, feedback and insights from the test and evaluation of Level(s), to overcome the difficulties that have been found using Level(s) to assess the sustainability of buildings. ACE is keen to contribute positively to the adjustments necessary to maximize the user-friendliness and relevance of Level(s) as a framework and support tool for decision making at all life cycle stages in the built environment.

Architects are in a powerful position to help prevent the catastrophic acceleration of climate change. Buildings account for 40% of EU carbon emissions and are responsible for a significant portion of pollution and waste. They also represent a society's relationship to its environment and are expressions to social cohesion and wellbeing. A creative as well as scientific approach is needed if we are to find new ways of living within our planetary means. The current emergency requires the rapid transformation of our existing building stock as well as the creation of new buildings using minimal natural resources for maximum gain of performance and value. A key message of EU architects has been 'Measure to Manage' – in order to increase the evidence, base for building performance and ensure that impacts are not transferred to less reported categories downstream. That requires a shift in sustainability reporting towards tracking the natural resources required to create, operate and disassemble buildings against the environmental quality achieved with their consumption.

It is the role of architects to balance the often-conflicting drivers for sustainability to create one-off designs that stand the test of time. Site conditions, climate, material constraints, budget and time are the more recognised factors however members of the profession now need to be able to command the decision-making process over material choices, fabric build-ups, spatial configuration and systems integration with a much more factual understanding of environmental impacts. More than ever before designers need rapid feedback on the whole life impacts of their choices to guide their decisions. That means going beyond the current regulatory requirements and develop a transparent framework that can support a holistic discourse on performance over a building's life span.

The role of sustainability audits is two-fold: to be able to identify and tackle impact hotspots as well as to increase the accumulation of robust data to support comparisons and benchmarking. Recommendations made in this report emphasise the need to help users identify hotspots during key project stages with minimal effort with standardised data at an entry level and to better reward increasing levels of accuracy and validity of data as projects progress. In particular the EU-wide collection and analysis of performance data for both materials and buildings has been identified as a key incentive for generating higher granularities of data.

ACE has been a member of the Level(s) strategic steering group and a number of its member organisations participated in the pilot phase.

At this critical phase of the pilot, Level(s) has raised the hopes and expectations of built environment professionals to trigger a step-change in the environmental performance of buildings. Architects across Europe are hopeful that the recommendations of this report will be taken on board to create a reporting framework that supports a step-change in sustainable architecture and construction.

Why should you read this report?

Level(s) is the new EU framework for assessing the **sustainability performance** of buildings.

It is a **major initiative** of the EU Commission aiming to increase the use of data and evidence in sustainable design to help measure progress towards a cleaner planet at both building and stock level.[2] It may have **great implications** for **architectural design** in decades to come.

It can have great **impacts** if adopted as a core set of methods and tools in **building codes** or market driven **certification systems** of the future.

Level(s) intends to enhance sustainable **value creation** and **resource management** in the built environment. It is intended to promote **life cycle thinking** and **circular economy**.

It targets the **main stream market** of the construction sector.

It defines a **common language and a methodology** for both **beginners** and **experts**.

Level(s) is being **tested**. The test results will show how it needs to be perfected to become as **user-friendly** and **relevant** as possible.

You want to know what the **sustainability indicators** are, and how they **work**.

You want to know what **barriers** architects testing Level(s) encountered, and what they think should be done to **improve** it.

You want to **promote architectural design quality**. You have a strong belief that **architecture matters** for people and society and want to know how Level(s) could become **useful** to you and your fellow Europeans.

[2] According to DG Growth there is currently no data on for example what percentage of Green house gas emissions the construction sector is responsible for

Summary of the key recommendations

1. **Improve the guides and manuals for Level(s)**
   - The introduction to Level(s) must be super pedagogic, visually attractive and illustrated with examples

2. **Realign the 3 Level(s) to improve users' ability to handle complex decisions:**
   - Level(1) – optimization, many options, qualitative assessments, simple quantitative analysis
   - Level(2) – comparison, few options, more detail to assessments
   - Level(3) – Validation, one solution, high level of detail

3. **Rethink and redesign the reporting tool**
   - It should become a tool for process management to support dialogue and decision making in design and optimization processes

4. **Define target values and provide data**
   - Define baselines and targets for building performance according to the UN SDGs for 2030
   - Provide basic tools and datasets necessary for assessment at Level(1).
   - Give incentives for industry to provide more advanced tools and datasets for Level(2) and (3)

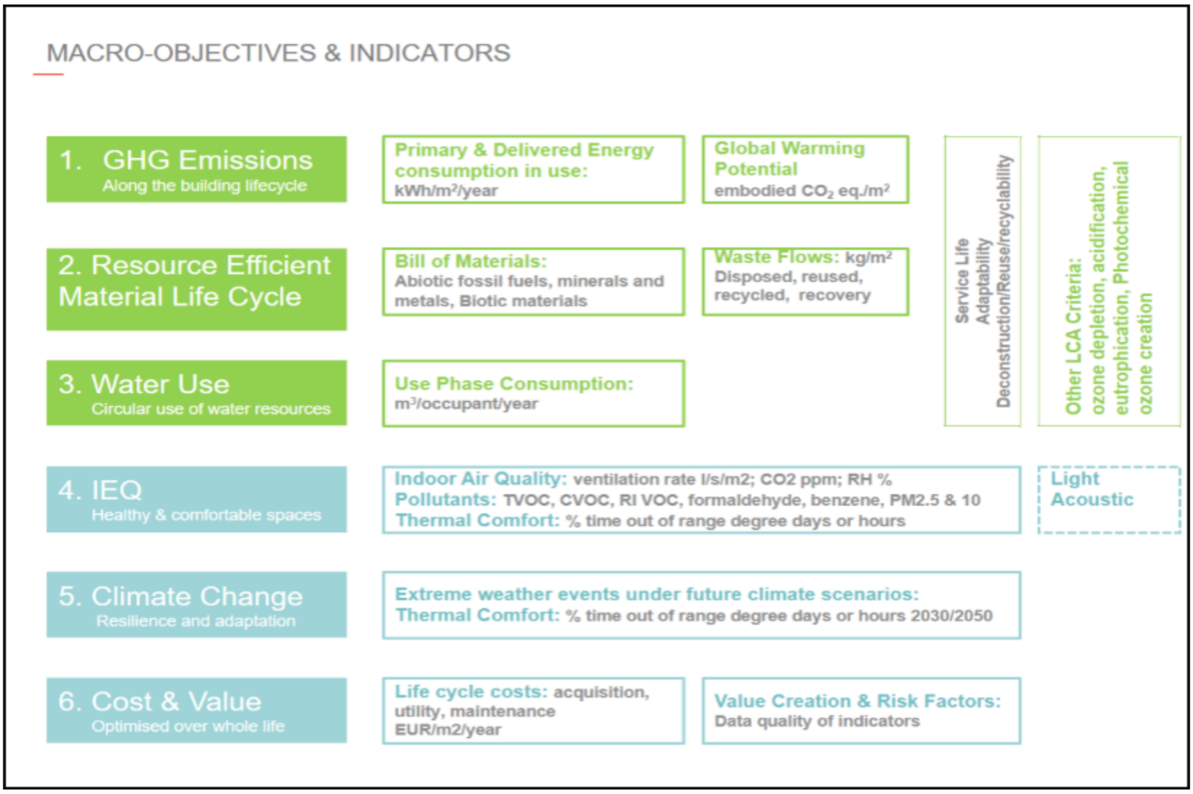

Fig. 1: The 6 Macro-objectives and their 9 indicators in the Level(s) framework. DG ENVI 2017

Level(s) – the new EU framework for sustainable buildings

Level(s) is a voluntary reporting framework developed by the European Commission that provides a common language for sustainability in the buildings sector. It provides a set of simple metrics to measure and manage the sustainability performance of buildings throughout their life cycle. It encourages life cycle thinking at a whole building level; it is a comprehensive toolkit for developing, monitoring and operations and supports improvement from design to end of life. It is intended to assist decision-making of professionals in the building sector and be relevant for the entire life cycle of buildings from planning to end of life and encourage better practices for the mainstream market.

Level(s) is expected to be instrumental to reducing the whole life carbon footprint of buildings, improve occupants' health, environmental quality and resilience to overheating, stimulate recycling and reduce construction waste & pollution by better targeting of achieved performance. It is also intended to improve collaboration, and construction quality, through improved skills and market awareness of sustainable buildings.

Level(s) uses accounting indicators mainly based on existing tools and standards and covers energy, materials, water, health and comfort, climate change and life cycle cost and value. Level(s) is applicable to offices and residential buildings; it is open source and freely available.

Level(s) consists of a framework of macro-objectives and indicators for assessing sustainability, a manual, and various tools to assist assessors. Most important is the reporting tool, in which users gather and report the results of their assessments.

Each macro-objective has one or more indicators, that allow assessors to analyse the sustainability performance of a building on a limited set of metrics selected by the EU commission. The metrics are mostly based on calculations if analysing building performance during the design process or based on measurements if the building is in use. The metrics cover key political priorities for additional performance parameters for the built environment:

1. Greenhouse gas emissions throughout the building's life cycle
2. Resource efficient and circular material life cycles
3. Efficient use of water resources
4. Healthy and comfortable spaces
5. Adaptation and resilience to climate change
6. Life cycle cost and value

Sustainability for beginners and experts

Level(s) aims to appeal to both less experienced and very experienced users who wish to improve the sustainability performance of the buildings they may own, manage, work or live in or just work with. It seeks to produce an overview of the building performance and enable users to increase the complexity of their analysis and assessments as they wish.

To enable users to manage the complexity of information and analysis when reporting, Currently Level(s) has three levels(!) of reporting: Level 1, 2 and 3.

Level 1 is intended for basic reporting for beginners.

Level 2 is intended to be a bit more complex, allowing users to compare results with other buildings or benchmarks.

Level 3 is intended to be more detailed and allow users with experience to optimize the design or real-life performance of buildings by going through the analysis repeatedly.

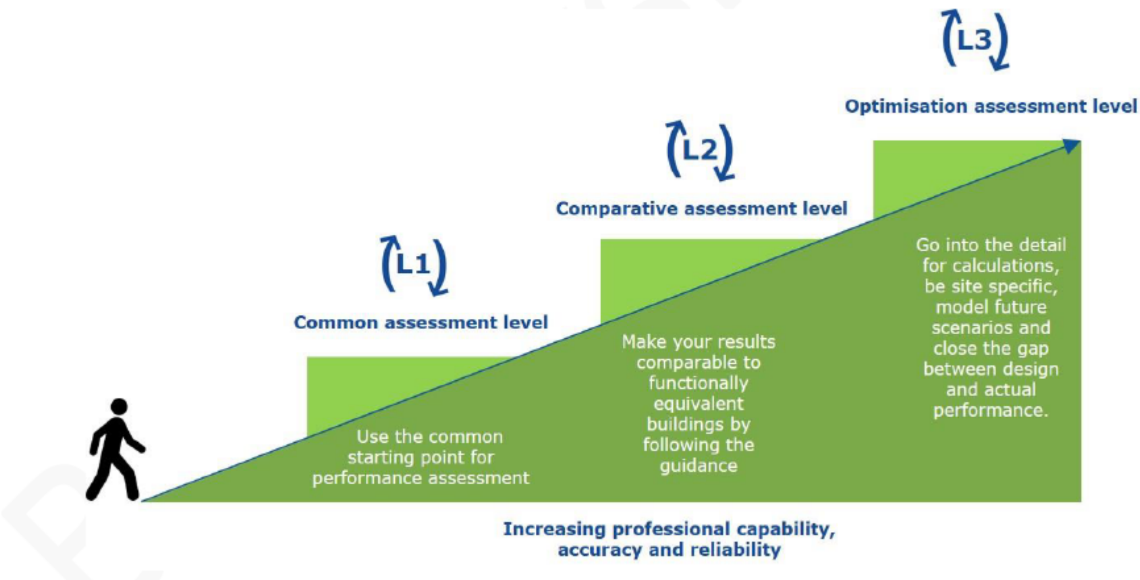

Fig. 2: The 3 levels of performance assessment. EU Joint Research Center 2017

Another way of handling complexity in the Level(s) test is to choose whether to work with minimum reporting, recommended additional reporting or optional additional reporting. Groups of indicators are suggested to let the assessor choose how many indicators it is useful to analyse.

