

REHVA



EPBD Recast & IEQ: Navigating the Future of Indoor Environmental Quality



Policy webinar
Thursday, 26 October
11h00-12h50 CEST



Welcome and Introduction

Jarek Kurnitski

*Chairperson Technology & Research
Committee*

REHVA
 Federation of
European Heating,
Ventilation and
Air Conditioning
Associations



Synopsis recap.

This policy webinar, organised during the **Build Up Portal's month of IEQ** under the leadership of **REHVA**, with the support of **Eurovent Association**, together with eminent IEQ researchers, experts and representatives from **EVIA**, **EPEE** and **GCP Europe**, delves deeply into the multi-faceted world of **building performance** with an emphasis on **Indoor Environmental Quality (IEQ)**. As we navigate through the realm of energy-efficient buildings and improved indoor climate, the lens of IEQ offers insights into not only the health and well-being of occupants but also the broader sustainability goals and energy performance of buildings.

With the ongoing **EPBD Recast Trilogue** signalling adjustments related to IEQ, it becomes imperative for stakeholders to have a comprehensive and updated perspective. These anticipated amendments underscore the **nexus between energy performance assessment and indoor environmental quality**, reaffirming the intertwined nature of building sustainability, occupant health, and energy efficiency.

Programme (indicative timing)

11h00 - 11h10 – **Welcome & Introduction**

by **Jarek Kurnitski**, Chairperson Technology & Research Committee, **REHVA**

11h10 - 11h25 – **Overview of IEQ and its Importance**

by **Pawel Wargocki**, Associate Professor, **DTU**

11h25 - 11h40 – **IEQ-related changes introduced by the EPBD Recast**

by **Claus Händel**, Technical Secretary, **EVIA**

11h40 - 12h40 – **Panel discussion: Transposing and Implementing the EPBD Recast Changes**

Moderated by Jarek Kurnitski, Chairperson Technology & Research Committee, **REHVA**

Programme (indicative timing)

11h40 - 12h40 – Panel discussion: **Transposing and Implementing the EPBD Recast Changes**

Panelists:

Carsten Dittmar, Product Area Director Heating, **Systemair Group**

Claus Händel, Technical Secretary, **EVIA**

Henk Kranenberg, Senior Manager, **Daikin Europe**

Risto Kosonen, Vice-President & Board Member, **REHVA**

Christina von Westernhagen, Chairperson EEE Working Group, **EPEE**

Nathan Wood, Chairperson IEQ Working Group, **GCP Europe**

12h40 - 12h50 – **Concluding Remarks and Way Forward**

by **Risto Kosonen**, Vice-President & Board Member, **REHVA**

Overview of IEQ and its Importance

Pawel Wargocki

Associate Professor



**Technical
University of
Denmark**





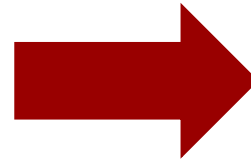
Pawel Wargocki (pawar@dtu.dk)

International Centre for Indoor Environment and Energy

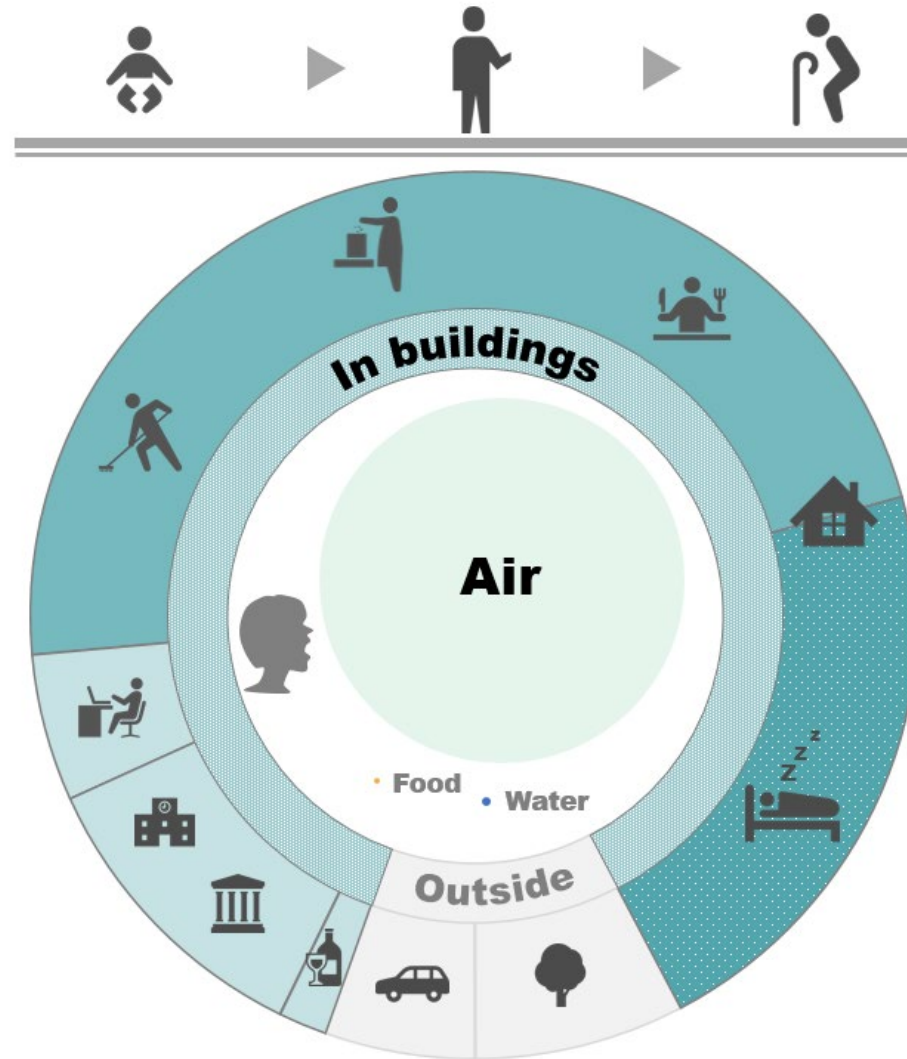
DTU Sustain, Technical University of Denmark

Overview of IEQ and its Importance

Human habitat 2023 and beyond:...



... >85% time is spent in buildings



Source: Klepeis et al. (2011)

We stay only 6 years outdoors....

- 79 years (average life time, male EU)
- 69 years (in buildings)
- 54 years (at home)
- 26 years (sleeping)
- ~4 years (commute)
- 6 years (outdoor air)



Source: Pinterest

Exposures in buildings are dominant....

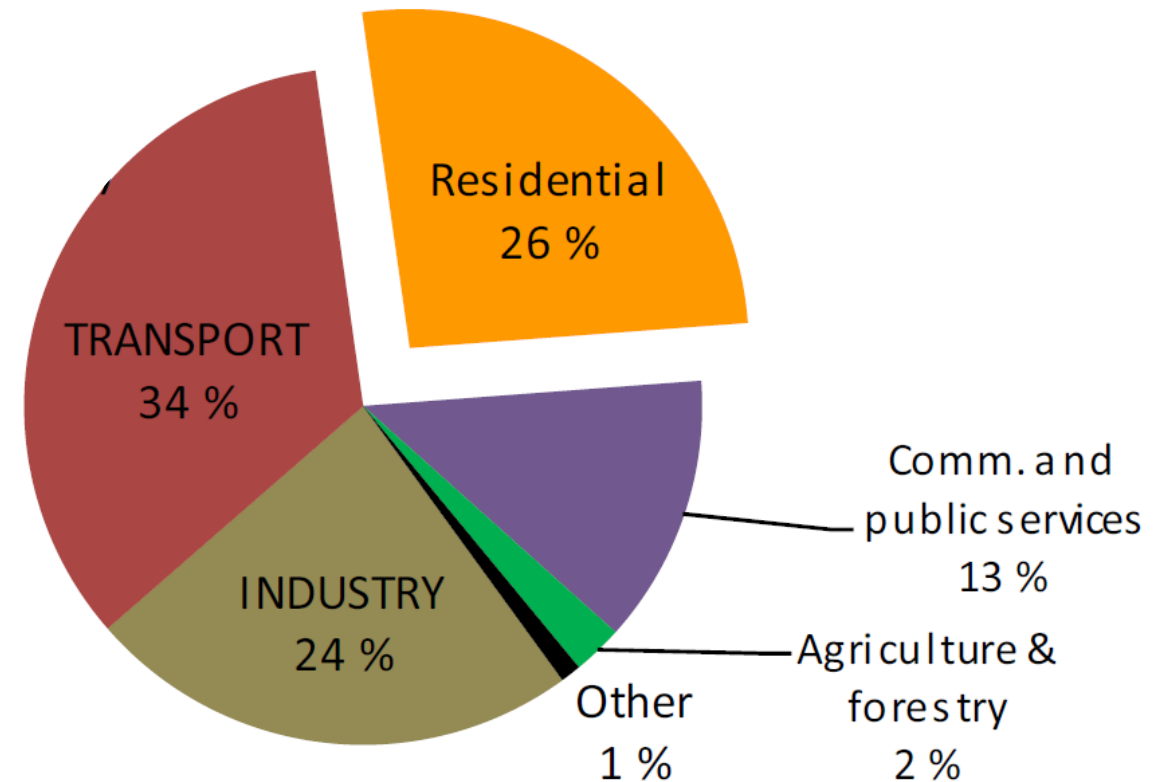
We drink 2-3 L of water a day



We breathe 11,000 L of air a day

Buildings and energy

- Currently 40% of the total energy consumption globally (40% of EU's energy use; 36% of EU's CO₂ emissions)
- Plus the whole-life CO₂



