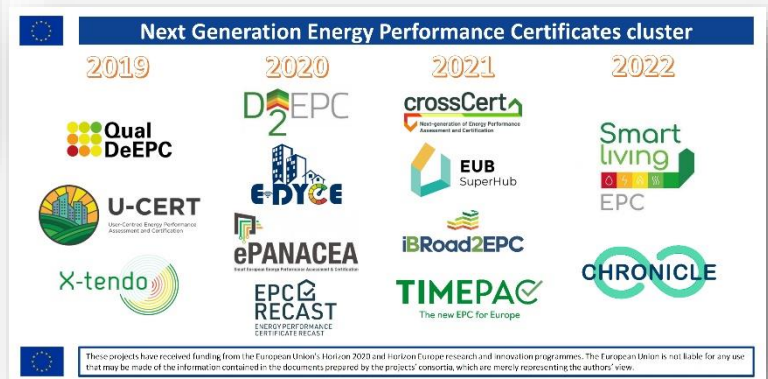


IEQ is in the scope of the EPBD

EPB experts' opinion

EPB Center & the Next Gen EPC cluster¹

This opinion document is formulated for supporting the EPBD Recast Triologue, keeping in mind the linchpin role of the CEN/ISO set of EPB standards in the transposition, implementation & monitoring of EPBD in EU's Member States



¹ The following projects are part of the Next Gen EPC cluster: U-CERT (GA N. 839937), X-tendo (GA N. 845958), QualDeEPC (GA N.847100), ePANACEA (GA N.892421), D²EPC (GA N.892984), EPC RECAST (GA N.893118), E-DYCE (GA N.893945), crossCert (GA N.101033778), EUB SuperHub (GA N.101033916), iBRoad2EPC (GA N.101033781), TIMEPAC (GA N.101033819), CHRONICLE (GA N. 101069722) and SmartLivingEPC (GA N.101069639). These projects have received funding from the European Union's Horizon 2020 and Horizon Europe research and innovation programmes. The European Union is not liable for any use that may be made of the information contained in the documents prepared by the projects' consortia, which are merely representing the authors' view.



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1 In a nutshell

From the **technology neutral perspective of the CEN/ISO set of EPB (Energy Performance of Buildings)** the following reasons support the explicit inclusion of Indoor Environmental Quality (IEQ) in the EPBD:

- **Holistic Approach to Building Performance:** The EPB standards aim to provide a comprehensive framework for assessing and improving the energy performance of buildings. However, energy performance cannot be evaluated in isolation. Including IEQ requirements within the EPB standards would enable a more holistic approach to building performance, acknowledging the interdependence of energy efficiency, occupant comfort, and well-being.
- **Occupant-Centric Performance Evaluation:** The EPB standards currently focus primarily on technical aspects such as energy consumption and CO₂ emissions. By integrating IEQ requirements, the EPB standards would shift the focus towards occupant-centric performance evaluation. This would ensure that the indoor environment supports the needs, health, and well-being of building occupants, creating comfortable and healthy living and working spaces.
- **Performance Verification and Compliance:** The EPB standards provide a framework for verifying and assessing the compliance of buildings with energy performance requirements. By including IEQ requirements, the EPBD would establish criteria for evaluating and ensuring compliance with indoor environmental quality standards. This would enable better monitoring, enforcement, and accountability for building performance in terms of both energy efficiency and occupant well-being.
- **Synergies with Energy Efficiency Measures:** IEQ requirements and energy efficiency measures are mutually beneficial. Incorporating IEQ requirements in the EPB standards would enhance the synergy between energy efficiency and indoor environmental quality. For example, optimizing ventilation systems can improve indoor air quality while reducing energy consumption. By integrating these requirements, the EPBD would promote integrated solutions that maximize energy efficiency while maintaining a healthy indoor environment.



- **Standardization and Harmonization:** Including IEQ requirements in the EPB standards would foster standardization and harmonization across the European Union. By establishing common guidelines and benchmarks for IEQ, the EPBD would facilitate consistency in building practices and regulations. This would improve the comparability of building performance across Member States and promote the exchange of best practices and knowledge-sharing.
- **Improved Data Collection and Performance Feedback:** Integrating IEQ requirements within the EPB standards would necessitate the collection of relevant data and information on indoor environmental parameters. This data can provide valuable insights into building performance and occupant satisfaction. By including IEQ in the EPBD, it would create a feedback loop for continuous improvement, allowing policymakers, designers, and building managers to optimize both energy performance and occupant comfort over time.
- **International Alignment and Collaboration:** The inclusion of IEQ requirements in the EPBD would push EU standards ahead of international initiatives and collaborations focused on indoor environmental quality. By harmonizing the global frameworks and exchanging knowledge and expertise, the European Union can contribute to the development of international best practices in assessing and improving IEQ.