The Level(s) test minimum reporting requirements
1.1 Use stage energy consumption
2.3 Construction and demolition waste and materials
3.1 Use stage water consumption
4.1 Indoor air quality
4.2 Time out of thermal comfort range

Recommended in addition to the Level(s) test minimum reporting requirements
1.2 Life cycle Global Warming Potential (GWP)
2.1 Life cycle tool: Building Bill of Materials (BoM)

The Level(s) test optional additional reporting
2.2 Life cycle tool: scenario 1 - Building and elemental service life planning
2.2 Life cycle tool: scenario 2 - Design for adaptability and refurbishment
2.2 Life cycle tool: scenario 3 - Design for deconstruction, reuse and recycling
2.4 Life cycle tool: Cradle to cradle Life Cycle Assessment (LCA)
5.1 Life cycle tool: scenario 1 – Protection of occupier health and thermal comfort
6.1 Life Cycle Cost (LCC)
6.2 Value creation and risk factors

Fig. 3: Testers of Level(s) must report 5 of the indicators at Level 1 as minimum reporting requirement.

More information on Level(s) is available on the Commission website[3].

[3] http://ec.europa.eu/environment/eussd/buildings.htm

Testing Level(s) is important

In 2018-2019, the EU Commission is running a test phase of Level(s). The feedback from the test phase is expected to inform the subsequent further development of the concept, methodology and tools in Level(s).

ACE considers the testing of Level(s) very important, since a common language and framework for sustainability in the built environment with quantitative and qualitative indicators could be a powerful instrument towards achieving higher quality and greater value with improved resource efficiency.

The challenge is for Level(s) to be simple yet powerful in use, to increase the availability of evidence on building performance and to highlight hotspots for users to support better informed design choices affecting environmental impacts and value.

Finally, to be successful, the framework needs to appeal to users that are new to sustainability assessments and experts alike - to ensure a significant uptake in the construction sector.

How could Level(s) support architectural quality?

Though sustainability is a relatively new term,[4] 'sustainable design' has in many ways always been practised by architects shaping the built environment to meet the functional and aspirational demands of clients, users and local communities. Resource management and value creation are inherent concerns in architectural design and pivotal to the role that architecture plays in society. All architectural projects must answer the questions of what benefits they deliver at what costs.

Now the perspective is global. Population increase and higher living standards lead to increased consumption of natural resources transgressing the planetary borders of how fast the natural resources can be regenerated. The result is environmental degradation, loss of biodiversity and productive land area. Fossil fuels lead to carbon emissions, acidification of oceans and rapid climate change. The environmental footprint of the built environment must be radically reduced.

Recent experiences in architectural practice shows that architects can reduce the detrimental climate change impacts of a building's construction and operation by 50 to 75% by design alone, if they **accommodate user behaviour, optimize construction and design for adaptability over time**. Environmental impacts are closely related to energy use and material resource management. Design principles for energy optimization are defined and part of design culture in many countries in Europe. Energy optimization and Life cycle thinking go hand in hand in the transition towards a circular economy. As energy use for building operation needs to be reduced and energy systems must shift towards renewable sources, the carbon emissions and environmental impacts associated with materials and the fabrication, maintenance and transformation, reuse and recycling of

[4] Sustainability made its way into popular and political thinking with the 1987 United Nations' Brundtland report: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

buildings, components and materials become a growing consideration in environmental architectural design. It is important that the operating performance of buildings is not independent of their footprint and that the life cycles of the built environment are planned for holistically.

Architectural quality and sustainability

The ancient Vitruvian[5] virtues of architectural quality – Utility, Durability and Beauty – can perfectly be understood as ways to ensure the sustainability of a building by architectural design. Utility ensures that the building is fit for the needs of its occupants, is easy to maintain and is adaptable to change. Durability makes sure that the building is resilient to the forces of nature and lets the resources invested in it last for generations. Its ultimate measure is life-span.

Fig. 5: Vitruvius as a character in LEGO – the movie.

Beauty is caring for the way the built environment is experienced, and how it contributes positively to the life quality of people. Beauty is a parameter in sustainable architecture. Buildings and objects that are perceived as delightful are highly valued, are better maintained and have longer life spans. Beauty creates social acceptance and protects the resources invested in the building by extending their life time.

The Vitruvian virtues can be used to discuss and assess the sustainability of any architectural project or building in qualitative terms and is in fact integrated in the Danish version of the DGNB Diamond concept.

What is new, is that utility, durability and even to some degree aspects of beauty can be assessed and described by numerical proxies.

Architecture and Sustainable development

The built environment is perhaps the single largest source of environmental impact as well as the biggest opportunity for sustainable development. The design and make-up of the

[5] Marcus Vitruvius, Roman architect and author of the only surviving treatise on architecture from antiquity.

built environment is to blame. And architecture holds some of the keys to improve the situation. More than 50% of the worlds' population live in cities, and the construction, operation and maintenance of the built environment uses an estimated 30-40% of material and energy resources. The present crises of global warming, and the loss of productive land areas and biodiversity are related to the way our societies, cities and buildings are organized and acknowledge downstream impacts. It can be influenced by design thinking – from urban planning to product design.

With buildings constructed during the next 30 years amounting to less than a third of the total stock by 2050, improving the performance of existing buildings and new construction should be a major political concern. The audit process that Level(s) prescribes makes it possible to balance the multiple and often conflicting drivers for sustainable buildings. It requires the tracking of key performance data across a building's whole lifecycle. To start addressing impacts at both building and stock level we need to Measure to Manage: track impacts to increase their visibility.

Fig. 4: The UNITED NATIONS 17 Sustainable Development Goals for 2030.

Several initiatives have been created to improve the sustainability of the built environment: Legislators have introduced political initiatives to improve the technical performance of the built environment. The EU introduced the Energy Performance of Buildings Directive (EPBD) a decade ago, empowering national governments to introduce low-energy standards in building codes. The EPBD did not introduce a more comprehensive concept of social, environmental and economic sustainability performance of the built environment however. Possibly because of the relative absence of progressive regulation, NGOs have introduced voluntary sustainability certification systems such as LEED, BREEAM, DGNB, HQE and many others. While sophisticated and comprehensive they cover only an estimated 5% of the yearly construction output.

In 2015 the UNITED NATIONS introduced the 17 Sustainable Development Goals (SDGs) as targets to be achieved globally by 2030. Many, if not all of the goals are directly addressing the built environment and impacted by the way cities and buildings are designed and operated. Level(s) would allow governments, companies and private citizens to track and improve the performance of buildings & neighbourhoods, and communicate measurable progress towards achieving several of the SDGs. Evidence of achieved performance in use informs investment and guides innovation. The lack of such a feedback loop undermines quality, contributes to a performance gap and risks turning sustainability assessments into a tick-box exercise.

Sustainable architectural value creation

Architecture creates value in many ways for many different stakeholders, and the Brundtland definition of social environmental and economic sustainability can be used to describe the basics of architectural value creation. Value is the relation between costs and benefits, which can be described in social, environmental and economic terms. There is currently little relationship between the environmental performance and value of buildings. Performance data helps reveal these links so that aspects of a design that contribute to building performance, for example in terms of material choice, are suitably appreciated.

Fig. 5: Methodology for documenting architectural value creation. Some of the methods are integrated in sustainability certification systems – and Level(s). Sattrup, Danish Association of Architectural Firms, 2018

The key to value creation is the incorporation of feedback from completed buildings in in stakeholder dialogue during the architectural design process – which seeks to create as much value for as many stakeholders as possible while managing resources wisely both in construction and the rest of the building's life cycle.[6]

Most of the value is created in the planning and design stages where needs and aspirations are clarified, and the design concepts defined that will allow the values to materialize in the building's use. Value is delivered through construction. But the value can only truly be assessed, evaluated and measured during the use of the building.

If successfully designed to facilitate the dialogue between building owner/investor, architects, engineers, users/occupants and stakeholders representing local communities and governments on building performance and how to create value while managing resources wisely, Level(s) can become a powerful tool for the construction sector across Europe. It is however extremely important that Level(s) supports the way information and knowledge is managed at various stages of a building's life cycle – in particular when planning and designing new buildings and retrofitting existing ones. It should be emphasized that design concepts, principles and solutions are both qualitatively and quantitatively assessed. So far, the present version of Level(s) is heavily oriented towards quantitative methods, which carries a risk of optimizing numbers rather than qualities. If Level(s) is to be successful, the qualitative character of design optimization in dialogue with stakeholders must be evident in its framework.

[6] A guide to documenting architectural value creation is published by The Danish Association of Architectural Firms. It will be available in English by June 2019.