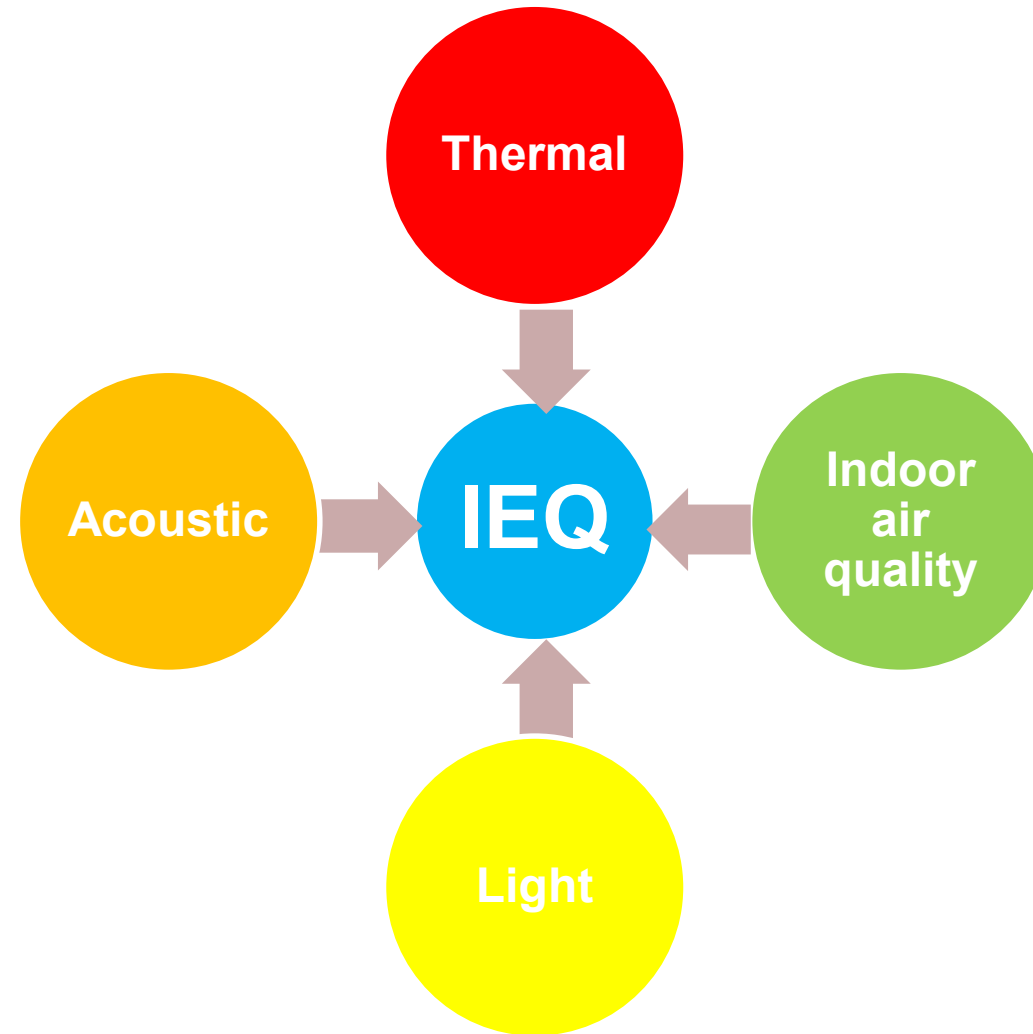
Humans and buildings (energy) must be in focus

- Buildings must be climate neutral by minimizing their carbon footprint when constructed, retrofitted and operated
- Buildings must ensure conditions that do not create the risks for health and promote health and healthy behaviors of their occupants



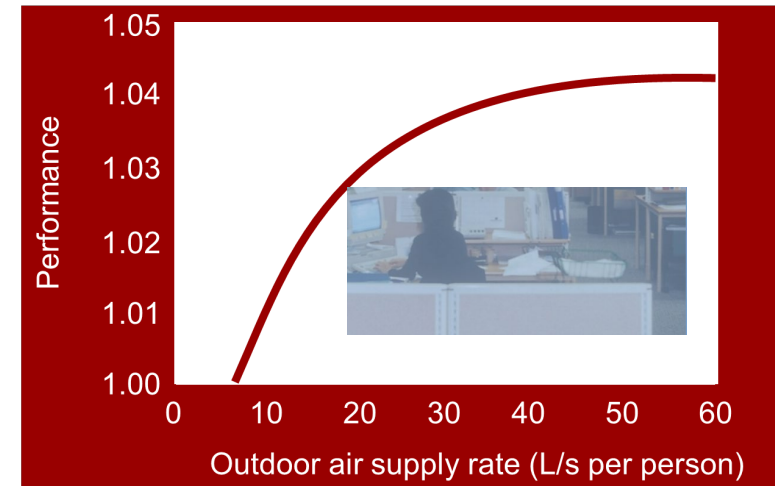
Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs

All major parameters impacting indoor environmental quality (IEQ) are relevant

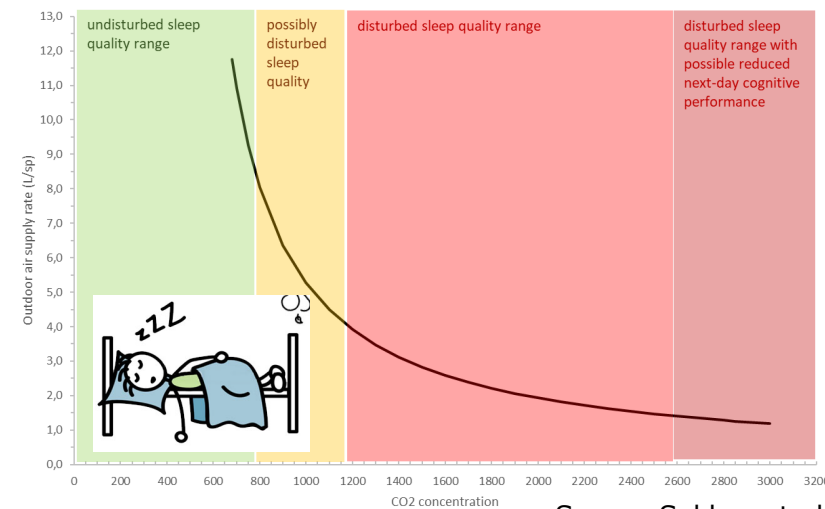


IEQ in buildings affects work, learning and sleep

- Reduced work performance, expected loss is at least up to 5%
- Increased absenteeism and presenteeism
- Reduced learning of children, expected loss of up to 10-15%
- A new data: Disturbed sleep quality, poor sleep quality => reduced health, cognitive performance



