LIFE Level(s) mainstreaming sustainable buildings in Europe

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DISSEMINATION Life for LLLs

Introduction

Growing urbanisation and the expansion of the built environment is a trend that continues to grow, as will the overlapping effects that follow. The impact on climate, environment and human health stems from a multitude of human-related actions, with the building sector and construction industry being a significant cause of concern. European buildings amass around 40 per cent of energy expenditure and are responsible for 36 per cent of CO_2 emissions. In a decade of climate urgency, when the consequences of climate change (CC) are fully tangible and impossible to undermine, economies, political structures and industries need to stand together to create change.

Needless to say, mitigating CC is paramount. When it comes to buildings, health and environmental impacts can stem from generated waste, extracted material and carbon emissions. An approach focused on the whole life-cycle (WLC) of buildings is required—making them more sustainable. EU policies and strategies like the Circular Economy Plan, the Green New Deal, the Taxonomy, the New European Bauhaus, and the updates of technical directives such as the EPBD, use the recent The Level(s) European Framework for Sustainable Buildings (hereinafter the Level(s) framework or 'Level(s)') to report on the social, environmental, economic, climate adaptation and human health performance of buildings.

"**Green Building Councils** (GBCs) are independent non-profit organisations made up of businesses, organisations and professionals working in the building and construction industry. In Europe alone, there is a community of over 20 national GBCs, 8 regional partners, and close to 5,000 members. The main activities include networking leaders, assessment and certification, awareness-raising, skills and capacity building, financial and economic incentives, and policy and regulation. All in order to catalyse the uptake of sustainable buildings for everyone, everywhere."

Why utilise the Level(s) framework to mainstream sustainable buildings?

Consequently, the obvious actors to rally up the spheres of industry, policy and economy around the same table—Green Building Councils (GBCs)—decided to tackle the need to mainstream sustainable buildings in Europe. Yet, to avoid mere declaratory remarks, the main actors in the story needed an anchor providing relevance, reliability and impact potential along the whole value chain.

That is where the Level(s) framework comes in. The European Commission's holistic tool aims to move construction value chains closer to the circular economy and to address the life cycle (LC) of buildings in a way understandable to policymakers, building professionals and investors. By using Level(s), the building sector stakeholders are provided with a tool for measurement and improvement from the design phase to the end-of-life stage, both in new construction and renovation, moving the sector closer to a life-cycle approach.

"The **Level(s)** European Framework for Sustainable Buildings provides a common language for assessing and reporting the sustainability performance of buildings. It is a simple entry point for applying circular economy principles in our built environment. It offers an extensively tested system for measuring and supporting improvements, from design to end of life. Mainstreaming the Level(s) framework can impact the building sector carbon footprint significantly."

The framework was designed as an assessment and reporting tool for sustainability criteria of buildings and has been tested in over 130 projects. The Level(s) indicators provide significant data on three 'levels': or project stages: *(1)* concept; *(2)* design and construction; and *(3)* monitoring. In that way, information on environmental performance, health and comfort, values and costs is available when addressing all key sustainability aspects over the building LC.