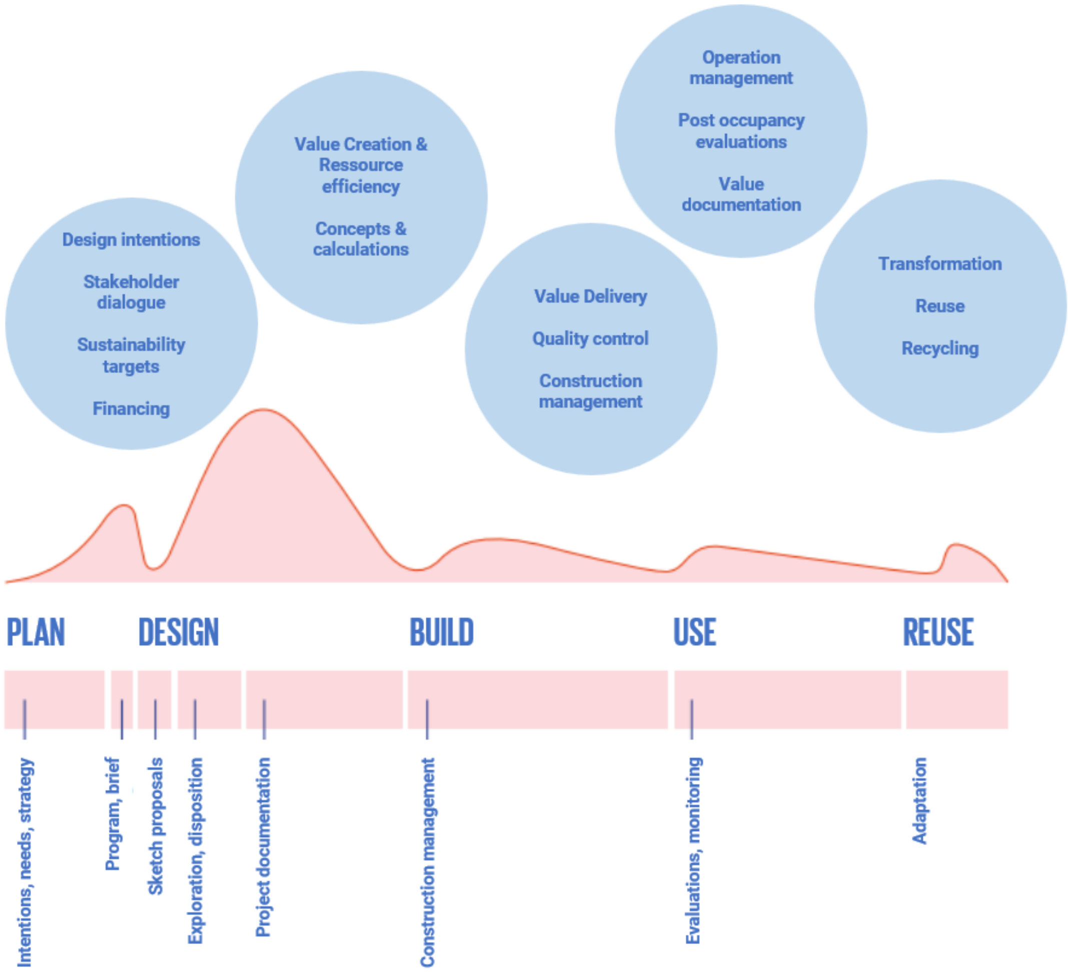

Fig. 6: Value is created through a continued dialogue with stakeholders. The workloads of the design team changes at various stages. Navigating the complexity and performance of design solutions requires many qualitative and quantitative studies of design variations in the early planning and design stages, when most value is added to the project. Sattrup, Danish Association of Architectural Firms, 2018

There is definitely a need for shared methods to align the interests of a highly fragmented industry. There's a great potential in raising the sustainability performance of existing buildings towards achieving sustainability goals over a building's life span.

Success requires that Level(s) is easy to use, has relevant indicators and metrics, and fills the gap between sustainability certification systems and building codes.

What do the architects testing Level(s) think of it?

Level(s) is currently being tested in more than 130 projects all over Europe.[7] The testers are to submit their reports and evaluations of Level(s) before June 30th, 2019, but the test phase continues until March 2020. The evaluations and feedback from stakeholders will be

[7] An introduction to the test can be found here : https://www.worldgbc.org/news-media/levels-testing-phase-everything-you-need-know

processed and Level(s) refined, to ensure that the resulting concept is as suitable and relevant for stakeholders as possible.

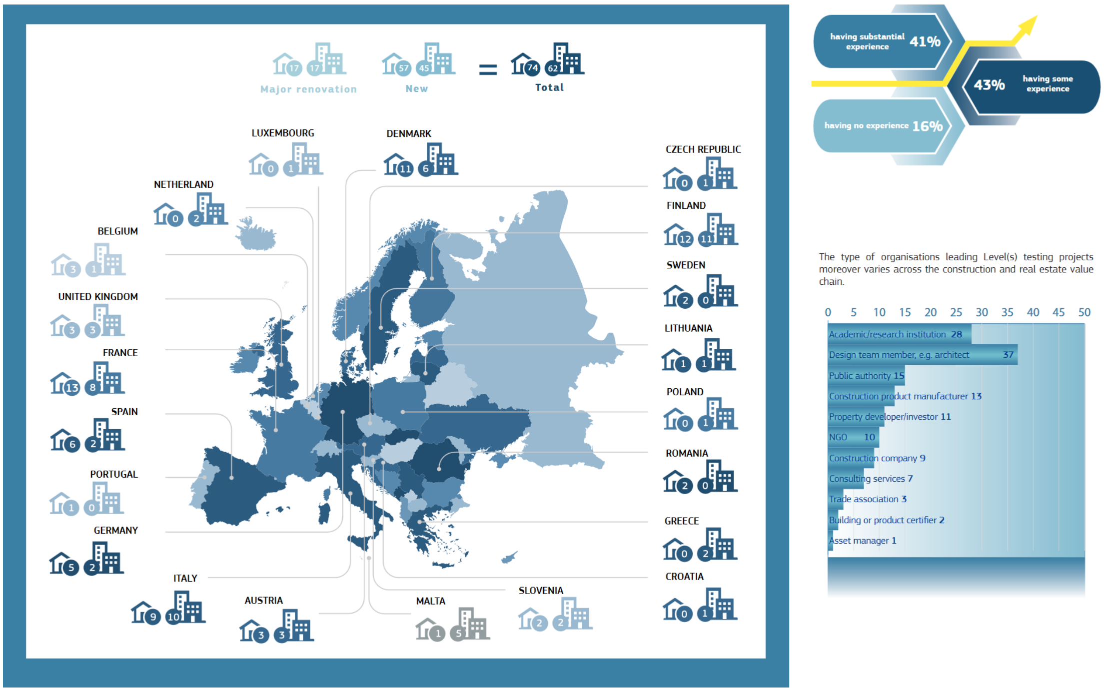

Fig. 7: Project types and numbers in the member states. Types of organizations and businesses testing Level(s). Testers' previous experience with sustainability assessment. Illustration: EU Joint Research Centre 2018.

The testers come from many different organizations and types of businesses. Roughly a quarter of the participants describe themselves as design team members, which is the category where one would expect to find most architects' offices. Four countries have more than 10 projects committed to the test: Finland, France, Italy and Denmark. Little data is publicly available yet on who the testers are. In this regard, it is important to note that architecture is practiced by stakeholders in the entire construction sector value chain, and that architects may be found in organizations and businesses ranging from ministries to manufacturers. For instance, the Finnish test of Level(s) is organized and coordinated by architects in the Finnish Ministry of Environment, while most of Finnish testers are engineering and construction companies.

Architects as design consultants are used to integrating knowledge across disciplines and though the professional experience of testers vary, it turns out that the education of the persons reporting with Level(s) play a very significant role, in judging whether Level(s) is of use to them or not. The following discussion and analysis of Level(s) is based on conversations and interviews with architects and engineers in Denmark, Germany and the UK.

Preliminary results of the Danish test of Level(s)

Details

The Danish test is coordinated by the Danish Association of Architectural Firms and has 5 participating architects' offices, 10 engineering consultancies and 1 building owner/construction product manufacturer as testers. At the time of writing, the authors had access to 14 copies of the feedback submitted to the Joint Research Centre by Danish testers ahead of the deadline in June 2019. 4 of the 14 evaluations were done by architects' offices, and their experiences are an important voice in the following discussion of Level(s)[8]. In general, the participating businesses covered the mandatory reporting indicators and included one or two of the recommended or optional additional indicators, due to the limited funding available for the test. The efforts were however coordinated, so that all indicators of Level(s) were tested by at least two participants.

Expectations

Level(s) is generally warmly welcomed as a political initiative to improve the sustainability performance of the built environment. The participants recognize that Level(s) is a very important initiative by the EU commission and that it may have great implications for practice if it is successfully implemented in future regulation and voluntary certification systems. The participants expected to varying degrees that Level(s) would provide (**a**) information on setting targets for the sustainability of projects, (**b**) the means to establish whether targets were met and (**c**) general information about the benefits of sustainable buildings. They expected to be able to (**d**) compare results with certification systems or national regulations and to be able to compare between different buildings (**e**) and different lifecycle stages. Most of the Danish participants had extensive previous experience with sustainability assessment, 2 of the 4 architects' offices note that they have limited, or some previous experience of sustainability assessment. Indeed, all but one of the projects had been, or were going, through a DGNB certification process, which carries the possibility that the participants to some degree may be comparing Level(s) to DGNB in the survey results. Most projects were new-build at the design, construction or handover stage. 2 projects were existing buildings being assessed. The UK participants were experienced in sustainability assessments and highlighted the danger of raising design expectations but falling short of delivering an accessible system of evaluation, which is likely to disengage the design community.

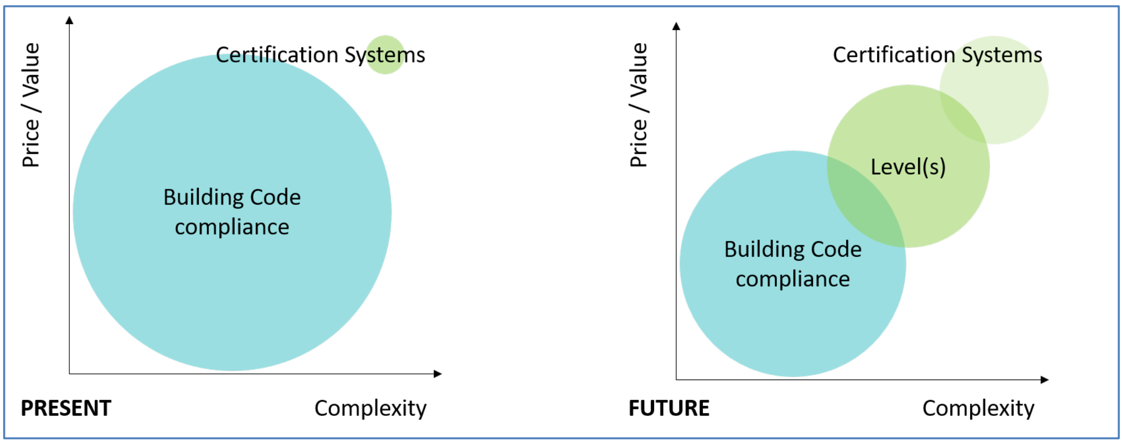

Fig. 8: There's a gap in the market for 'greener' buildings that go beyond the minimum standards of building codes but do not have the ambition, economy or experience needed for a more

[8] The Danish test continues after the writing of this report, and a more comprehensive analysis of the results will be submitted to the EU commission and the JRC by the Danish Building Research Institute. The Danish test was funded by the participating businesses, supported by grants from the Realdania Philantropic Association and The Danish Agency of Traffic, Construction and Housing. UK testing is under way led by UCL

comprehensive sustainability certification. Introducing voluntary sustainability classes based on the Level(s) framework in building codes with a roadmap for higher compulsory performance standards implemented over time could lift the quality of the built environment over time. Illustration: Sattrup, Danish Association of Architectural Firms 2018.

Virtually all Danish testers, architects and engineers alike, argue that they participate in the test to learn about Level(s) to prepare themselves and their businesses and that they hope to influence the subsequent development of Level(s) by their feedback. They express hope that Level(s) may find a good way to balance the experience and time needed for reporting and the complexity of analysis, since they do find that there's a very wide gap in the market for building owners and investors that are perhaps not as experienced or ambitious as the ones pursuing a full sustainability certification.