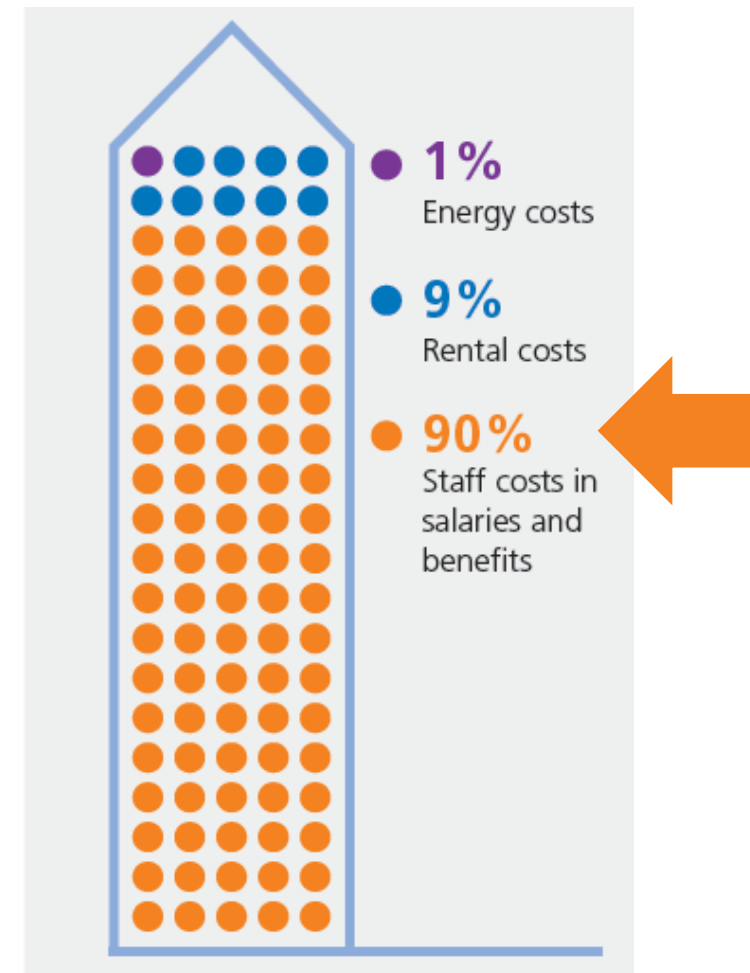
Source: Seppanen et al. (2006)



Source: Sekhar et al. (2020)

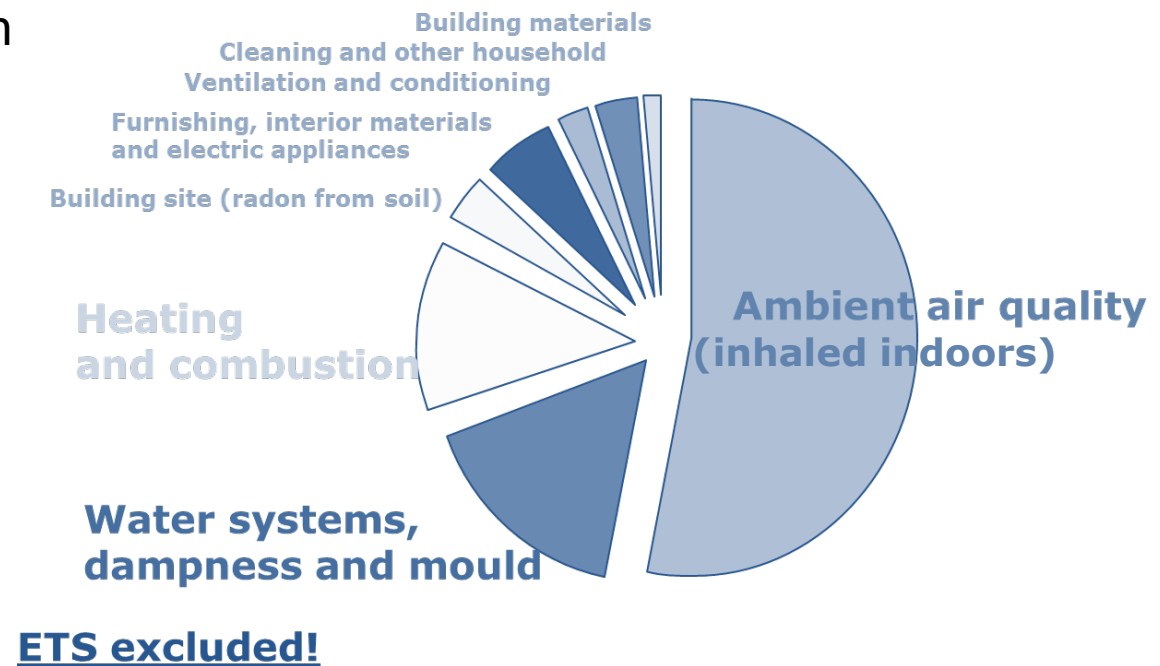
Considerable subsequent economic implications

- Modest gains in work performance can deliver significant financial benefits – even 1% increase in productivity is cost-effective
- Pay-back times are usually <1 (max. 2) years
- Crude estimate: Too short sleep (<7 hours) causes 3.7-6 working days lost per year



Considerable health consequences

- Exposure in buildings estimated in EU to cause >2 mil healthy-life years lost due to poor indoor air quality (IAQ) (ca. €200 billion annually)
- This effects is comparable with, e.g. road traffic injuries, cost similar to GDP of Cyprus
- 200 million in Europe live with allergies, asthma and COPD
- *COVID-19 costs in Denmark were 30,000 healthy life years in Denmark (only) partly attributable to poor IAQ (€1 trillion/mo globally)*

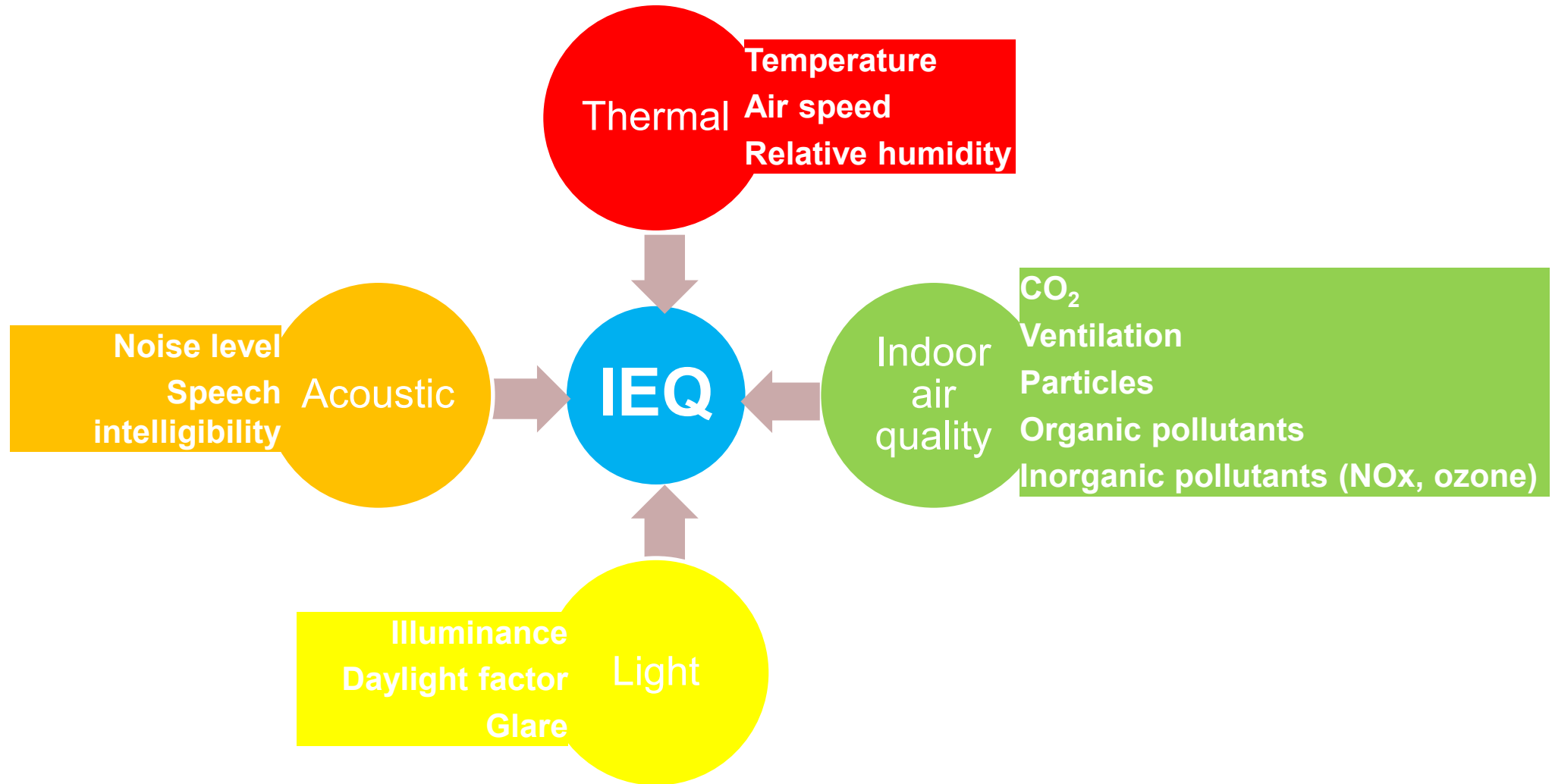


Source: ENVIE (2009)

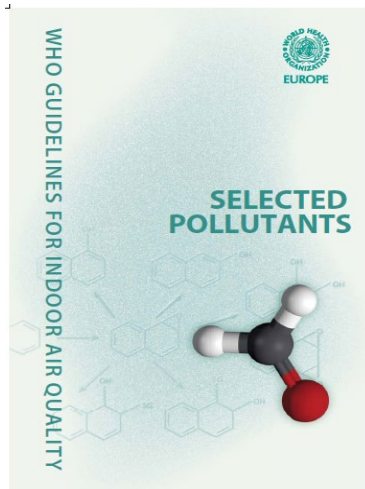
High IEQ is beneficial.