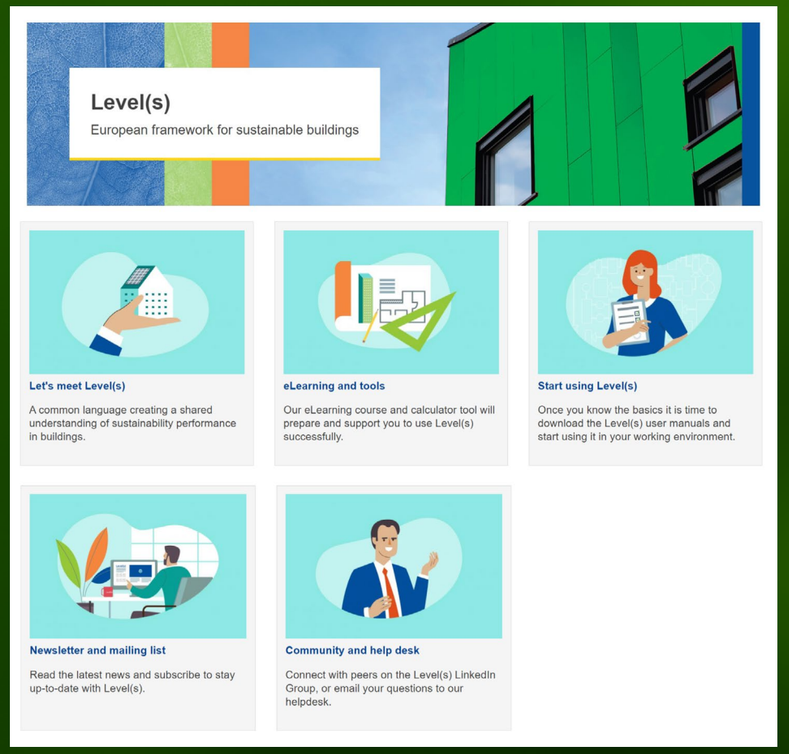
It is of value to note that the Level(s) framework has a vital policy component. As the countries of the EU are amalgamated around green policies, sustainability in performance and energy-efficient practices, Level(s) has a growing role in a European policy context. Principles of decarbonisation and green transition within the EU economies are now an integral part of initiatives such as the EU Renovation Wave. Accordingly, the shift of thought towards whole-life emissions implies the refocus on the LC of buildings. Hence, by stressing environmental impacts of buildings, future-proofing products, using quantifiable indicators for health and wellbeing, costs and risks, the Level(s) framework lies at the core of chasing and delivering sustainability.

The goals and ambition of the LIFE Levels project

The role of the building sector and construction industry in causing CC has caused a need to focus on decreasing LC impacts Europe-wide. The industry has major potential for mitigating CC by using tools such as the Level(s) framework to reach higher sustainability of buildings. The tools exist, but the matter of sharing the knowledge, values and practice with the actors across national markets remains. As noted previously, GBCs from eight countries joined forces with the goal of generating greater awareness and usage of the Level(s) framework through the LIFE Levels project, which is financed by the LIFE Programme of the European Commission.

Policymakers and industry leaders usually start from a different baseline when integrating recent policies and processes. The LIFE Levels project looks to overcome the barriers caused by challenges such as lack of data and expertise. In line with the stakeholder scope of Level(s), LIFE Levels addresses both industry and government to educate on the value of Level(s) and an LC approach. The project aims to advocate for the use of quality data to form comparable quality metrics by information guidance and the creation of verifier checklists.

However, awareness and knowledge-sharing alone tend to cause a tenuous impact, while climate urgency calls for a much more substantial effect. Therefore, the crew of LIFE Levels laid the foundation for the alignment of Europe's leading building certification schemes (BCS) with Level(s) sustainability indicators and created a backdrop for integration of national green public procurement (GPP) criteria with the administrative and data requirements of Level(s). By impacting the BCSs themselves, the project may impact the utilisers of said schemes which amount to hundreds of projects by major investors and developers on the continent.



How utilising the Level(s) framework will elevate analysis from operational carbon to whole-life carbon

The Level(s) framework consists of 16 indicators across six macro-objectives, as shown in Figure 1. In terms of carbon impact, the most significant is indicator 1.2. Life-cycle global warming potential (GWP). This indicator aims to identify both the amount of GWP contributions of a building and the timings of these contributions during the LC from cradle to grave.

Generally speaking, two sources contribute to the majority of emissions: the production of building materials and the emissions resulting from the energy usage of the building. From a technical point of view, these are a result of processes that take place in factories and processing plants of building materials (referred to as A1-A3 in EN15978, or upfront embodied carbon), and the emissions involved in the production heating, cooling and electricity used in the building either on site or in productions plants (referred to as B6 in EN15978, operational carbon).