Possibly the best aspect of LEVELS is in my interpretation of the intentions behind it: To create a common language, framework and process across borders. That is truly powerful. – Jesper Ring (JR), Dominia

Introducing a simpler yet relevant and usable framework could assist legislators in the member states in developing Sustainability Classes for building performance in their respective building codes. Danish experiences with the introduction of voluntary low-energy classes in the building code as an implementation model for the EBPD 2010-2020 were very good. Gradually implementing tougher energy standards on a voluntary basis before making them compulsory, motivated investors and consultants to go beyond mandatory regulations and develop the competences needed for low-energy design at a very early stage. There's a widely shared notion among the Danish testers of Level(s) to think that a similar introduction of sustainability criteria in building codes on a voluntary basis, but with a clear roadmap for introducing compulsory baselines for 2025 and 2030 would lift the performance of buildings in Denmark and the EU significantly and generate new knowledge and competences giving progressive businesses significant competitivity advantages internationally. A common language and framework for sustainability performance would assist internationalization and the exchange of services across borders.

The design and value of Level(s)

As discussed above, the design of Level(s) needs to be adapted to the decision-making processes of stakeholders in the built environment for it to be successfully implemented.

There are three basic options for the implementation of Level(s) in practice:

1) Level(s) can be used as a **dialogue and decision-support tool** in dialogues between investors and consultants, who can use Level(s) to assess and optimize how their projects deliver on select sustainability goals. It can be used by developers, investors and building owners to optimize and market their stock. In this regard, the absence of performance standards makes it very important to support the initial analysis and dialogue regarding the condition of the existing stock and defining the standards that a project owner may find relevant. This requires that Level(s) is extremely fit for purpose in design and optimization processes. It is important for investors to differentiate their projects in a commercial market which is why targets are needed to communicate that projects achieve some degree of excellence. Investors always need to ensure that their buildings perform to building codes.

More ambitious investors would want to differentiate their buildings in the market by marketing their superior quality and sustainability performance, which is why national targets market standards of excellence accompanied by benchmarks are so important.

2) Level(s) could be **integrated in national Building Codes** and used to secure performance on resource efficiency in a life cycle perspective. This requires that member states define targets for sustainability performance to be included in voluntary or mandatory sustainability assessments, possibly with the UNITED NATIONS Sustainable Development Goals as reference, including a roadmap for implementation towards 2030. Just defining the political targets for building performance, value creation and resource efficiency can have great motivational effects on investors' priorities, as the case of the Danish voluntary low-energy classes demonstrate.

3) The LEVELS methodology could be **integrated in Sustainability Certification systems** like DGNB, HQE, BREEAM and LEED, ensuring that the basic criteria of sustainability certification are aligned across the EU. This requires that there's a certain freedom to choose and adapt Level(s) to the priorities of already existing market driven certification systems, without losing the overall consistency of Level(s).

The three options don't exclude one another – they supplement each other. The challenge is how to engage the different stakeholders that Level(s) need to appeal to for best possible market uptake: Clients, consultants, managers and users of buildings, national and local governments and Sustainability certification system owners such as Green Building Councils.

General feedback – ensuring the uptake of Level(s)

Asked how helpful/meaningful Level(s) was for planning sustainability targets, getting practical information on sustainability performance, identify performance improvements and assisting the dialogue and decision-making with clients and other stakeholders, the Danish testers generally found that Level(s) was only helpful to a limited or moderate extent. The testers have several remarks that could improve the design of Level(s) to ensure the uptake of it in practice:

Once accustomed to the methods included in Level(s), testers found the workload necessary to cover the **selection of indicators** to be manageable in terms of making sustainability assessments that would add important dimensions of resource efficiency to building codes but be less demanding than most sustainability certification systems.

The relevance and definition of indicators is good but needs further discussion.

The testers found the **manual** very hard to read and understand, even for experts in sustainability certification with a high degree of international experience, due to unnecessarily complicated technical language. They missed practical examples and illustrations connecting sustainability accounting and reporting to design principles used to achieve performance.

It is recommended that the manual is edited and illustrated with practical examples for improved readability.

The testers found that the idea of using the **Reporting Tool** to gather all information for the assessment was good but found the design of the Reporting Tool not suitable for decision support in design or optimization processes, due to not being aligned with specific stages of design and optimization processes and poor explanation of results' relevance to decision-making.

We strongly recommend that the Reporting Tool and the definition of the three levels are redesigned to reflect the need for dialogue and decision support at all life cycle stages.

They found the absence of **baselines** and **target performance** requirements to be confusing when assessing sustainability for two main reasons (Even though these are explicitly explained to be set by stakeholders and users of Level(s)): The absence of baselines makes it difficult to judge whether the performance metric is relevant to the project, and difficult to judge whether a change in design is indeed an improvement. The relative freedom to choose between different methods and standards to qualify results is adequate for now as it reflects the diversity of national approaches. There is however a need for basic targets, data and tools to assist assessments in Level(s).

It is recommended that relevant basic targets, data and tools are developed and supplied by the commission.

In particular, tools to assist the balancing of typical conflicts between sustainability drivers need to take priority, for example to be able to make decisions on the basis of whole life carbon and whole life cost and to be able to compare calculated with achieved performance seamlessly to get the design community's support. At the minimum known hotspots and ways of mitigating them should be offered, such as addressing the complexity of technical systems, Designing Out Waste principles, using mineral rather than fossil-based materials with high recycled and recyclable content, etc.[9]

Selection of indicators: Manageable workload for basic assessments

The participants generally found that the limited set of indicators made the workload of reporting with Level(s) manageable for basic sustainability assessment, which could appeal to clients that were new to sustainability certification thus targeting the gap between Building Codes minimum performance and full certification systems.

The idea of simplification and the limited set of indicators, as compared to other very comprehensive sustainability certification systems, makes it manageable. You can relate to the nine indicators. – Jesper Ring

I don't think it requires a lot of time to use Level(s) to make a sustainability assessment. Once you get into the methodology, it is quite straight forward. But it does require some time to get to that point. – Brian Sørensen

Improving the usability of Level(s) in optimization and design processes.

Many testers found that the definition of the three Levels did not quite fit the design and optimization processes architects and engineers work with and found that the structure and processes of Level(s) could be refined.

I think that the first stage should be about intentions and requirements, before moving on to discuss design concepts and solutions. I don't think the three levels reflect the way that we handle complexity and uncertainty in the design process… I recommend that LEVELS be

[9] www.wrap.org.uk/designoutwaste

adapted to the way we practice as consultants: Level 1 is discussing needs and defining requirements that the design solutions are to resolve and be measured against. If you then begin to calculate results and compare them to standards, you're at level 2. Level 3 would be optimizing the project by going through several design performance optimization iterations. – Jesper Ring

In fact the three Levels of complexity / optimization were found to imply a workflow that was almost completely opposite to what is generally done in practise. Testers had the expectation that Levels 1, 2 and 3 would reflect an increase in complexity: From the basics at Level 1 to something like full sustainability certification complexity at Level 3:

Levels 1,2 and 3 are not expressing a process progression. Instead, the life cycle of buildings is described in 5 stages. These are where you engage in the dialogue. I think it is important that the design team behind LEVELS address more clearly which Level 1, 2 or 3 is relevant when discussing and optimizing performance at the various life cycle stages: For example, Level 3 – optimization and comparison of various options – makes extremely good sense in the early design process of a project. But you do these comparisons on a very low degree of resolution, and a relatively simple set of data. You do massing studies for instance, addressing the issues of sun, light and water, but you keep resolution low, so as to be able to learn from more scenarios. It doesn't really make sense to make high resolution optimization calculations late in the design process, because they don't really change the project. You need the optimization in the beginning, where the design is still flexible, and changes are cheap to accommodate. Very detailed calculations in the construction phase simply don't make sense. They would only assist a bit in the choice of specific components, but nothing that really enhances the performance of design. I think this thinking is clearly absent in the design of LEVELS. It needs a clearer approach to design thinking, and some recommendations of which tools to use when. – Jesper Ring

LEVELS should reflect the common sense of making most of the calculations early in the design process. Highly detailed calculations in the late stages don't add much value. They just ensure compliance if you have a target performance to achieve. And these are not included in LEVELS. – Brian Sørensen

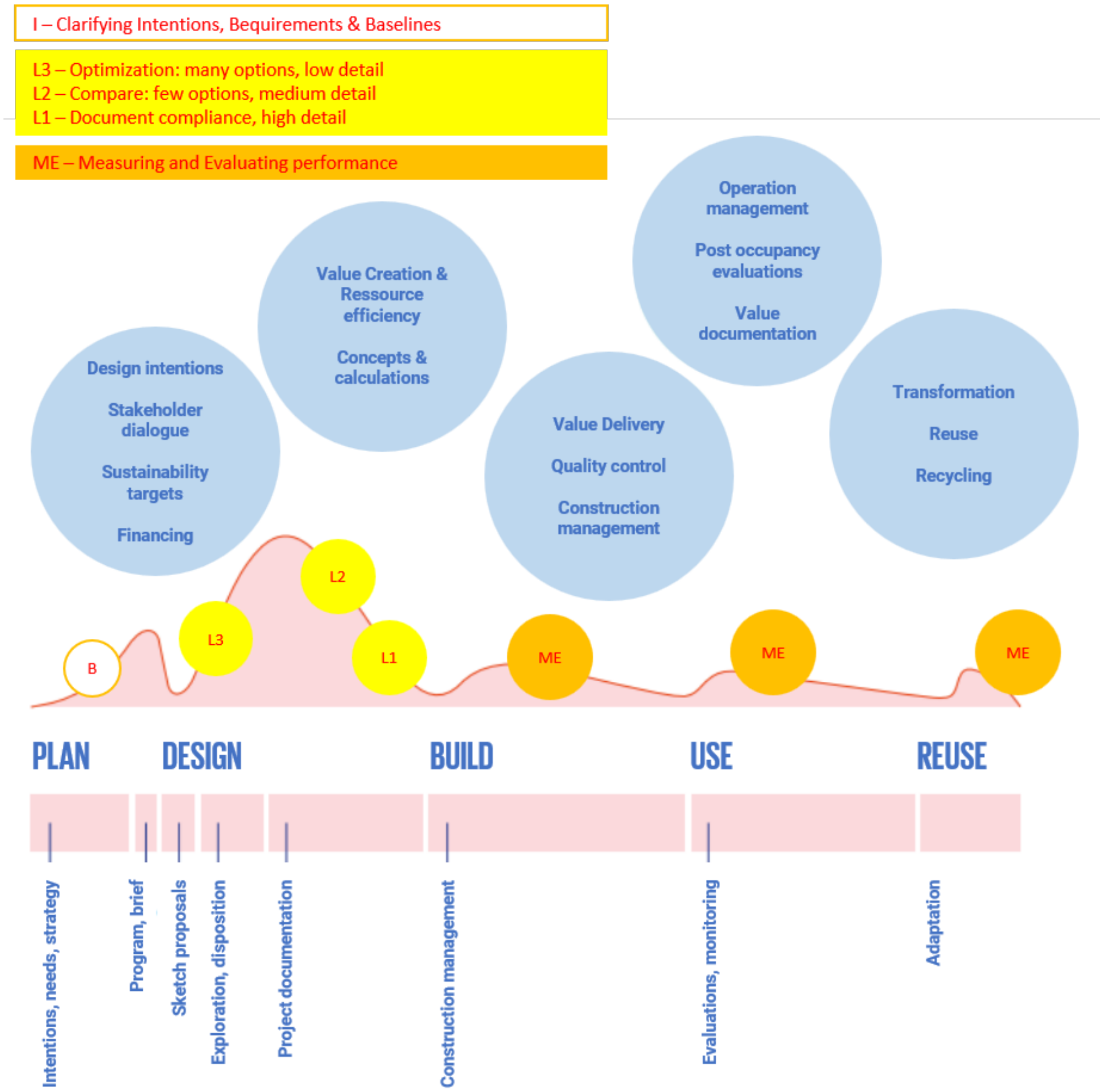

Fig. 9: The design process requires very precise management of information and knowledge creation regarding sustainability performance in the stakeholder dialogue. There is an inverse relation between the three levels towards optimization in Level(s) and how the level of detail of design is managed in the design process. The structure of Level(s) should clearly reflect that it is to be used as a dialogue and decision support tool. Sattrup, Danish Association of Architectural Firms.