Poor IEQ costs a lot.

IEQ parameters can and SHOULD be measured (examples)



The main unsafe exposures are known....



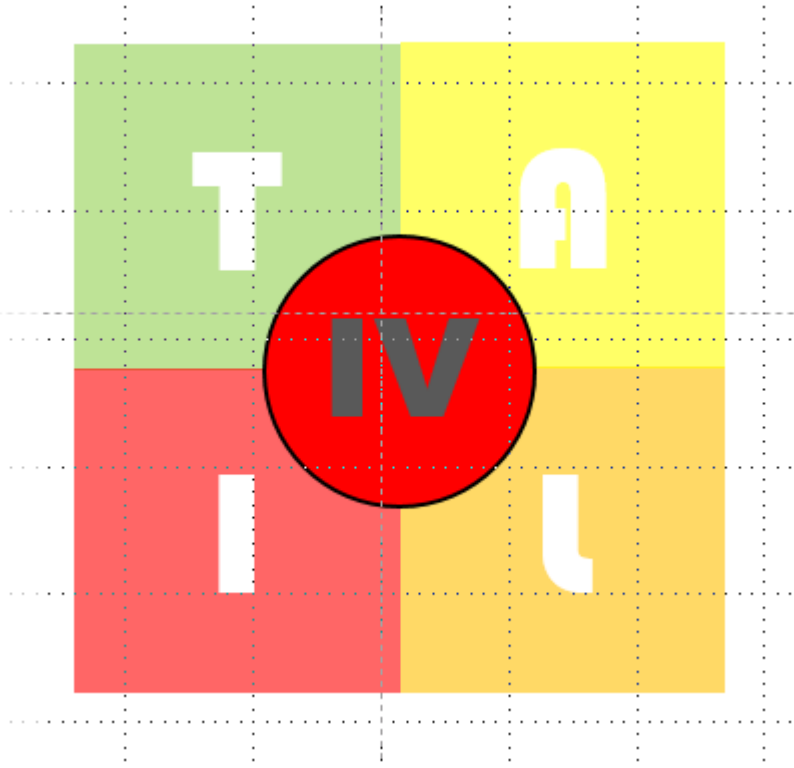
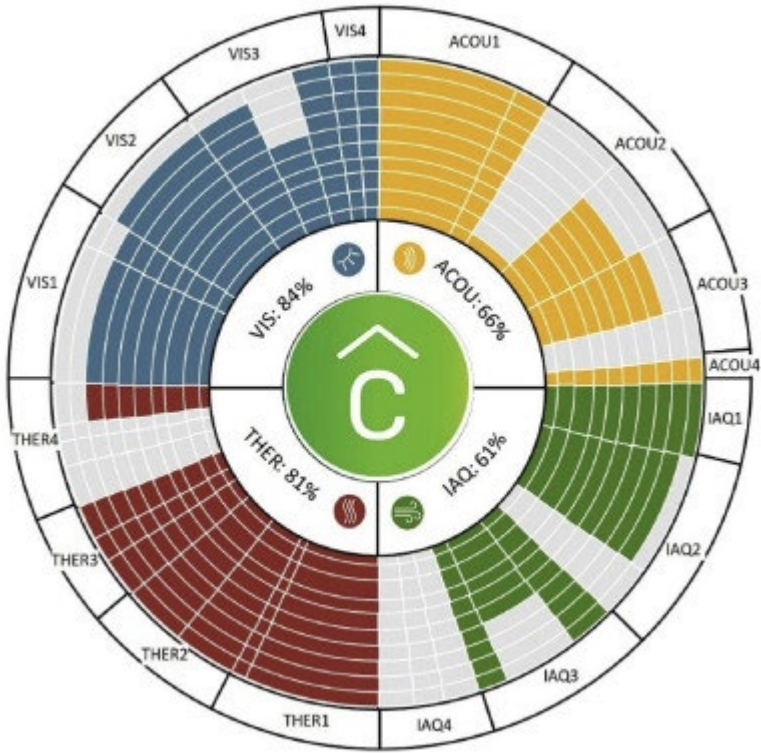
- Carbon monoxide
- Nitrogen dioxide
- Benzene
- Formaldehyde
- Naphthalene
- Trichloroethylene
- Tetrachloroethylene
- Polycyclic aromatic hydrocarbons (PAHs)
- Radon
- PM2.5
- PM10
- Sulphur dioxide
- Ozone
- Infectious agents



IEQ monitoring results in abundant benefits

- Useful data for all building stakeholders and additional incentives for improvement of IEQ
- Create benchmark, reference, building data-base
- Monitor performance – compliance and maintenance
- Input to sustainable investments, and technological advancements
- Input to control and AI
- Input to energy simulation and reduce performance gap
- Input to economic calculations
- Demonstrate invisible - occupants feel secure (no risks)

The way forward, labeling (examples)



Final statement

- IEQ in buildings is crucial part in efforts achieving to secure public health and sustainability.
- Decarbonization of buildings should not compromise IEQ, because consequences can be costly.
- Monitoring IEQ in all buildings should be mandated as a benchmark, to provide information on performance (compliance), to improve and advance methods for IEQ control, and last but not least to inform the public.

IEQ monitoring = prerequisite of sustainable development

**Decarbonization
Energy retrofits**



**Indoor
environmental
quality**

Thank you

IEQ-related changes introduced by the EPBD Recast

Claus Händel

Technical Secretary



IEQ-related changes introduced by the EPBD Recast

Based on Parliament Proposal and some information
gathered during ongoing Trilogue

Claus Händel, Technical Secretary, EVIA



secretariat@evia.eu

Avenue des Arts, 46, 1000 Brussels | Belgium

Some key proposals in EPBD on IEQ

- §1: Set Requirements for IEQ
- § 2: Definitions on IEQ
- § 3: Renovations plans including IEQ
- § 5: including IEQ in minimum requirements
- § 7+8: IEQ in new and existing buildings
- § 10: Including IEQ in Renovation Passport
- § 11: Monitoring and regulation of IEQ
- § 11a: Indoor Environment Quality
- § 16: Implement IEQ in EPC
- § 20: Implement IEQ in inspections

The collage shows various energy performance certificates (EPCs) from different countries:

- Figure 5: Residential EPC, Flandre:** Shows a certificate in Dutch/Flemish with a green energy class.
- Figure 6: Residential EPC, Cyprus:** Shows a certificate in Greek with a green energy class.
- Figure 7: Page 1 of Residential EPC, Portugal:** Shows a certificate in Portuguese with a green energy class.
- ENERGIEAUSWEIS:** Shows a German energy certificate with a green energy class.
- Energy Performance Certificate:** Shows a UK energy certificate with a green energy class.
- Energy Performance Certificate:** Shows an Irish energy certificate with a green energy class.

A large yellow diagonal banner across the collage reads: **Based on the European Parliament amendments**

Some impressions on current known aspects Trilogue

Determination,

- that indoor conditions are outside the scope of the EPBD
- responsibilities over it are a national competence

Focus on indoor conditions (IEQ) instead of indoor air quality (IAQ) and health

- Partial deletion of Article 11a – some aspects might be shifted to Article 11
- Only CO₂ and temperatures remain?