As building standards and codes require better-performing buildings to lower operational carbon, building designers fail to address quantities of materials in buildings, leading to higher embodied carbon. This means emissions are being pulled forward in time to take place during the materials manufacturing process rather than during the operational stage of the building's life. Moreover, as the energy sector's carbon intensity decreases in the future due to the use of renewables, we can reasonably expect the operational carbon figure to reduce. For that reason, we need to minimise the embodied emissions caused today and ensure we are not designing in vain for future operational emissions that might not exist.

To model and measure this, we need reliable data on the carbon impact of every stage of the building's lifetime.

Macro-objective	Indicator	Unit of measurement
1. Greenhouse gas and air pollutant emissions along a building's life cycle.	1.1 Use stage energy performance	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)
2. Resource efficient and circular material life cycles	2.1 Bill of quantities, materials and lifespans	Unit quantities, mass and years
	2.2 Construction and demolition waste and materials	kg of waste and materials per m^2 total useful floor area
	2.3 Design for adaptability and renovation	Adaptability score
	2.4 Design and deconstruction, reuse and recycling	Deconstruction score
3. Efficient use of water resources	3.1 Use stage water consumption	m^3/yr of water per occupant
4. Healthy and comfortable spaces	4.1 Indoor air quality	Parameters for ventilation, CO_2 and humidity Target list of pollutants: TVOC, formaldehyde, CMR VOC, LCI ratio, mould, benzene, particulates, radon
	4.2 Time outside of thermal comfort range	% of the time out of range during the heating and cooling seasons
	4.3 Lighting and visual comfort	Level 1 checklist
	4.4 Acoustics and protection against noise	Level 1 checklist
5. Adaptation and resilience to climate change	5.1 Protection of occupier health and thermal comfort	Projected % time out of range in the years 2030 and 2050 (see also indicator 4.2)
	5.2 Increased risk of extreme weather events	Level 1 checklist (under development)
	5.3 Increased risk of flood events	Level 1 checklist (under development)
6. Optimised life-cycle cost and value	6.1 Life-cycle costs	Euros per square metre per year (€/m^2/yr)
	6.2 Value creation and risk exposure	Level 1 checklist

Figure 1: Macro-objectives and indicators of the Level(s) framework.