Introduce qualitative assessments of design problems and design solutions

The design of LEVELS should reflect the way we create value for the client and users in the design process. Very time-consuming calculations don't necessarily create better design solutions. Sometimes they only improve the certainty with which we can say that a solution was well considered. And that doesn't add much value for the client or users. – Brian Sørensen

Level(s) is very focused on calculations and measurements which are required to improve the performance of the built environment. But Level(s) should also include qualitative assessments of design problems and design solutions for it to become truly integrated in architects' design processes. The issue is how Level(s) can be used to improve decision making in the design process.

In my view, LEVELS is very technical (calculations-based), and therefore difficult to use for most architects here in Denmark. Of course, the education of architects varies a lot among European countries, but I think the (typically engineering) competencies needed for most of the LEVELS indicators would be a challenge for most architects. Indoor environment simulations? I'm lost! However, if you have a good architect-engineer team working together, I think it would be quite easy to use LEVELS. – BS

BASELINES: Level(s) should include basic data and performance standards to make sense

Does a system without benchmarks make sense? If there's no data for comparison, how do you communicate that your design meets the requirements or that it is indeed performing better?

At the present, Level(s) is a language and a framework without performance standards. These are to be decided by the users, which could be legislators, certification system owners, professional consultants and private or public building owners wanting to improve their stock. But the absence of standards puzzled the testers a lot, as it was hard to make sense of the data with nothing to compare it against.

We expected a tool that would be able to test the sustainability of the building to various degrees and be able to say to which extent certain goals had been met. – Dissing + Weitling Architects

Even with their professional experience of working with voluntary performance standards in mind, the Danish testers generally found it rather difficult to make sense of working with Level(s): If performance standards are not defined, it is very difficult for a non-professional client to judge whether results are good or bad, and what decisions may be best to improve performance:

I expected a simple tool that provides a better sustainable "score" and makes you able to make the right decisions and provide information about the benefits of more sustainable buildings to clients/users – Signe Bang Korsnes (SBK), Arkitema Architects

I believe Level(s) is very difficult to use as a dialogue tool in the design process as it is right now. Even on level 1 you need to supply a lot of numbers that don't make sense without benchmarks or standards. If you don't know what the numbers mean, why calculate? – Jesper Ring, Dominia

The question is what you use the data for: Do you want to improve performance, or are you just going through the numbers to get on with the next project? Without benchmarks or high-performance standards, Level(s) does not achieve the value and prestige of full certification systems like the DGNB. – Brian Sørensen

Level(s) is designed to let national governments, certification system managers or individual building owners set relevant performance standards but given the challenges of resource scarcity and climate change facing the next generations of Europeans, it would make much more sense for politically defined performance targets that are coordinated with the UNITED NATIONS 17 Sustainable Development Goals for 2030. It is indeed possible to decide a carbon budget for the built environment based on the Paris Agreement and the 17 SDGs. The business organizations coordinating the test of Level(s) in Denmark positively request political action on this agenda from the Danish Government and the EU Commission.

To achieve rapid progress in impact reduction and in the uptake of lifecycle impact audits, it is imperative for regulators to set benchmarking categories and collect sufficient data in each building type. Such data should be collected in a publicly accessible and online database and maintained with adequate and long-term funding.

MANUAL: It should be very easy to understand and explain how Level(s) work

I agree that LEVELS is difficult to grasp – even for me as an engineer. The manual is hard to read, and too much of it relates to data quality, which I think could be addressed with far fewer questions. There's also far too much focus on self-assessing the competencies of the people behind the various analyses. It is relevant to the client, yes, but it gets far too much attention in the manual… Make the manuals much simpler. Extremely simple. We will never get the market to embrace this, if the concept and the manuals are so difficult to understand as they are today. No way. – Jesper Ring

Getting started was tough for most testers. They found it cumbersome to prepare themselves for reporting with Level(s) since the manual was hard to read. This is not surprising by itself since many aspects of sustainability assessment are complex and requires expert knowledge.

The manual should be easier to understand. It is hard to understand the meaning of the indicators, which are described in very technical language. The purpose of Level(s) is not clear, and it makes it hard to understand the meaning of Level(s). To ensure the uptake of Level(s), the added value to the project of using it should be clearer. – Brian Sørensen, Årstiderne Arkitekter

But since most of the testers are themselves experts familiar with the terminologies and methods of assessment, it seems that the manual was unnecessarily complicated. The manual should aim at explaining the concepts for less experienced users such as clients and investors and add appendices for experts to secure the market uptake and facilitate the stakeholder dialogue between regulators, building owners, investors, managers, occupants and consultants.

Instead of references to standards the manual should be constructed in the manner of 'help files' that explain methodologies in a clear and simple language. The Level(s) framework should be treated as an educational tool as much as an optimisation one.

An 'outcome' should be clarified for each audit category, whether that is benchmarking, the evaluation of design choices or the identification of optimisation opportunities. Users must receive a benefit from the laborious tracking and inputting of so much data.

Reporting Tool: Good idea, but unaligned with design process. Needs redesign.

I think one of the very good aspects of LEVELS is that it gathers a lot of essential performance data in one document. Usually you have all the information scattered in several folders of documentation. LEVELS makes the performance data accessible. – Brian Sørensen

Most testers found it hard to figure out what matters and what doesn't, when using the reporting tool. They found that it should be redeveloped to fit much better to the design and optimization processes they work with, and focus on dialogue.

I think it really should shift its focus from the calculations and results to the process: What are the intentions and goals, and what can be done to accommodate and achieve them? As it is, the reporting tool becomes the focus, and I don't think that is most appropriate. I think the focus should be on the dialogue. – Jesper Ring

Using the reporting tool in the design process would be a show stopper. It doesn't give you any indications of what is good or bad about the design, or what to do. I think the reporting tool should be much more specific to the various stages. Cut it up and make it specific for the optimization or dialogue you need for the specific life cycle stages you are working with. You don't need the same information at all stages. – Brian Sørensen

The reporting tool was found to be extremely cumbersome to work with in design or optimization processes. Doing so, would mean spending a lot of time on calculations that did not necessarily create value at the right time in the design or optimization process. This is an issue which should be relatively easy to improve, as sustainability services are quite well defined in some countries. In Denmark, a description of services relating to sustainability is used as a framework for contracts between clients and consultants.

I think the reporting tool should reflect that sustainable design has already been given a lot of consideration in the 'Description of Services' (plan of works) for sustainability, which you can find in some countries. In the Danish version, the process is described in a clear way: First you think carefully about what you want to achieve, you describe your vision, make your sustainability plan and define the quantitative and qualitative indicators you want to benchmark the project on. And then you follow up on that in the following design stage. That is a well-considered process, where you engage the relevant stakeholders at specific points in the process. You don't need to calculate much in the initial stages. You define measurable demands and qualitative outcomes. So, I don't think the reporting tool should be the same for each stage. You need to specify targets, assess and simulate the performance of design scenarios, and to document the real measured performance. If you look at how you work as a sustainability manager/leader, you spend half the time on getting the specifications done for the sustainability plan as part of the design brief. And then you move on to work with the design team on qualifying the solutions. It is in the planning and design stages that most value is created, and that is what you can measure once the building is in use. LEVELS should reflect that process. It is totally absent. – Jesper Ring

Basic data and tools for reporting indicators are requested.

A lot of the data needed for Life cycle assessments and Life cycle costing would need to come from suppliers and manufacturers, and much of the data is not available yet. For small and medium sized manufacturers, making an environmental product declaration is expensive. This could be eased if the EU made basic data on materials available and supplied some basic tools for analysis to be used with the indicators. This would lower the market threshold for small and medium sized enterprises in the supply chain of construction.

Level(s) could give the market incentives to produce better and more credible data, if it included weighting factors related to data quality in LCA and LCC calculations. That would give suppliers an incentive to compete on quality and credibility of the data they supply.

In parallel with benchmarks for performance, generic data should be developed on the environmental impact of materials.

Reflecting the Level(s) indicators from architects' perspective

This section discusses the Level(s) indicators from the perspective of architects. For all Macro-objectives, a brief description of its aim will be followed by the indicators and performance metrics. Each will be assessed in terms of the "Usability of indicators to identify the hotspots", the required skills to assess performance". This report will highlight the actors with the greatest influence on the indicator ("Actors to propose improvements") for better results of assessments of the indicators, will reflect on the "Market readiness and accessibility of tools and information" and will finish with architects' "Expectations and experiences of users / architects".

Macro-objective 1: Greenhouse gas emissions along a buildings life cycle

Intend

"Minimise the total greenhouse gas emissions along a building's life cycle, with a focus on emissions related to energy in the use phase of a building and emissions embodied in building materials and associated processes along the life cycle."

Indicators and performance metrics

Indicator	Performance metric
1.1 Use stage energy performance *1.1.1 Primary energy demand* *1.1.2 Delivered energy demand* (supporting indicator)	kilowatt hours per square metre per year (kWh/m_2 /yr)
1.2 Life cycle Global Warming Potential	kg CO_2 equivalents per square metre per year (kg CO_2 eq./m_2/yr)

Usability of indicators to identify the hotspots

From a design perspective, the energy indicator reflects current focus of the EPBD directive. The scope of regulatory implementation and the calculation of potential heating, hot water, cooling, ventilation and lighting and for compliance purposes varies across Europe. As a result, benchmarks, and any comparisons of consumption calculated to comply with building regulations, vary country by country.

An important part of the energy consumption is omitted from energy indicators: occupant-related or 'unregulated' energy use. This user-related energy use becomes more prominent as heating and cooling is reduced. Heat gains of plug-in lighting or of IT are standardised for compliance calculations and in practice often require additional cooling. Small power loads and energy used for controls, security, catering, vertical transportation, vehicle charging and special functions such as AV (schools and theatres), refrigeration (supermarkets) or lab equipment are omitted from these calculations. The impacts of extended hours of use or higher than the standardised occupancy are also unaccounted for in compliance calculations. Omitting the important user related energy demand in the design stage can lead to reverse effects. The energy indicators do not stimulate e.g. passive or innovative design solutions: very often typical architects' topics.

Due to "standardized occupancy patterns" within the energy calculation methods that have to be applied to be consistent with regulations, the energy indicators (especially the "Delivered energy demand") seldom match with the measured energy consumption. The energy indicators are not addressing all hot spots and do not build the bridge to the measured results of the building's real performance.