More general provisions in the competence of the member states

Possible deletion of references of IAQ in Article 20 - Inspections

Optional inclusion of extended requirements in the revision clause



Article 1 Subject matter



This Directive promotes the improvement of the energy performance of buildings and the reduction of greenhouse gas emissions from buildings within the Union, with a view to achieving a zero-emission building stock by 2050, taking into account

- the outdoor climatic conditions, the local conditions,
- **the requirements for indoor environmental quality** and
- the contribution of the building stock to demand-side flexibility for the purpose of improving energy system efficiency and cost-effectiveness.

This Directive lays down requirements as regards:

ka) the **indoor environmental quality performance of buildings.**

EPBD Article 2 Definitions and Article 5

57g. 'indoor environmental quality' means a set of parameters relating to a building, including indoor air quality, thermal comfort, lighting, and acoustic affecting the health and wellbeing of its occupants;

57h. 'healthy indoor climate' means the indoor environment of a building, which optimises the health, comfort and well-being of occupants in line with specific performance levels, including those related to daylight, indoor air quality, thermal comfort, in particular heating mitigation, and acoustic quality;

Article 5 Setting of minimum energy performance requirements

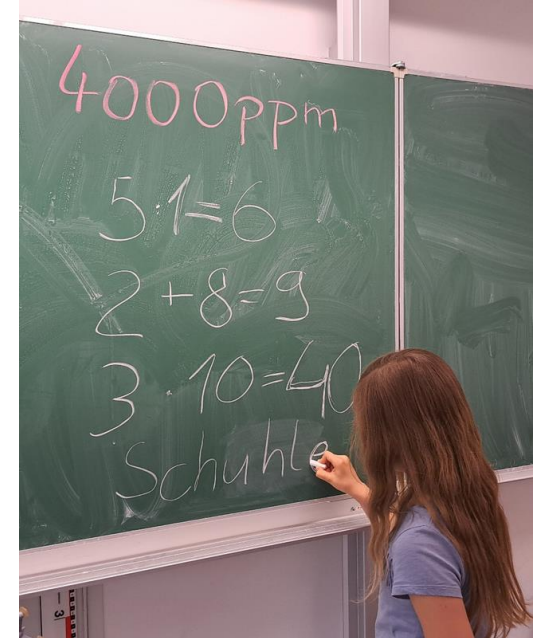
Those requirements shall take account of healthy indoor climate conditions based on optimal indoor environmental quality, as well as local conditions and the designated function and the age of the building

Might stay somehow

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Might stay somehow



EPBD Article 3 National building renovation plan

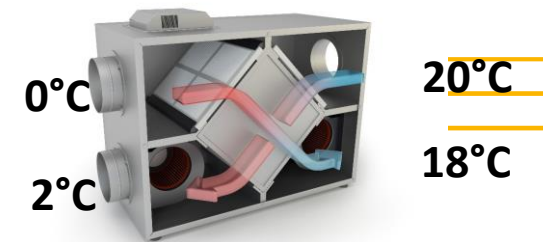
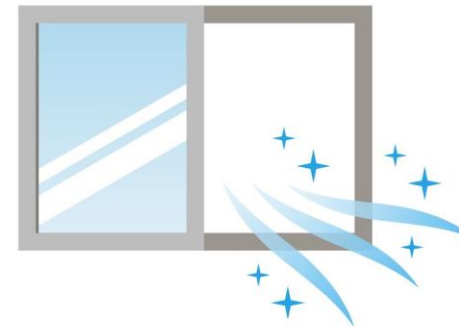
1. Each Member State shall establish a national building renovation plan to ensure the renovation of the national stock of residential and non-residential buildings,

The roadmap referred to in paragraph (b) shall include:

- i) an evidence-based estimate of expected energy savings, GHG emissions reductions, and wider benefits, including indoor environmental quality, which may be based on an integrated district approach;

4. The Commission shall assess the national draft building renovation plans, in particular whether:

- cb) the plan takes into account the objectives of the Directive 2008/91/EC and ensures consistency with relevant legislation and the protection of the environment and human health,



Might stay somehow

Might be deleted

Article 7 New buildings

4. Member States shall ensure...[date of transposition of this Directive] that new buildings have **optimal indoor environmental quality levels, including air quality, thermal comfort**, a high capacity to mitigate and adapt to climate change through,

Might stay somehow

Might be deleted

Article 8 Existing buildings

3. Member States shall ensure... Member States shall address... in relation to buildings undergoing major renovation the implementation of passive heating and cooling elements, **healthy indoor environmental quality standards**, ...

Might stay somehow

Might be deleted



Article 10 Renovation passport

3. The renovation passport shall comply with all the following requirements:

- cc) it shall cover the bill of materials for construction products circularity as well as wider benefits related to health, comfort, indoor environmental quality, safety such as fire, electrical, and seismic safety, and the improved adaptive capacity of the building to climate change, and

Might be deleted

Might stay somehow



Article 11 Technical building systems

3. Member States shall require the installation of measuring and control devices for the **monitoring and regulation of environmental quality** at relevant level and where technically and economically feasible in the following buildings:

- ...

When considering the economic feasibility of an installation, Member States shall also take account of its measurable health benefits.

- Member States **shall ensure that data on indoor environmental quality** and other relevant data collected through measuring and control devices is interoperable with the digital building logbooks pursuant to Article 19(6) and in accordance with Union and national data protection



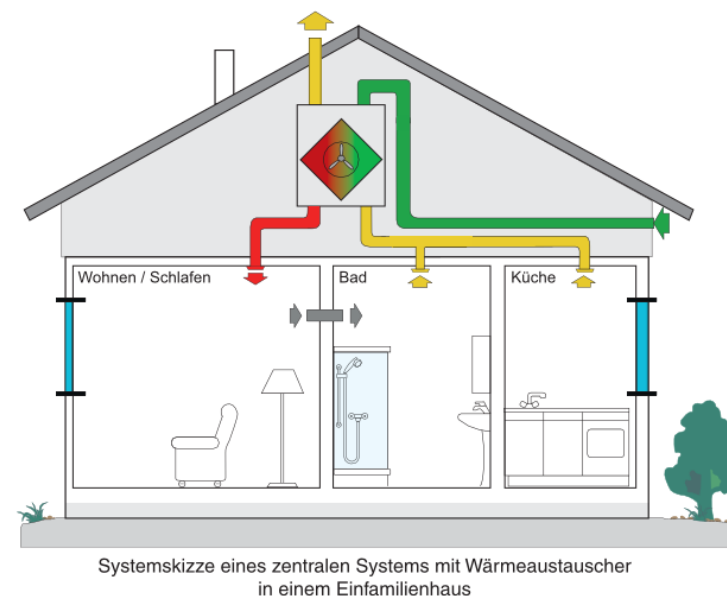
Article 11 Technical building systems

The building automation and control systems shall be capable of:

- (d) effective monitoring of indoor environmental quality, to ensure occupants' health and safety.

4b. Member States shall lay down requirements to ensure that from 1 January 2025, new residential buildings and residential buildings undergoing major renovations with an effective rated output for heating systems [cooling systems] or systems for combined space heating, cooling and ventilation or above 70 kW are equipped with, where technically and economically feasible,

(d) effective indoor environmental quality monitoring system, to ensure occupants' health and safety.



Article 11a Indoor environmental quality

1. Member States shall set requirements for the implementation of adequate indoor environmental quality standards in buildings in order to maintain a healthy indoor climate.

2. By.. [1 November 2023/date of transposition referred to in Article 32], Member States shall set requirements according to measurable indicators based on to those of the LEVELS framework. Indoor environmental quality indicators shall be measured inside the buildings. Indicators shall at least include:

- (a) level of carbon dioxide
- (b) temperature and thermal comfort;
- (c) relative humidity;
- (d) daylight illuminance level or adequate daylight levels;
- (e) ventilation rate in air changes per hour
- (f) acoustic indoor comfort, such as the control of the reverberation time and background noise level and speech intelligibility.

Might stay somehow

Might be deleted

Somehow combined with Article 11



Article 11a Indoor environmental quality

Might be deleted

The following indicators shall be reported based on available data at product level, or direct measurement where available, of the relevant sources in relation to the indoor environment of the building:

- g) particulate matter of emissions of indoor sources
- (h) target pollutant limits from indoor sources, on volatile organic compounds, classified as carcinogenic, mutagenic, or toxic for reproduction according to Regulation (EC) No 1272/2008²¹, including formaldehyde.

3. The Commission is empowered to adopt delegated acts in accordance with Article 29 to supplement this Directive by establishing a methodology and framework for calculating the indoor environmental quality standards.

Somehow combines with Article 11

4. Member States shall ensure that new buildings and buildings undergoing major renovation comply with adequate indoor environmental quality standards.