2 Article 11a

The inclusion of Article 11a in the Energy Performance of Buildings Directive (EPBD) establishes a vital framework for the applicability and methodology of calculating Indoor Environmental Quality (IEQ) standards. By integrating this article, the importance of IEQ can effectively be addressed and healthy indoor climate within buildings can be promoted.

- **Integration of IEQ in EPBD:** The latest versions of the EPBD recast, including those endorsed by the EU Council, have already recognized the significance of IEQ and its association with healthy indoor conditions. The directive emphasizes the requirement for non-residential zero-emission buildings to be equipped with measuring and control devices to monitor and regulate indoor air quality. Furthermore, it encourages the installation of such devices in existing buildings during major renovations, where technically and economically feasible. The EPBD also highlights the need to optimize health, indoor air quality, and comfort levels defined by Member States when calculating energy needs and energy use. Supporting energy performance upgrades of existing buildings that contribute to achieving a healthy indoor environment is also encouraged.
- **Existing BACS Requirements:** The latest versions of the EPBD already include provisions for the installation of Building Automation and Control Systems (BACS) in both non-residential and residential buildings. These systems encompass IEQ sensors, further underlining the importance of monitoring and maintaining optimal indoor environmental conditions.
- **Energy Savings through IEQ Monitoring:** Implementing IEQ monitoring offers significant energy-saving opportunities. By actively controlling air exchange rates and avoiding the maldistribution of ventilation air, energy consumption can be optimized. Incorporating IEQ standards and monitoring devices ensures that energy efficiency measures are aligned with providing a healthy indoor environment.



- **IEQ Parameters for Energy Performance Calculations:** Defining specific requirements for IEQ parameters, as outlined in standards such as EN 16798-1, becomes essential for accurate energy performance calculations and system design. By incorporating these parameters into the methodology framework, the EPBD can provide comprehensive guidelines for achieving energy efficiency while safeguarding IEQ.

In conclusion, the inclusion of Article 11a in the EPBD signifies a crucial step towards recognizing and enhancing IEQ standards. By acknowledging the importance of IEQ, promoting monitoring and control systems, and incorporating specific parameters into energy performance calculations, the EPBD ensures the harmonious integration of energy efficiency and a healthy indoor environment.

3 Evidence-base from EU funded projects

3.1 ALDREN

The ALDREN project conducted a comprehensive analysis on the impact of renovation and non-energy benefits on market value. One of the key aspects explored in the study was the enhancement of Indoor Environmental Quality (IEQ) and its direct influence on market value, as well as its role in driving private sector engagement in renovation activities. Improved IEQ, encompassing health and well-being considerations, emerged as a vital component.

It is widely recognized that better IEQ significantly increases market value and serves as a compelling motivator for the private sector to invest in renovation projects. Therefore, it is crucial to incorporate IEQ indicators into energy renovation efforts and ensure their inclusion in Energy Performance Certificates (EPCs).

- The ALDREN project proposed a cost-effective thermal comfort score, derived from hourly energy calculations and [the project also recommended the adoption of the TAIL \(Thermal, Acoustic, Indoor air quality, Lighting\)²](#) approach, which involves dedicated measurements or simulations of various IEQ parameters tailored to specific cases, that should be incorporated into the standard EN 16798-1 and be considered as an output on par with the calculated energy requirements in EN ISO 52016-1.
- In the near future, a demonstration output of the IEQ score will be made accessible through the EN ISO 52016-1 spreadsheet, further emphasizing the significance of incorporating IEQ assessment alongside energy calculations.

The minimum IEQ level holds significant importance as an input parameter in assessing energy performance, both in terms of calculated and measured energy. Consequently, IEQ must be explicitly mentioned in the EPBD Recast.

- It is essential to always have knowledge of and report IEQ parameters connected with energy, such as thermal comfort, air exchange-carbon dioxide levels, daylighting,

² <https://www.rehva.eu/rehva-journal/chapter/tail-and-predictail-the-tools-for-rating-and-predicting-the-indoor-environmental-quality-in-buildings>



external acoustic levels, and pollution (which is considered for example in energy calculations in France).