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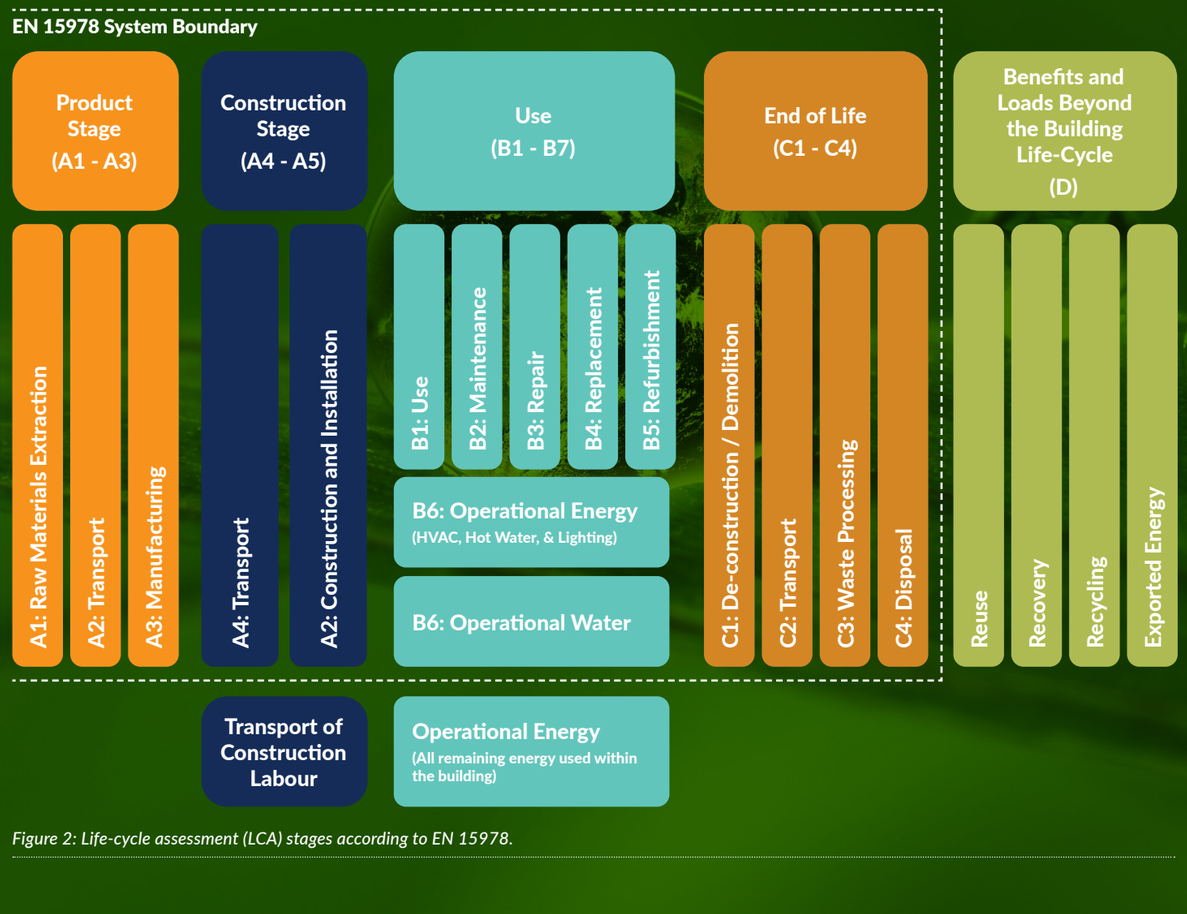

Figure 2: Life-cycle assessment (LCA) stages according to EN 15978.

This includes harvesting raw materials, transporting them to plants, processing them into building materials, transport to the site, construction, operation of the building, renovations, replacements and refurbs, and deconstruction.

Fortunately, there is a recognised European standard for this—EN15978 (see Figure 2). The Level(s) framework takes this standard as a basis for measurements consistently and at scale. Consistency and scale are vital if we are to fully understand the totality of a buildings' emissions, set baselines or limits and treat all proposals fairly when considering planning and funding. The quality and sources of this data must be reliable and verifiable.

How utilising the Level(s) framework will improve the quality of GWP metrics

Operational carbon is not so difficult to quantify and estimate since, in Europe, much of it comes from well-administered energy grids. All that is required is an energy model of the building and data on the environmental impacts of energy generation and delivery (primary energy, scope 2 emissions). Government agencies typically provide these data.

For embodied impacts of building materials, finding and selecting this data can be more problematic. A brick, for example, may have been produced using high carbon or low carbon energy, resulting in a higher or lower carbon footprint, but it is impossible to tell by looking at the brick itself. A steel beam may be made from virgin iron ore mined at a great environmental cost, or it may be mostly composed of recycled material, or it may even be salvaged and reused without any recycling required. How do we know the provenance of our materials?

Quality metrics through quality data

The best source of data for the environmental impacts of building materials or components is an environmental product declaration (EPD). An EPD contains the results of a modelled sample of the production process. It is typically produced by an LCA consultant using data on raw material quantities, energy inputs, transport methods and distances supplied by the manufacturer. Using specialist software to track the impacts of these inputs, the consultant can create a model of the process and reveal the environmental impacts.

EPDs are produced according to EN15804, which was revised in 2019 to form EN15804+A2. For consistency and reliability, the analysis should follow the reviewed European standard EN15804+A2, which sets out the rules of the LCA and any further rules required by the specific product type—product category rules (PCR). In line with the standard, the results should also be verified by a third party before publication.