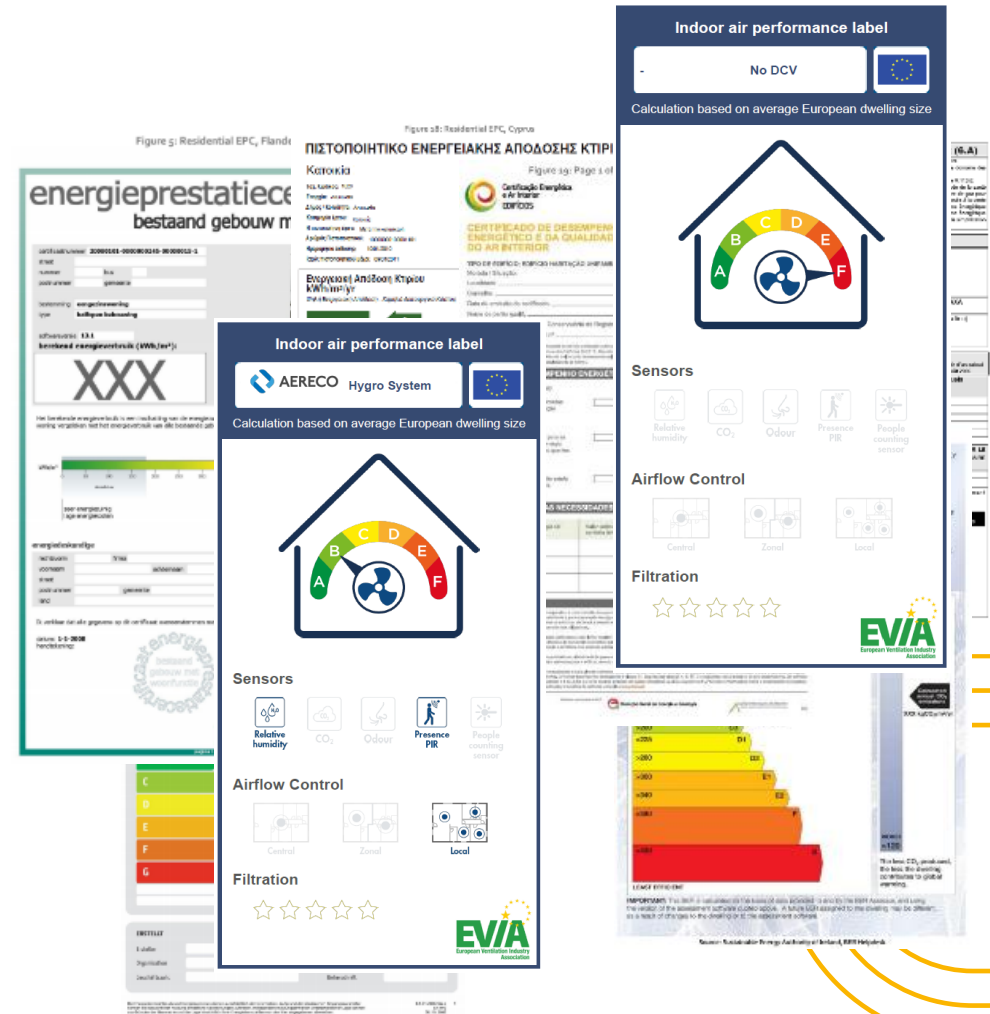
Article 16 Energy performance certificates

4. The energy performance certificate shall include ... **the improvement of indoor environmental quality of a building or building unit**, ... The recommendations included in the energy performance certificate shall cover:

5. The recommendations included in the energy performance certificate shall be technically feasible for the specific building and shall provide an estimate for the energy savings and the reduction of operational greenhouse gas emissions over the expected service life of the building and **the improvement of indoor environmental quality performance indicators**.

Might stay somehow

Might stay somehow



Article 20 Inspections - Article 26 Information

1. Member States shall lay down the necessary measures to establish regular inspections of heating, ventilation and air conditioning systems with an

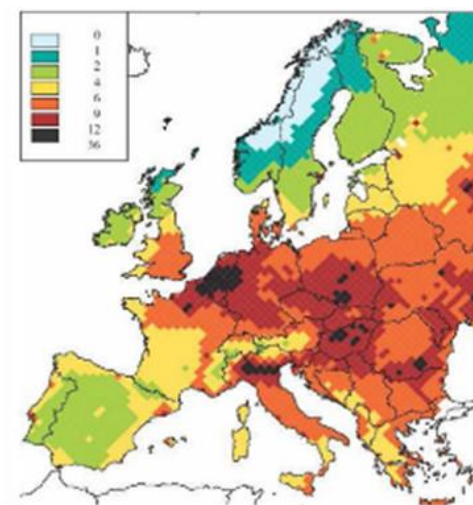
10. Member States shall put in place inspection schemes including ... , indoor environmental quality, and fire safety requirements as laid down in by the building codes or equivalent regulations.

Article 26 Information

3. Member States shall ensure that guidance and training, ... Such guidance and training shall also address ... , the removal of hazardous substances including asbestos, air pollutant emissions (including fine particulate matter), indoor environmental quality and accessibility for persons with disabilities.

Might stay somehow

Unclear or open



Decreased life expectancy in months due to exposure to fine particulate matter in Europe; Annual emissions 2000
For years, the fine dust values in Germany have not declined but merely reflect climatic or annual deviations.



ANNEX I COMMON GENERAL FRAMEWORK FOR THE CALCULATION OF ENERGY PERFORMANCE OF BUILDINGS (referred to in Article 4)

2. The energy needs and energy use for space heating, space cooling, domestic hot water, ventilation, lighting and other technical building systems shall be calculated using hourly or subhourly time calculation intervals in order to account for varying conditions that significantly affect the operation and performance of the system and the indoor conditions, and to optimise costs, health, indoor environmental quality and comfort levels defined by Member States at national or regional level. The calculation shall include an estimation of the thermal responsiveness of the building and its capacity to offer flexibility to the energy grid.

ANNEX V Template for energy performance certificates (referred to in Article 16)

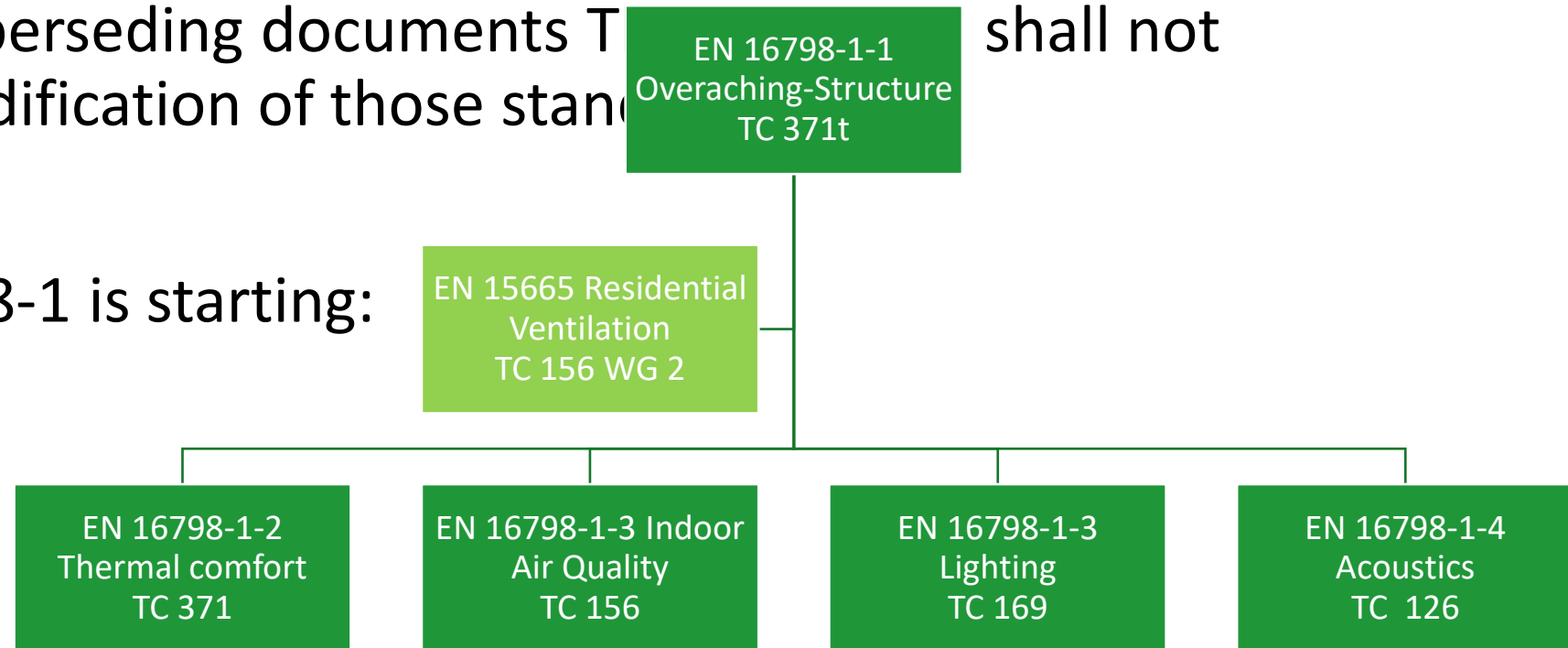
2. In addition, the energy performance certificate shall include the following indicators:

- **(j) the presence of fixed sensors that monitor the levels of indoor environmental quality;**
- **(k) the presence of fixed controls that respond to the levels of indoor environmental quality;**
- **(q) operational fine particulate matter (PM2.5) emissions and performance indicators for the main categories of indoor environmental quality once the relevant provisions apply;**

ANNEX I

Member States shall describe their national calculation methodology based on Annex A of the key European standards on energy performance of buildings , namely EN ISO 52000-1, EN ISO 52003-1, EN ISO 52010-1, EN ISO 52016-1, EN ISO 52018-1, **EN 16798-1**, EN 52120-1 and EN 17423 or superseding documents TC 371 shall not constitute a legal codification of those standards

Revision of EN 16798-1 is starting:

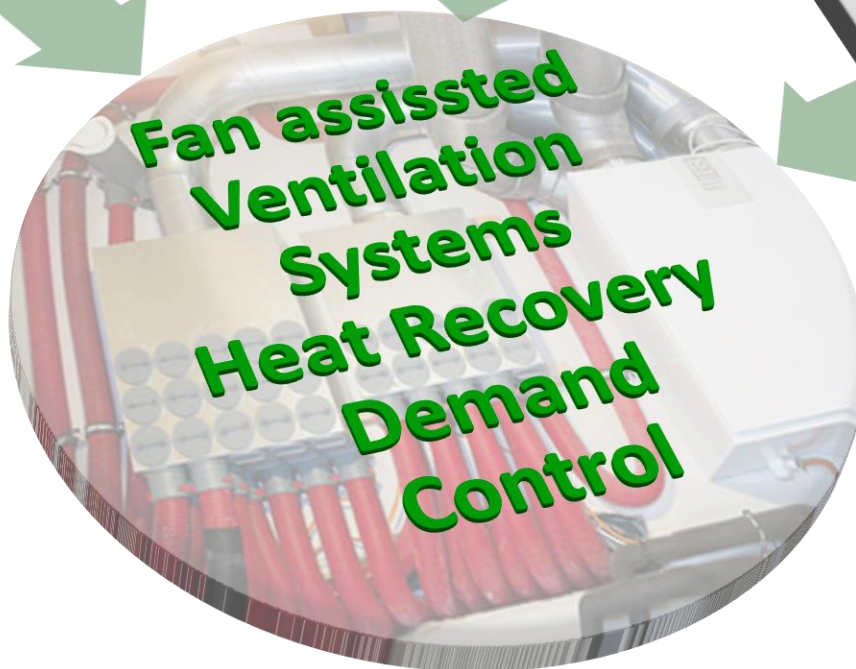
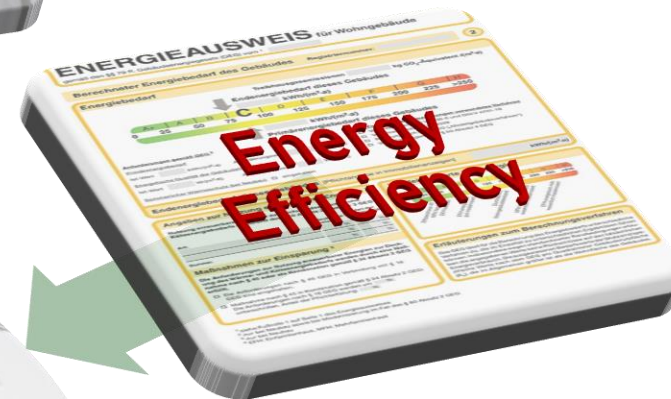


EPBD – Lessons learned

What could we expect in terms of indoor environment quality?

- The European Parliament has always made far-reaching demands in this area.
- These have been regularly trimmed or deleted by the EU's Council (Member States).
- Possible reason:
 - The position of the Parliament is weak here, because
 - Directive competence is in the member states or regions
- Legal basis is Article 194(2)
 - ... Such measures **shall not affect a Member State's right to determine the conditions for exploiting its energy resources**, its choice between different energy sources and the general structure of its energy supply,
- Other, possible legal basis (to be investigated)
 - **Article 191** ... preserving, protecting and improving the quality of the environment, **protecting human health**;
 - **Article 168** ... **high level of human health protection** shall be ensured in the definition and implementation of all Union policies and activities.
 - Others?





Q & A



Panel discussion: **Transposing and Implementing the EPBD Recast Changes**

Moderated by **Jarek Kurnitski**

*Chairperson Technology & Research
Committee*

REHVA
 Federation of
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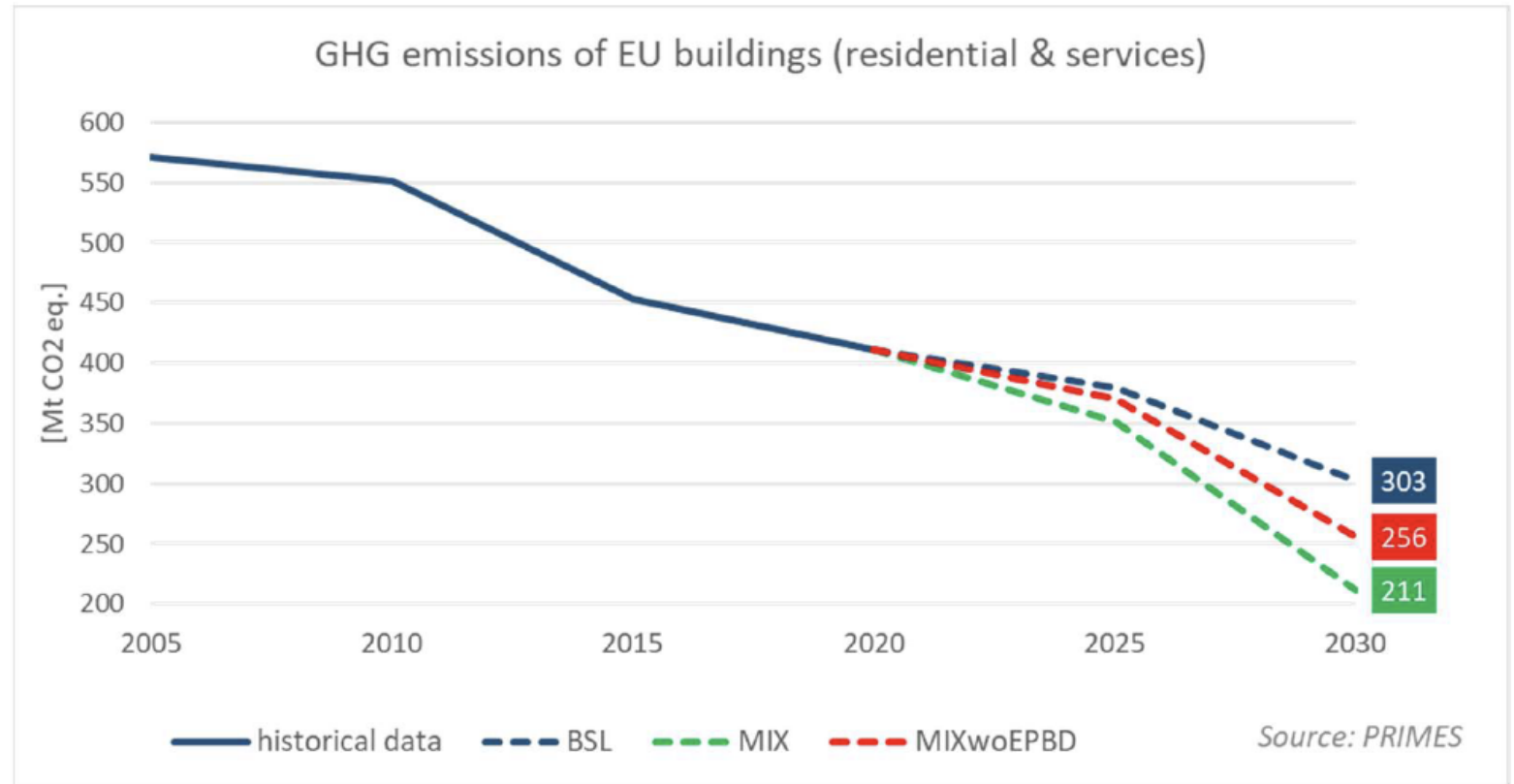
EPBD IEQ Challenge - IEQ in MEPS, deep/major renovation and ZEB