In addition to lacking an energy consumption forecast that is comparable to achieved consumption in use, in the EPBD there is an absence of a requirement to validate the performance of energy consuming technical systems after installation and commissioning in most member states. This unfortunate combination of factors has removed the reasonable checks and balances from achieved energy performance in use, resulting in significantly higher than expected energy consumption in new buildings and refurbishments across the EU. Not only does this compromise efforts to limit carbon emissions but it and has also skewed the perception of impact hotspots for GHG emissions.

This is an inherent shortcoming of the EPBD calculation metrics and not of Level(s), however, if not addressed leads to confusion about the assumptions behind the figures reported against the indicators. Level(s) is in theory expecting transparent reporting between calculated (for compliance) and achieved (measured) energy use and needs to tackle this issue to be a credible reporting scheme, as highlighted in previous position papers[10] by ACE.

The excel data table used for collecting the data is confusing. While it allows the entry of data by energy end uses or by fuel, the format of the table requests energy end use breakdowns for each fuel type. This is a meaningless exercise as it is rarely possible to tell how much of an energy end use is associated with a particular energy source. These kinds of errors cause nuisance and alienate the more experienced users or mislead the less savvy ones.

It is difficult to see what benefits Levels 2 and 3 offer beyond Level 1. The hierarchy should be energy consumption calculation for compliance with building regulation for L1, full energy calculation, including unregulated loads for Level 2 and validation of these with operational data in L3. Alternatively, 'calculated' records should include benchmarks only in L1, by fuel reporting by L2 and by energy end use for L3. By fuel reporting should include a conversion tool to carbon – either by setting energy provider and region or by allowing users to enter their own carbon factors.

The indicator "Primary energy demand" is therefore not helping to reduce greenhouse gas emissions. It cannot even be used as a proxy to reducing operational carbon emissions. Instead the operational carbon (GHG) emissions should be used as design and reporting indicator and a methodology to derive this figure from metered energy figures should be provided and linked to relevant standards. Likewise a methodology to forecast all likely energy end uses at realistic operating conditions should be provided or this indicator will

[10] https://www.ace-cae.eu/policies/

only align Level(s) with a major credibility issue in the market. The reporting against this indicator misses a major opportunity to make calculated and measuredenergy consumption comparable that would allow Level(s) to meet its targets for transparency across life cycle stages and to inform design choices. As it stands falls short of being able to highlight potential consumption hotspots and contributes to a distortion in the market.

The indicator “Life cycle Global Warming Potential” (Life cycle GWP) draws the attention to GHG emissions related to building materials and products and their impacts of the “before-life” and their potential impacts during the use of the building and for a specific end-of-life scenario, combined with potential energy related operational emissions. Since a large share of all carbon emissions in Europe result from construction materials and construction activities, - in new buildings environmental impacts from materials make up for approximately 50% over the life cycle of a building,[11] - it is very important to address this with clarity to guide the architects and decision makers towards « low life cycle carbon » solutions. The calculation rules for the scenarios of the use and after-use-stage of the building, are quite difficult to apply and even more difficult to judge. The balancing of operational versus materials related GHG emissions is the most readily accessible and of the highest impact in terms of preventing Climate Change. Architects have a major impact on this process and Level(s) must make it easier to readily compare operational vs embodied impacts.

Required skills to assess performance

The energy related indicators can be assessed with a special training as energy consultant. Energy consultants are very often part of medium to larger projects. The assessment of the Life cycle GWP requires additional training. The method of life cycle assessment is part of the curriculum of very proactive, forward-looking universities and cannot be claimed as standard skill of architects. Training requires at least one day of methodological background plus several days of practical experiences. The analysis can be carried out by software however most software packages are set up to calculate compliance calculations only. A great deal more expertise is required to incorporate ‘unregulated’ consumption in the thermal analysis of buildings.

Actors to propose improvements

The usefulness of the calculation in terms of options appraisals very much depends on the background of the person carrying out the analysis of the energy indicators. If it is carried out by architects, improvements can also include measures that address the design of buildings, e.g. solar gains through orientation or use of daylight, passive shading, building envelope build-up or sufficiency gains regarding space optimization. If it is carried out by energy consultants, very often technical solutions improving the HVAC aspects are proposed. The improvements should cover all aspects: masterplan / urban development (daylight potential and solar exposure), building energy use (envelope performance), user energy use (plug loads and real hours and occupancy), supply systems (efficiency), and the use of renewable energy. In all aspects, architects play a major role in identifying opportunities for improvement. A focus on total consumption is needed alongside a joined-

[11] Green Building Council Denmark : Byggebranchen kan blive bæredygtigere

up approach with DG Energy (e.g. Smart Readiness Indicators) that would facilitate the reconciliation of calculated with measured performance.

Today, analyses of the proposed life cycle indicators are mainly carried out by LCA consultants. Very often, the results are presented at a very advanced planning stage or even during the execution stage. Major potential for low environmental footprints lies in (1) high intensities of use of spaces, (2) creating flexible spaces for the building's futures, (3) limited use of natural resources from the building's expected life time, (4) choosing circular solutions of the construction, and (5) selecting products and materials with a low environmental footprint of the manufacturing and transportation stages. The first two improvement potentials should be evaluated and addressed by architects to the investor or building owner at very early planning stages, improvement potential (3) is a typical (detailed) design task, number (4) requires both, designers and manufacturers and the last potential (5) can mainly be raised by building products manufacturers by improved production processes. All of these should be underpinned by greater availability of product and material information and data.

Market readiness and accessibility of tools and information

For the energy indicators, basic tools and data are available in most countries. But the Level(s) guidance document states: "The majority of national calculation methods are currently based on EN 15603 and its associated standards. It is anticipated that over time these methods will be updated to reflect the new EN ISO 52000 series on the Energy Performance of Buildings. There will therefore be a transitional period during which either standard may be referred to." This means, that Level(s) cannot be used for comparative assessments amongst countries to date. The aspect of reliability rating of the tools and methods is very difficult for users of tools and requires deep insights into modelling principles in the centre of the tools. These reliability ratings should not be carried out by the applicants but by tool providers. The onus should be on tool providers to ease inter-operability between design and LCA tools too.

The life cycle indicators are much more difficult to assess. There are only a small number of tools available to assess the environmental footprint of buildings. And only few countries have LCA databases for building materials and products available. Training on the LCA calculation method is very limited. Interfaces between LCA tools to standard tools are also very limited but would increase the efficiency of the process. Hence, much time and effort go into data collection, tools assessments and selections, self-learning and trainings, and discussions with all members of the design and project teams to identify improvement potentials. As discussed before, architects can play a major role in improving the life cycle environmental footprint ("Life cycle Global Warming Potential" and LCA method), but the majority of architects do not have access to tools or data. More accessible guidance, tools and data are needed to make Level(s) functional, including providing comparability between calculated and measured indicators.

Expectations and experiences of users / architects

The energy indicators clearly expected to be addressed by Level(s). The uncertainty if regulated national methods comply with Level(s) should be addressed in the near future. Improvements from architects would be more activated, if the aspect of "masterplan / urban development" (daylight potential, shading, albedo and solar exposure) would be more in focus of energy calculations.

Architects are well aware of their role to reduce climate change impacts, or to speak in Level(s), provide a low "Life Cycle Global Warming Potentials" of a building. It is one of the key sustainability targets and can be positively influenced. A good performance in this indicator is a result of a holistic and conscious design process. But there are huge difficulties in assessing the respective metrics and these cannot be overcome by providing an option to report "incomplete life cycles" (see simplified methods), as proposed for the Level 1 reporting option.

Instead, in order to reduce the impact on the climate immediately the transfer of consolidated "generic" findings from realized LCA assessments to the current design tasks should be encouraged. For example, Level(s) indicator 2.2 "Life cycle tools: scenarios for building lifespan, adaptability and deconstruction" represents an easier way of evaluating, whether tools or methods have been applied, which lead to lower environmental impacts, based on the assumption that transparency on life spans or recycling / recovery options of products or materials will influence decision makers towards better solutions. Generic data would be extremely helpful for this.

Similar guiding questions on the application of design principles for a low lifecycle carbon footprint could be found and would facilitate greater engagement, a faster uptake and a higher impact than thousands of detailed LCA assessments.

Design principles resulting in lower carbon impacts include: (1) high intensities of use of spaces, (2) creating flexible spaces for the buildings futures, (3) limited use of natural resources from the building's expected life time, (4) choosing circular solutions of the construction, and (5) selecting products and materials with a low environmental footprint of the manufacturing and transportation stages.

Summarized, neither the energy indicators nor the life cycle global warming indicator are results of methods, usually applied by architects. But the potential of architects to contribute to good results in both is very high. The link between Bill of Quantities or the scheduling capacity of BIM software is necessary for quick Life Cycle GHG Potential calculations and should be highlighted by the report alongside guidance to link these to the Bill of Materials in MO2.

To enable less time-consuming assessments to be made by non-experts in LCA, two options should be considered:

a) Level(s) could a) limit the scope of assessment (system boundaries) to make LCA much more easy and a two hour excel task or
b) Level(s) could include a qualitative assessment of the design principles applied in projects referring to point 1-5 above.

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

Intend / Definition

"Optimisation of building design, engineering and form in order to support lean and circular flows, extend long-term material utility and reduce significant environmental impacts."

Indicators and performance metrics

The macro-objective 2 life cycle tools:	
Life cycle tool	**Performance metric or reporting form**
2.1 Life cycle tools: Building bill of materials	Reporting on the Bill of Materials for the building, as well as for the four main types of materials used.
2.2 Life cycle tools: scenarios for building lifespan, adaptability and deconstruction	According to the performance assessment level: 1. Design aspects that are proposed/have been implemented (common performance assessment) 2. Semi-qualitative assessment giving a score (comparative performance assessment) 3. LCA-based assessment of scenario performance (design optimisation)
The macro-objective 2 indicators:	
Indicator	**Performance metric**
2.3 Construction and demolition waste	kg waste and materials per m2 of total useful floor area (per life cycle and project stage reported on)
2.4 Cradle to grave Life Cycle Assessment	Seven environmental impact category indicators (detailed guidance is provided under 4.4 Overarching assessment tool)

Usability of indicators to identify the hotspots

The first part of the reporting is dedicated to using "life cycle tools". A Bill of Materials (BOM) of all materials used in the building and an allocation to four main material types is the quantitative basis for calculating Life Cycle Assessments. Provision of the information without valuation, definition of targets or benchmarks is of very limited use and it is a very vague method to influence design solutions towards more "lean and circular flows". Using scenarios for lifespan, adaptability and deconstruction are more appropriate methods to identify hotspots as are the Designing out Waste principles championed by the UK's Waste and Resources Action Programme (WRAP).

The second part, indicators for construction and demolition waste and cradle to grave LCA results, are more "sustainability accounting" type indicators and can prospectively – with valid benchmarks – be used to reduce construction waste and potential demolition waste flows. Whether more materials from previous buildings on the site will be recovered by listing up the mass flows is doubtable. Cost and benefits considerations will most likely dominate decision processes. The Cradle to grave Life Cycle Assessment linked to Waste Management Plans represent best practice methods but should be guided by weighting the seven environmental impact categories including Global Warming Potential, Primary Energy Consumption, Acidification Potential etc., to better identify hotspots.