- Without comprehensive information of the IEQ aspects, comparability of calculated values becomes challenging, and reliance on measured energy should be approached with caution.

Investigating and reporting IEQ alongside energy performance serves multiple purposes:

- Firstly, it allows for an assessment of whether improved energy efficiency ratings have been achieved at the expense of IEQ deterioration, for example, in buildings lacking cooling systems.
- Furthermore, it provides visibility to exemplary designs that utilize passive solutions and contribute to building climate change resilience.
- Reporting IEQ also helps prevent the risk of post-renovation IEQ deterioration due to factors like decreased air exchange rates or compromised solar factors.
- Lastly, it ensures the appropriate utilization of financial instruments and Minimum Energy Performance Standards (MEPS). It guards against misleading energy savings claims resulting from underheated or overheated buildings, where fictitious energy savings are reported due to a reduced IEQ level.
- **Above all**, in the context of calculating energy requirements for heating, cooling linked to indoor temperatures (as outlined in EN ISO 52016-1), a critical consideration is the need to assess whether improved energy ratings are attained without compromising Indoor Environmental Quality (IEQ). This is particularly pertinent in cases where cooling systems are absent, as it is crucial to ensure that enhancing energy efficiency does not result in a decline in IEQ standards.

In summary, integrating IEQ into energy performance assessments is essential. It not only addresses the potential trade-offs between energy efficiency and IEQ but also showcases sustainable design practices, safeguards against post-renovation IEQ deterioration, and ensures the accuracy of financial instruments and MEPS. By embracing the consideration of IEQ alongside energy performance, holistic and responsible building practices are promoted that prioritize both energy efficiency and occupant well-being.

3.2 CHRONICLE

Energy performance of buildings and indoor environmental quality (IEQ) have significant co-benefits that merit addressing them simultaneously. Improved IEQ directly impacts occupants' health, comfort, and productivity. Parameters such as temperature, humidity, ventilation rates, and air quality play a vital role in creating a healthy and comfortable indoor environment.

Integrating energy performance and IEQ measures can result in long-term cost savings at building operation and renovation phases of existing buildings. By considering these factors together, we can create spaces that prioritize our health, well-being, and environmental sustainability through reductions in GHG emissions. Energy-efficient systems and practices can help to reduce energy consumption and operational costs, while optimized IEQ can potentially decrease healthcare expenses associated with poor indoor air quality. Energy efficiency measures, such as those related to heating, cooling and ventilation, may have direct



influence the comfort and IEQ of housing. Thus, addressing IEQ at a renovation phase is paramount to ensure healthy indoor conditions.

Increased innovation in the field of digitalization and digital monitoring of building performance as well as improved building automation systems will contribute to developing cost effective ways for assessing, monitoring and operating building performance both in energy efficiency as well as IEQ.”

3.3 X-tendo

Although IEQ is essential, it is not yet covered by EPCs. However, there are methods ready to be applied to also assess, document and highlight IEQ in EPCs and thus communicate the co-benefit of IEQ.

Adequate levels of indoor air quality (IAQ), thermal comfort, lighting and acoustics in buildings are among the most important benefits and drivers especially for renovation, as they lead to improved health and comfort of the occupants. However, they are not currently covered by EPCs: this indicator allows to assess the levels of comfort in terms of Indoor Environmental Quality for a given building through reliable and evidence-based inputs.

X-tendo develops an assessment approach for calculation of Asset and Operational comfort rating, that is tested in buildings, and consists of a simplified checklist of systems and materials, measurements of temperature, relative humidity and CO₂-concentrations and survey of occupants' perception on aspects such as thermal comfort, indoor air quality, visual comfort and acoustics.

See <https://x-tendo.eu/toolboxes/comfort/>.

3.4 crossCert

It has less to do with technical arguments, but an argument could be that indoor air quality as an indicator can be connected to the Indicator "Population Living in dwelling with presence of leak, damp and rot".

This indicator refers to the consequences of poor construction practices of dwellings and humid indoor conditions and can also be a consequence of an inability to keep the house adequately warm. Studying these two indicators together may provide a more complete picture of buildings where owners / tenants face energy poverty.