An EPD sheds light on the manufacturing processes of specific products and allows specifiers to better understand the environmental impacts of the supply chains they use when designing a building. With carbon budgeting and reduction beginning to make their way into legislation, a lower carbon footprint can become a competitive advantage in the marketplace. It is hoped that by demanding to see EPDs from suppliers and manufacturers, they will be incentivised to produce them, examine their processes, and seek to improve their carbon footprint. This phenomenon is already a reality. A building's LC begins long before it is opened for use.

If the design is still at an early concept stage and specific suppliers cannot yet be selected, it is necessary to have generic data to evaluate which approach is likely to lead to the best outcome and where the hotspots in the design are likely to be. It is at the early design stages where the greatest carbon saving decisions can be made to the building's entire LC. These decisions need to be backed up by quality data.

For example, suppose an underground car park is included in the original design, but the analysis reveals that the volumes of concrete required are so large that the car park constitutes one of the largest carbon contributors. The design team can take the early decision to look for alternatives, e.g. locating the car park above ground, creating more bicycle parking and shower facilities, or providing a shuttle bus service from a local train station.

> "Early analysis can highlight areas of the design to focus attention on for maximum savings. As a design progresses and the design begins to take form, it is more complex (and costlier) to decrease emissions. Setting the strategic direction early usually leads to better outcomes at lower cost and with greater 'buy-in' from stakeholders."

Quality metrics through fixed analysis

Another problem when trying to compare the embodied impacts of designs is the scope of the analysis: what has been included and, just as importantly, what has been left out. When designs are in competition with one another, it is vital that the scope is consistent; otherwise, one building may be penalised for thorough analysis while a thin one will yield what appears to be a better result.
To counter this, Level(s) includes an inventory that defines the mandatory aspects of the analysis and includes the condition that a third party must verify it. This is in line with the conditions related to EPD verification. The LIFE Levels project has developed an extensive checklist to help verify that the results reported are based on a thorough and comprehensive assessment of all of the facets of the building that the Level(s) framework indicates.

Where primary data does not exist, the assessment practitioner must explain their choices of substitute data and ensure they are from recognised reliable sources. Using this checklist will ensure a Level(s) compliant study has included everything consistently and fairly, using solid data. This ensures the playing field is level for building design. It further allows us to see where the hotspots are in general terms, spot patterns and adjust accordingly. It is

When designs are in competition with one another, it is vital that the scope is consistent; otherwise, one building may be penalised for thorough analysis while a thin one will yield what appears to be a better result.

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worth noting that planning, designing and constructing buildings is a slow process and working practices are notoriously slow to change in the industry as a whole. Gathering comparable data helps to inform policy faster.

In conclusion, we have to create staging posts that indicate the direction of our journey in general terms before we can more accurately assess the evolving design. Some of the steps on the journey are taken before we have a specific design, so we have to use generic data to treat possible approaches to the problem fairly. Also, because of the variation in the environmental impact of what appear to be similar materials, assessments must be updated when the further specification is reached. Paramount is a fixed process and quality input; if metrics are non-comparable, incorrect assumptions will be made to the distress of the climate issue.

How to use existing BCSs as a vehicle to mainstream the Level(s) framework

When facing the need to align building performance with various EU policies and declared objectives, key sustainability elements were outlined in Level(s) macro-objectives. From greenhouse gas emissions and resource efficiency, through wellbeing and health, all the way to climate resilience and cost optimisation, each Level(s) macro-objective includes quantifiable and comparable indicators.

The indicators selected in the LIFE Levels project relate to LCA, life-cycle costing (LCC) and indoor air quality (IAQ). The selection was based on high impact capacity and value concerning the preservation of health and the natural environment. Since one of the staples of the project is the aim to bring Level(s) into broad application Europe-wide, the integration of the framework into green building certificates creates a poignant platform in reaching stakeholder's networks and raising the demand for the Level(s) framework itself.