In terms of work flow, the bill of materials and components is the foundation of audits from Indicators 1.2-2.4 and also 4.1.2 (VOC emissions from materials) Data relating to these material aspects should be possible to attach to a Bill of Materials and the tool should provide standard figures for these too for earlier stages. The different levels should clearly reflect the different granularities of data available at different stages and provide totals that are easily and visually comparable across the different stages. The differences between levels should reflect the robustness of the data used (standardised figures, figures based on EPDs and independent validation of what was incorporated in the building).

To reflect the levels of data available at different work stages the Bill of Materials should provide sufficient information relating to common materials for typical construction types. The inter-operability between Level(s) Bill of Materials, Bill of Quantities and BIM should be subject to a major funding effort to support the automation of this process, which is currently very cumbersome. Public projects at the minimum should be required to report such data to incentivise uptake.

Required skills to assess performance

The proposed Life cycle tools do not require specific skills. The BOM is a laborious task as well as the reporting on scenarios for building lifespan. The Level(s) reporting tool does also not require special skills to describe aspects for enhanced adaptability and enhanced deconstruction performance for Level 1. The indicators Construction and demolition waste require some knowledge on the EN 15978 modules descriptions (“module D”) and the estimates on future waste flows is also a very laborious task and require (manufacturers) information on the classification of waste categories of all materials. Indicator 2.4 Cradle to grave LCA can only be generated with special skills on LCA calculation methodology. Without a contractor’s Site Waste Management Plan and reported wasted quantities the risk of a performance gap is high. The path to validation should be clarified by the Level(s) framework and guidance.

Actors to propose improvements

All tools and indicators of this macro-objective can mainly be improved by the architect of a building. Building products manufacturers have an influence on improving waste flows by providing more circular, less waste generating products to the markets.

Market readiness and accessibility of tools and information

For Level 1, the Level(s) reporting format provides the required tools, except for LCA calculations. Information on waste classification of materials and products is often not easily available and are often not reliable. Gathering the quantitative indicators is a very laborious task and could be carried out much more time- and resource-efficient if existing tools would include the respective information already. At least, the combination of LCA calculations and waste flow analysis as proposed should be an integrated process. LCA tools do not report waste flows, although the basic information should be available. Same holds true for the lifespan scenarios and deconstruction scenarios. Tools do not report these aspects of the underlying building model.

Expectations and experiences of users

The topic is very relevant for architects and requires an upward movement. Neither clients nor regulation seems to be very interested in resources-efficient and low-waste design options. Flexibility and adaptability are important design aspects. Hence, the proposed metrics are not meeting expectations of architects and seem not appropriate to be part of the communication with the investor or building owner. A big difficulty of introducing these metrics into design and communication processes is that benchmarks are not available.

Experiences of users show that the proposed indicators and tools of this macro-objective are very time-consuming and generate long lists of detailed information. Practitioners can easily get lost in details and struggle to transform results into improved design options. Methods to quantify and identify hotspots using benchmarks should be L1.

Macro-objective 3: Efficient use of water resources

Intend / Definition

"Make efficient use of water resources, particularly in areas of continuous or seasonal water stress."

Indicators and performance metrics

Indicator	Performance metric
3.1 Total water consumption	m^3 of water per occupant per year
3.2 Proposed: water use in construction	
3.3 Embodied water in materials	

Usability of indicators to identify the hotspots

The topic of water use is of high importance in some European regions, and of lower importance in others. Water costs differ a lot what makes the indicator for high-cost countries / cities / regions quite important to be regarded. From an environmental perspective, scarcity aspects are addressed by the water stress index. Indirectly, water use related energy consumption and use of water and waste water treatment agents can be reduced by lower water consumption. What is not included (yet) is the water consumption of building products, which should be at least highlighted as a longer term goal.

The guidance document refers to a tool, which helps the practitioner in calculating the required metrics. A graphical presentation of results helps identifying hotspots in the defined scope.

Required skills to assess performance

The water calculation tool includes default data for all fields. It is easy to apply and only requires as a minimum some information on the intended use of the building. Special skills are not required.

Actors to propose improvements

Typically, HVAC planners propose how many toilets, kitchenettes, bathrooms with bath tubs or showers etc. should be built. In residential buildings, depending on the "standard" of the building, the investor or building owner can influence the water consumption by not demanding bath tubs. Consumption rates of appliances are usually decided in tendering stages. Improvement options to reduce the water consumption for irrigation of plants usually come from architects or landscape architects. Rainwater harvesting and greywater recycling is deemed to be one of the most cost effective measures for many building types and should be included.

Market readiness and accessibility of tools and information

Level(s) provides a tool with default values. In order to speed up an uptake of the aspect, the generation of interfaces to existing tools would be advised.

Expectations and experiences of users

Calculating a building's water balance is an appropriate and common instrument. Evaluating the location's water stress is new for many, but with the provided tool an easy task. The idea of providing a tool for basic calculations is regarded as very helpful, and would help practitioners if similar tools were provided for the other macro-objectives.

Macro-objective 4: Healthy and comfortable spaces

Intend / Definition

"The design of buildings that are comfortable, attractive and productive to live and work in and which protect human health."

Indicators and performance metrics

Indicator	Performance metric
4.1 Indoor air quality	4.1.1 Good quality indoor air: Parameters for ventilation, CO2 and humidity 4.1.2 Target list of pollutants: Emissions from construction products and external air intake.
4.2 Time outside of thermal comfort range	% of the time out of range of defined maximum and minimum temperatures during the heating and cooling seasons

Usability of indicators to identify the hotspots

Indoor air pollution is a severe problem and affects occupants and a building's value. The indicator for "Indoor air quality" contains two sets of metrics: One for "good quality indoor air" and one for a "target list of pollutants". The first set of metrics addresses the most relevant air related comfort aspects, influenced by physical building aspects. The second set of metrics tries to provide transparency on emissions from construction products and from external sources. The emissions from building products have an especially important health impact. Off-gassing from building materials, such as plastics, foam insulation products, finishes and glues are all major sources of VOCs. There are two ways to frame these, one, by limiting off-gassing of individual products through labelling and secondly, by measuring indoor air quality. It is doubted that more transparency on emissions from construction products is a viable indicator. Transparency on the emissions from constructions products is important, but without setting limit values, just a very labourious task. Limit values or labels can influence decisions and will have a higher impact if indoor air measurements (with limit or orientation values) are defined. CO_2 has a major impact on health and cognitive performance. Pollution from cooking is missing even though it is one of the major contributors to particulates in the home.

The second aspect that is defined by Level(s) for healthy and comfortable spaces is thermal comfort, represented by the indicator “time outside of thermal comfort range”. Additionally, draught (and humidity – see indicator 4.1) is an important comfort aspect for occupiers.

Comfort aspects that are as well very relevant for building users are noise and acoustics (stress and discomfort) and to some degree also the visual comfort. These indicators are currently in discussion.

Required skills to assess performance

The indicator for indoor air quality is based on energy related calculation standards. Typically, energy consultants or HVAC experts have the skills to report the relevant indicators. The “target list of pollutants” is a very laborious and time-consuming task. Specialists like “building biologists” are sometimes part of planning teams. In general, all members of design teams, dealing with the selection, tendering and control of construction products can be trained to gather the relevant information on pollutants in the building products.

The indicator on “time outside thermal comfort range” requires thermal simulation skills and tools.

Actors to propose improvements

Improvements for the first set of indoor air quality indicators (“Good quality indoor air”) usually come from HVAC engineers and architects (natural ventilation). Better construction products are usually proposed by architects. In some cases, the building owner expresses the intent to regard pollutants in construction products and to reduce potential impacts on the indoor air quality.

Improvements regarding the thermal comfort come from HVAC specialists, building physics engineers, energy consultants or from specially trained architects.

Market readiness and accessibility of tools and information

The first set of indicators (ventilation, CO_2 and humidity) is part of standard energy planning. The information for the target list of pollutants is very often difficult to find, since it is not communicated in a standardized way. Training or supporting databases are available in some countries, in others only very limited information is available from manufacturers.

Thermal simulation is a discipline for experts. Special training and tools are required. Thermal simulation is not often used for small buildings. Architects are not very familiar with this method.

The potential for smart systems to log the performance data provided by sensors should be made explicit and links to the Smart Readiness indicators should be clearly set so that systems complying with SRIs are able to provide the data required by the indicator effortlessly. This is the greatest potential for the ubiquitous availability of such data as such assessments are not required by EU building regulations.

Expectations and experiences of users

Under the headline “Healthy and comfortable spaces” architects expect other topics. The indicators are very technical and hard to translate to the investor or building owner. Only little feedback from architects could be gathered, and some disappointment could be sensed, that this topic (not even in Level 1) could not be managed by architects. The aspect of low polluting construction products was expected to be less laborious by making use of product labels. The direction of travel should be clarified in the excel sheet too. Level(s) should make it possible to better balance the inherent conflict between different macro objectives, in this case the increase of airtightness reducing heating bills against the extra energy consuming or human engagement measures needed to improve air quality.

Macro-objective 5: Adaptation and resilience to climate change

Intend / Definition

“The futureproofing of building performance against projected changes in the climate, in order to protect occupier health and comfort and to sustain and minimise risks to property values.”

Indicators and performance metrics

Life cycle tool	Performance metric or reporting form
5.1 Life cycle tools: scenarios for projected future climatic conditions	Scenario 1: Protection of occupier health and thermal comfort Simulation of the building's projected time out of thermal comfort range for the years 2030 and 2050.

Usability of indicators to identify the hotspots

Activities to adapt to future climate conditions very much depend on the local context. With regards to buildings, the risks such as floods, heavy rainfalls, storms, droughts, wildfires etc. can occur more often. Investing in more climate-adaptive, resilient buildings reduce future risks for high repair costs or worse. The chosen indicator focusses on the future occupants’ thermal comfort and if the design has the capacity to adapt for climate change. Other indicators are not regarded yet. The scope is very limited, as the focus is over-heating. It could possibly include more indoor environment metrics, and could easily add a projection of future energy demand for cooling. The indicator has strong implications for passive design principles.

This Indicator has potentially high impacts on design decisions, including external shading, thermal mass, floor to floor heights, ventilation and night purge technologies as well as the specification of heat pumps that can work in cooling as well as heating modes. These decisions would have impacts in other impact categories, especially on Life Cycle GHG Potential.

Required skills to assess performance

The indicator requires thermal simulation skills and tools. Simulation with future weather projections is a very new instrument and performed by maybe a few experts only despite the simplicity of the process when the simulation is carried out by thermal software.

Actors to propose improvements

Improvements regarding the future thermal comfort come from HVAC specialists, building physics engineers, energy consultants or from specially trained architects. Passive measures to reduce potential overheating would be proposed by architects and calculated by the above.

Market readiness and accessibility of tools and information

Thermal simulation is a discipline for experts. Minimal training is required, to upload projected weather data in a thermal analysis software. Thermal simulation is not often used for small buildings and architects are not very familiar with this method – however architects are well trained in the design of external shading and the design of passive cooling measures. The calculation required to test overheating is already required in many countries for non-domestic buildings – to assess climate change resilience the current climate data has to be replaced with future projections, a relatively simple swap in a software package. The source of future climate data should be documented for each EU region, it is already standardised in some EU countries.