More on this:

https://indicator.energypoverty.eu/modules/custom/epah_inidicator_frontend/pdfs/EPAH_Energy_Poverty_Indicators_Report_20221128.pdf#page=61

Indoor air quality is a subject that has been receiving attention for some time in France:

- The National Commitment to the Environment Act of 12 July 2010 introduced the obligation to periodically monitor indoor air quality in certain establishments open to the public (ERP) where sensitive populations are present or exposed for long periods.
- Following feedback on the implementation of this monitoring since 2018, a review of the regulatory system has been undertaken as part of the 4th National Environmental Health Plan (PNSE 4).
- This revision also considers feedback from the health crisis linked to the SARS-CoV2 pandemic. This health crisis highlighted the importance of implementing an environmental strategy to control air quality in all public buildings. Controlling the rate of air renewal in



premises by measuring CO₂ concentration has become a major challenge, as it helps to dilute and eliminate indoor pollutants, including airborne infectious agents. Furthermore, it has been scientifically established that an increase in CO₂ concentration is associated with a reduction in the cognitive performance of the occupants of the premises.

[Here](#)³ is a link to the article listing the decrees and orders governing indoor air quality in France in buildings open to the public where sensitive populations are present or exposed for long periods.

3.5 U-CERT

U-CERT project had at heart the people, during its implementation activities. As the main takeaway message, having IEQ information in the EPC is relevant for building tenants and owners as it promotes health and well-being, enhances productivity, optimizes energy efficiency, ensures legal compliance, fosters transparency and accountability, and provides market differentiation. By considering IEQ alongside energy performance, tenants and owners can make more informed decisions and contribute to creating healthier and more sustainable built environments.

- **Health and Well-being:** IEQ factors, such as air quality, thermal comfort, lighting, and acoustics, significantly impact the health and well-being of occupants. By including IEQ information in the EPC, tenants and owners gain valuable insights into the indoor conditions of a building. This enables them to make informed decisions regarding the suitability of the space for occupancy and take necessary measures to improve the environment if needed.
- **Productivity and Performance:** Numerous studies have shown that a healthy and comfortable indoor environment has a direct positive impact on occupant productivity, cognitive function, and overall performance. By incorporating IEQ information in the EPC, tenants can identify spaces that promote productivity, while owners can showcase the quality of their buildings, attracting potential tenants and increasing occupancy rates.
- **Energy Efficiency Optimization:** IEQ and energy efficiency are closely interrelated. Including IEQ information in the EPC allows tenants and owners to understand the relationship between energy performance and indoor environment. This knowledge facilitates the optimization of energy consumption while ensuring a healthy and comfortable indoor setting. It encourages the adoption of energy-efficient technologies and practices that contribute to reduced energy bills, lower carbon emissions, and increased sustainability.
- **Legal Compliance:** Many jurisdictions and building standards are increasingly recognizing the importance of IEQ and its impact on occupants. Including IEQ information in the EPC aligns with legal requirements and regulations related to building performance and occupant health. It ensures compliance with existing guidelines, codes, and certifications, promoting responsible building practices and the well-being of occupants.
- **Transparency and Accountability:** Incorporating IEQ information in the EPC enhances transparency and accountability in the real estate market. Tenants gain access to comprehensive data on the indoor environment before committing to a lease,

³ <https://sante.gouv.fr/sante-et-environnement/batiments/article/surveillance-de-la-qualite-de-l-air-interieur-dans-les-etablissements-recevant>



enabling them to make informed decisions. Owners, on the other hand, are motivated to maintain and improve the IEQ of their buildings to attract and retain tenants, thereby promoting responsible building management.

- **Market Differentiation:** In today's competitive real estate market, including IEQ information in the EPC can provide a significant advantage to both tenants and owners. Tenants seeking healthy, comfortable, and productive spaces can easily identify buildings that prioritize IEQ, while owners can differentiate their properties by showcasing their commitment to providing high-quality indoor environments. This differentiation can lead to increased property value, tenant satisfaction, and a positive brand image.

More details can be found in the following deliverables of U-CERT project:

- [D2.3 Report on users' perception on EPC scheme in U-CERT partner countries](#)⁴
- [D2.4 Building performance indicators based on measured data for holistic EPCs](#)⁵
- [D3.2 Proposed set of user-centred and effective overall and partial indicators, including SRI](#)⁶
 - [U-CERT Certificate](#)

Next Generation Energy Performance Certificates cluster

2019



2020



2021



2022



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⁴ <https://u-certproject.eu/proceedings/epcertificates-people/>

⁵ <https://u-certproject.eu/proceedings/indicators/>

⁶ <https://u-certproject.eu/proceedings/u-cert-certificate-calculated-measured-indicators/>