The project established a step-by-step procedure to explore the level on which the selected indicators were already aligned with existing BCSs, how the integration can be of stronger quality, and encourage the stronger uptake of Level(s) in markets operating the certifications schemes. For that reason, a qualitative review of the links between the Level(s) indicators and those of the BCSs needed to be performed. The following selection criteria were applied to determine which BCSs to evaluate: regional coverage, scheme maturity, potential, and alignment with EU standards.

To produce a detailed comparative overview between BCSs and the Level(s) framework, a set procedure to evaluate the conformity was required. Thus, a mapping tool was developed to be a quantitative conformity assessment mechanism for the LCA, LCC and IAQ indicators, as well as a general qualitative conformity assessment of all the Level(s) indicators. When the mapping tool was complete, all there was left to do was to apply it to the identified project partners' BCSs.

It is of value to highlight the significance of the process because it provided the project with a perspective on how aligned the BCSs are with Level(s) at the given time. Two important resources resulted from the mapping process: *(1)* recommendations on best ways on integrating the BCSs with Level(s) to increase the conformity; and *(2)* recommendations on the further development of the Level(s) framework itself.

Further aligning of the Level(s) framework and the selected BCSs required a second vital tool, a reporting template through which certifiers can report on the compliance of the indicators of their schemes with those of Level(s). Moreover, the idea of the reporting template is to simplify the procedure of Levels(s) reporting, so users receive an easy-to-understand interface that presents the perspective of the certifications and that of the European Level(s) framework. Thus, the comparability of different projects with Level(s) becomes more streamlined, allowing a coherent communication between BCS operators and the Level(s) framework.

"The **sustainable building certification schemes** (BCS) are toolkits to understand, measure, report, rate and certify comprehensive sustainability parameters of buildings. A building is a system whose social, environmental and economic performance can be assessed and improved, from the suitability of the building to the site and its pre-existences to the resources' demand along with its use phase, until the end of life management of its components. BCSs can help buildings to outperform others. As BCSs are widely used already, developing them is an impactful way of improving the market's sustainability."

DGNB linked the content of the reporting template to the DGNB System for New Construction, referring from the individual Level(s) indicators to the corresponding DGNB methods, providing a translation key between the DGNB BCS and the Level(s) indicators.

DGBC plan further development of the BREEAM-NL BCS to integrate the reporting template with additional outreach towards projects and building professionals willing to raise the sustainability levels of the national building sector.

IGBC tested the integration of the reporting template with the Irish Home Performance Index (HPI), proving that the development of the BCS has a strong perspective on alignment with Level(s) indicators.

FIGBC will use the Level(s) reporting template to educate building professionals and to encourage public authorities to use the shared knowledge in public procurement processes. The activity will take place in the future as the certification body of Finland, Rakennustietosaatio (RTS), awaits an update in 2022 as the new national regulation on LCA is developed. The legislation will be aligned with Level(s).

GBCe will carry out partial integration of the Level(s) reporting template with VERDE BCS to understand the needed upgrades of VERDE, build capacities and assess main implementation challenges.

GBC Italia has also planned future use of the reporting template. The Italian rating systems GBC Home, GBC Condomini and GBC Historic Buildings, based on LEED BCS, were tested on the alignment with Level(s). The rating systems will be revised and published in 2022. The reporting template will be distributed alongside the systems to demonstrate the coherence level.

Alliance-HQE reported that pre-existing BCSs in France—Cerqual for residential buildings and Certivea for non-residential buildings–intended to integrate the Level(s) reporting template in 2023 and at the end of 2021, respectively.