Expectations and experiences of users

The topic of “Adaptation and resilience to climate change” is a new design perspective for many architects, but it is more and more common practice in landscape architecture or designing exterior spaces.

This indicator was very well received, particularly by the engineers in the Danish test. Since a low-energy paradigm has been implemented in Danish building codes since 2015, buildings are typically well-insulated and have indeed a higher risk of over-heating in a warming climate, which could lead to an increase in energy demand for cooling. This became very evident in the unusually warm and dry summer of 2018. An analysis of how the design performs in a projected future climate could lead to more robust passive design solutions and different choice of materials.

I think the focus on simulating the indoor environment of the building using predictions of the future climate due to global warming is an eyeopener. We are expected to keep future climate patterns, rainfall, heat etc. in mind when we design, but here you get a tool to analyse the consequences of warmer climates on a project level. That’s excellent I think. – Jesper Ring

Macro-objective 6: Optimised life cycle cost and value

Intend / Definition

"Optimisation of the life cycle cost and value of buildings to reflect the potential for long term performance, inclusive of acquisition, operation, maintenance, refurbishment, disposal and end of life."

Indicators and performance metrics

Life cycle tool	Performance metric or reporting form
6.1 Life cycle costs	Euros per square metre of useable floor area per year (€/m_2/yr)
6.2 Value creation and risk factors	Reliability ratings of the data and calculation methods for the reported performance of each indicator and life cycle scenario tool.

Usability of indicators to identify the hotspots

The first tool to be applied, calculates the net present value of the product stage (until completion) and estimated follow-up costs, based on scenarios. Depending on the level of details, the method provides more or less usable results within decision making processes. Level 1 allows using a very simplified "incomplete life cycle" approach. This adds up either the construction costs plus energy and water costs for a defined life time of the building or the construction costs plus energy and service life time costs (regular replacements of products). Depending on the type of building and its location, the selected follow-up costs can be representative for the hot spots. But it could also be other costs.

The indicators for "Value creation and risk factors" represent a very "Level(s) internal" perspective. Only the reliability of reported information is regarded and assessed according to a newly developed method. Value creation is not in a way addressed, as investors or building owners would expect it.

Required skills to assess performance

The life cycle cost calculation (LCC) has to follow a European standard. The reference standard for calculating the life cycle costs of each life cycle stage is ISO 15686-5 and EN 16627. Both standards require basic training and skills to use LCC tools or unfailing calculation tools.

The reliability rating is not requiring more than the Level(s) documentation.

Actors to propose improvements

Depending on the scope of assessment, the actors to propose improvements vary. The main idea of LCC calculation is to provide more transparency on expectable follow up costs. In principle, it brings different actors together to ideally reduce the total costs. In reality, this method only works, if the LCC calculation is carried out in early design stages and if the buyer / decision maker trusts the calculation method and parameters.

Market readiness and accessibility of tools and information

ISO 15686 compliant LCC tools are not commonly used. Service life information or end-of-life-costs are difficult to gather.

Expectations and experiences of users

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Conclusions

What amendments are needed in LEVELs to achieve a broader uptake?

ACE remains deeply committed to the development and testing of Level(s). ACE warmly welcomes Level(s) as a very important EU initiative with great implications and potentials towards creating a better and more sustainable built environment.

Testing Level(s) has however revealed that there is a need to improve parts of the framework, notably the manual and the reporting tool, to make Level(s) better adjusted for use in practice.

Practitioners testing Level(s) suggested these modifications to ensure that it would be most adequate for use in their design and optimization processes:

Work on the structure of Level(s). It should not only be a reporting tool. **Make Level(s) work as a dialogue and decision support tool**, and adapt it to the established processes of design and optimization (See fig. 9 above).

Include a methodology for assessing the sustainability of architectural concepts qualitatively and include qualitative aspects of all indicators to be discussed among stakeholders. Reference to the role of 'architecture' to deliver higher building performance would help architects engage. More clarity over what Level(s) can and cannot do without additional data better comparison tools should help expectation management. Likewise a greater focus on numeric outcomes comparable between different work stages would be essential to improve uptake.

The **provision of EU-wide database to collect and analyse data for benchmarking** purposes is much needed.

The reporting tool is far too complex to be fit for use in rapid design and optimization processes. It needs a much clearer structure for consultants to manage complexity and level of detail in the assessments. It should be redesigned completely to accommodate the points above.

Include target benchmarks for 2020, 2025, 2030 and the 17 UN SDGs. These should reflect the implications of the Paris agreement. The direction of travel for Level(s) should be made more explicit in the context of the EU strategy for the Circular Economy.

The Level(s) manual should highlight any barriers to carry out the audits and offer suggestions and incentives to overcome these, including case studies and improved guidance. Level(s) has the potential to become an important tool to underpin educational programmes and green procurement.

Super pedagogic illustrated manual is needed. It should include cases and explain how they are assessed, and which design principles affect performance in what ways. As part of this typical hotspots should be identified under each indicator with known measures to address these.

Provide basic tools / methodology for life cycle thinking and qualitative assessment of design solutions before calculating results.

To accommodate users with less experience, all Level 1 assessment should be possible at the same, relatively low level of complexity with easy to use methods included in Level(s).

Audits of work stages must result in **numeric outcomes that are comparable** between stages and against benchmarks, rated for robustness and visually presented to incentivise use.

The project stages should **reflect the data granularity** available and should start low and increase towards later work stages. The differences between levels should reflect the robustness of the data used (standardised figures, figures based on EPDs and independent validation of what was incorporated in the building). It would be helpful to set up a table showing what to calculate and when, e.g. Energy, total and by end use then by fuel during measured, including everything; material emissions vs indoor VOC levels. Similar logical breakdown of the data granularity should be defined for all other indicators for each work stage.

The **Bill of Materials** is central to the assessment of a number of indicators. Its assembly is currently the most cumbersome activity relating to Level(s) and more effort should be made to improve the inter-operability between the Bill of Materials required by Level(s) and a project's Bill of Quantities and BIM schedule of products and materials.

Levels should help **balance the inherent conflicts** between many of the indicators – for example increased air tightness for reducing heating consumption requires additional measures for ventilation if air quality is not to suffer, or increased thermal mass for balancing relative humidity and temperatures incurs penalties in terms of embodied carbon. Clear numerical outputs displayed on the same page for each indicator should help designers track the impacts of various design decisions.

What are the key recommendations for EU policy makers?

To emphasise the architect's impact in achieving the UN Sustainable Development Goals we need factual discourse about environmental performance. ACE participates in and facilitates workshops, conference events, research projects that design the actions required to make significant progress towards the Circular Economy.

Ace has committed to improving the profession's awareness of the latest research and exemplars and is an active partner in EU-wide research efforts that advance excellence in these areas. ACE is committed to sharing exemplars, both in terms of effective practice and case studies, with its members.

ACE has campaigned energetically to raise architects' as well as policy makers' awareness of the need to tackle the following areas in legislation and practice:

1. Closing the **energy performance gap** through the validation of achieved performance in use
2. Taking a **lifecycle approach** to environmental impacts
3. Monitoring **indoor environmental quality** not just the resources required to achieve it
4. Consider **climate change resilience** as part of regulatory and design frameworks
5. Emphasise architecture's role in **value creation** in the context of meeting the UN's 17 sustainable development goals

To achieve this ACE argues for the following actions by EU policy makers:

Close **alignment of initiatives** by DG Energy, Environment, Grow and Culture to ensure that forthcoming regulatory efforts have maximum impact. This includes alignment of EPBD, SRI, Level(s), Building Passports, Eco-labelling, Horizon programme, etc.

EU funding for the creation and maintenance of **databases and benchmarking tools** for building energy use, construction and material impacts (including GHG Potential, VOC emissions, resource depletion, recyclability, waste, water consumption, etc).

Likewise **examples of excellence** in practice and case studies should be collected and promoted as part of the rollout of Level(s). Every opportunity should be pursued to describe specific benefits beyond the boundaries of level(s) for stakeholders.

Establish performance targets for the built environment that address the UN 17 SDGs as soon as possible. These should be voluntary initially yet include a roadmap for a step by step implementation towards achieving the expected mandatory performance of the building stock by 2030.

Make sustainability performance benchmarks mandatory in building codes by 2025 and 2030.

Provide basic data for most material groups to be used in LCA. These will make it easier to get stakeholders started on reporting. The basic data can be supplemented by detailed and product specific data from industry suppliers if suppliers are enabled to provide data in a standardised format for LCA and LCC and given incentives to stimulate competition on component performance and data quality.

Additional recommendations for Level(s) given by the Federal Chamber of German Architects (Bundesarchitektenkammer - BAK)

No mandatory application of Level(s)

It is essential that the use of this instrument remains optional. It should be left to the Member States to choose the incentives to encourage the use of Level(s). It is possible that market-based measures such as the introduction of CO2 pricing could lead to a stronger demand for resource-efficient construction and for corresponding assessment tools in the future.

Focus on core objective

Level(s) should focus on the core objective: increasing resource efficiency in construction and improving the environmental performance of buildings. Level(s) should focus on the building as the accounting framework. I.e. no inclusion of the neighbourhood context or coupled consideration of the building and transport sector. The criteria should also aim to record and evaluate resource consumption for construction and deconstruction and during use. If there is a need for a neighbourhood-related assessment, an add-on assessment framework "Level(s) Quartier" should be developed. However, the first priority should be to keep the assessment framework as lean and user-friendly as possible in order to lower the application threshold.

Manageability and practicality - All calculations in one tool

Currently there is no application tool for Level(s). The measurement and calculation values of a building are compiled in an Excel list. However, the calculations themselves cannot be carried out in Level(s). For this purpose, further calculation programs are currently required, which are sometimes costly and time-consuming to operate. It is strongly recommended to develop a tool which meets the following criteria:

- Program accessible to everyone
- Step-by-step support of the user through the evaluation
- All required calculation tools for the measurement of the values must be stored in Level(s), no other programs are required additionally.
- Final evaluation of a building → Possibilities of certification by Level(s)
- Certification Increasing in application of a higher “Level”

Take into account the validity of the criteria requested for all Member States

In principle, care should be taken to ensure that the criteria consulted are valid in all Member States. In the discussion, the example of "summer thermal insulation" was cited, which was queried and included in the overall assessment. However, summer thermal insulation does not have the same relevance for ensuring a comfortable indoor climate in all Member States. Rather, the question should focus on what (energetic or technical) expenditure is necessary to ensure a comfortable indoor climate. Summer thermal insulation is only one possible measure in this respect.

Replace "lifetime" by "operating life”

The term "lifetime", which is used in level(s), is misleading. It is not the life of a component that determines when it is replaced, but its useful life. The theoretical life of a component usually exceeds the actual useful life many times over. In the discussion, the example cited was the façade from the 1970s, which was replaced, not because it had lost its functionality, but because it no longer meets current requirements. The service life of building components and buildings is therefore decisive. It provides information about the cycles in which modernization is due and the quantities of resources that need to be mobilized.

Name "Level(s)" is not very meaningful

The name "Level(s)" is not very meaningful and can also be misinterpreted in such a way that it is a question of differentiated assessments carried out either by professionals or by amateurs. Here it is recommended to find another title for the instrument which better expresses the intention behind the instrument: namely the evaluation of resource efficiency and the improvement of the environmental performance of buildings in different levels of detail.

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