The reporting tool is available online free of charge. It is structured as an Excel format table but is also available to extract as a PDF. Alongside the core parameter list, which highlights one key value of every indicator and a building description sheet for basic project information, the reporting tool consists of categorised sheets containing the reporting for indicators and values on the three levels of the Level(s) framework:

1. Design stage

2. Detailed design and construction

3. As-built and in-use

To position themselves as frontrunners for the rest of the market, the project partners supported the implementation of the Level(s) Framework by using the reporting template to test the integration of their certification systems with Level(s), all with an ambition to partially or fully incorporate the reporting template into their respective BCS.

Each GBC provided an outlook on the opportunities to use and integrate the reporting template. The experience of GBC's in carrying out the mapping exercise was presented at the project webinar in May 2021.

Reflecting on the platform created by the LIFE Levels project with a goal of making Level(s) ready to be aligned with existing European BCSs, it is important to emphasise how the reporting template was developed to be used by a broad range of stakeholders within the construction and real estate value chain. The potential synergy between BCSs and Level(s) cannot be understated as the Level(s) framework macro-objectives address sustainability concepts over the WLC of buildings in line with EU policies and climate goals, while BCSs provide national specificities and further building sustainability topics.

"The **Level(s) framework reporting template** is an output of the LIFE Levels project usable by any BCS oriented towards complying with Level(s). It can help designers, developers and financiers pre-check how a building will perform in relation to Level(s) related tools and policies."

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Next steps

As the project moves to the last of its three years, interest in replication by other certifications has increased. The project partners' positive impact on the Level(s) test phase continues through hand-in-hand collaboration with the basic e-learning platform, which will be launched this month (October 2021) on EU Academy.

Green public procurement insights gained thanks to extensive surveys, and interviews with pioneering procurers are paving the way to greener public practices and private initiatives. Consultation on which indicators better reflect the process management and impacts of this kind of project have been shared with the LIFE programme and will hopefully help building performance become better funded in LIFE.

Alliances with sister projects tackling biodiversity premises, waste valorisation, decarbonisation roadmapping, innovation and transition in the sector and others will continue clarifying an integral vision of the challenges of European buildings. And a dozen new jobs created will benefit young professionals who will lead building design, construction and management to a cleaner and more resilient Europe. Stay tuned at **lifelevels.eu**!

Conclusion

The positive impacts and awareness raised by LIFE Levels are clear when considering the work completed and the period ahead for both the project and the various EU and nation-specific processes, initiatives, and policies. However, considering the weight of the challenges that need mitigation, significant work still needs to be done. For LIFE Levels and its team, this means generating commitments by public authorities to implement Level(s) criteria in GPP processes, thus creating a chain of responsibility stemming from policymakers and public authorities to manufacturers and professionals.

The same actors require further education and capacity building, another future challenge of LIFE Levels project. Awareness and knowledge are essential when discussing the sustainability of buildings, climate urgency and tackling the carbon impact of the sector.

LIFE Level(s)

PROJECT SUMMARY

LIFE Levels project is mainstreaming sustainable buildings in Europe through awareness and adoption of the Level(s) Framework, a set of EU indicators addressing the whole life-cycle performance of buildings. Key indicators are life-cycle assessment (LCA), life-cycle costing (LCC) and indoor air quality (IAQ). Capacity building of professionals, manufacturers and procurers on these issues can be a game-changer.

PROJECT LEAD

Dr Anna Braune is a building assessment expert engaged in the development of Level(s); Dr Valentina Marino is an experienced capacity building expert on sustainable buildings; Stephen Barrett is an expert in LCA and whole-life carbon assessment; Benjamin Petrovic is the D&C, alliances and networking lead; and Borja Izaola is the project coordinator and connector with EU policies.

PROJECT PARTNERS

The partners on the project are some of the most recognisable green building councils (GBC) across Europe, notable for their success in governance, inclusiveness and market impact. Therefore, the consortium is made up of GBC España (GBCe), Croatia GBC, Dutch GBC (DGBC), Alliance HQE-GBC, GBC Finland (FIGBC), GBC Italia, German Sustainable Building Council (DGNB) and Irish GBC (IGBC).

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