Jarek Kurnitski

REHVA Technology & Research Committee
Tallinn University of Technology, Aalto University

Objectives of the EPBD revision

- **Climate Target Plan** by 2030
 - reduce GHG emissions by 55%
 - integrate 32% RES
 - reduce final energy consumption by 14%
- **Renovation Wave** by 2030
 - renovate 35 million units
 - double and deepen renovation
 - establish minimum standards
 - harmonise EPC classes



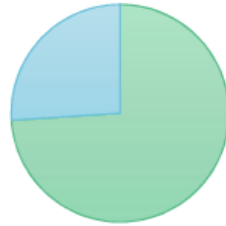
Twofold objective:

Provide a **long-term vision** for buildings and ensure an adequate contribution to achieving climate neutrality in 2050

Set an **enabling framework** for an orderly transition by empowering all levels of action

EU building stock

24 billion m2 floor area,
around **74 % residential**



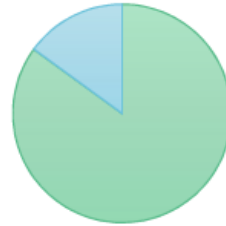
Around **186 million** residential
units are **permanently inhabited**



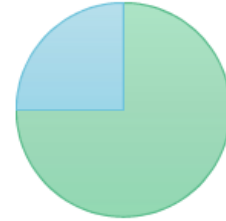
Only **11 %** of existing buildings undergo
some level of **renovation** each year



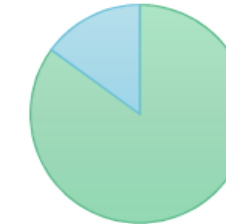
85 % of existing EU dwellings
were **built before 2000**



75 % has **poor energy performance**, of which ...

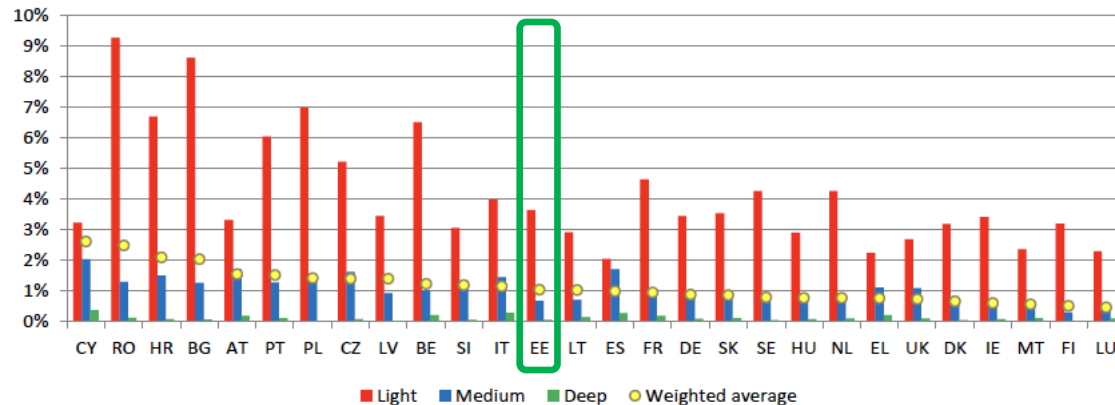


... more than **85 %** will still be in
place in **2050**



RENOVATION WAVE BY 2030: DOUBLE AND DEEPEN RENOVATION

- EU28 deep renovation rate is 0.2-0.3% and the annual weighted energy renovation rate is 1.0-1.2% (res vs. non-res, JRC 2021)
- Apartment building example from Estonia:
 - 22 000 buildings need renovation, from which 17 000 in use in 2050
 - 3 000 renovated, 14 000 to be renovated by 2050
 - Current deep renovation rate 0.8% (200 buildings per year/KredEx grants)
 - Required deep renovation rate 1.9% (467 buildings per year)
 - Deep renovation rate needs to be doubled – not yet covered by financial commitments
- Standard renovation concepts and processes, modular and industrial solutions needed to tackle the workforce and supply chain challenges

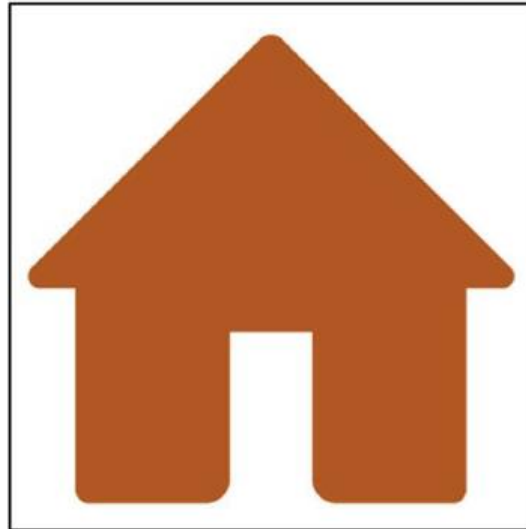


Source: JRC, 2020



A zero emission building stock by 2050

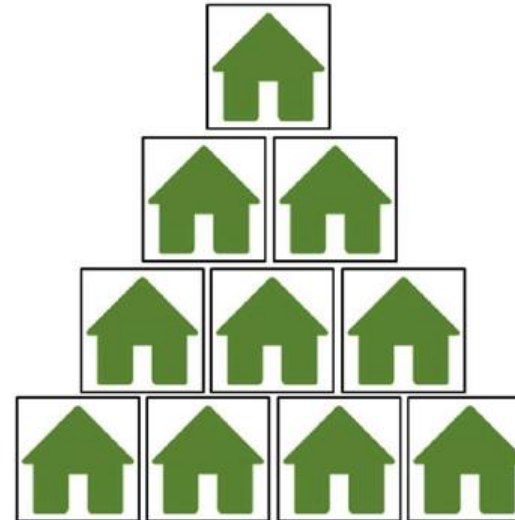
EU avg 2019:
22% of renewables H&C
34% renewable electricity*



G class building



Powered by renewables
zero direct CO2 emissions



ZEB building



EPBD IEQ CHALLENGE

1. Minimum energy performance standards MEPS – how IEQ and ventilation will be addressed in step-by-step renovation?
2. Deep renovation and major renovation – IEQ requirements should push to install new ventilation systems in residential buildings
3. IEQ in Zero-emission buildings – demand controlled, and smart operation needed to execute a new vision to transform EU building stock into zero-emission buildings by 2050

Main changes compared to 2018 EPBD



Panel discussion: **Transposing and Implementing the EPBD Recast Changes (intro)**

Carsten Dittmar

Product Area Director Heating



Panel discussion: **Transposing and Implementing the EPBD Recast Changes (intro)**

Claus Händel

Technical Secretary



Panel discussion: **Transposing and Implementing the EPBD Recast Changes (intro)**

Henk Kranenberg

Senior Manager



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Panel discussion: **Transposing and Implementing the EPBD Recast Changes (intro)**

Christina von Westernhagen

Chairperson EEE Working Group



Healthy Buildings: Delivering improved IAQ

October 26th, 2023

Proven technologies and value-added services contribute to good IAQ.



Ventilation



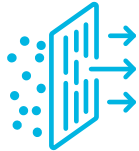
Supply clean outside air as available while displacing dirty air



Humidification and dehumidification



Condition air for proper moisture content



Filtration



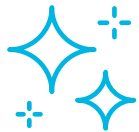
Mechanically remove particles from the air



Pressurization and isolation



Maintain proper building pressurization positive pressure and negative / isolation zones



Disinfection



Ultraviolet light disinfection for surface and air applications



Planned service agreements



Inspect and maintain equipment to continuously meet operation design criteria



Monitoring



Continuous status of system performance, occupancy, IAQ and occupant comfort

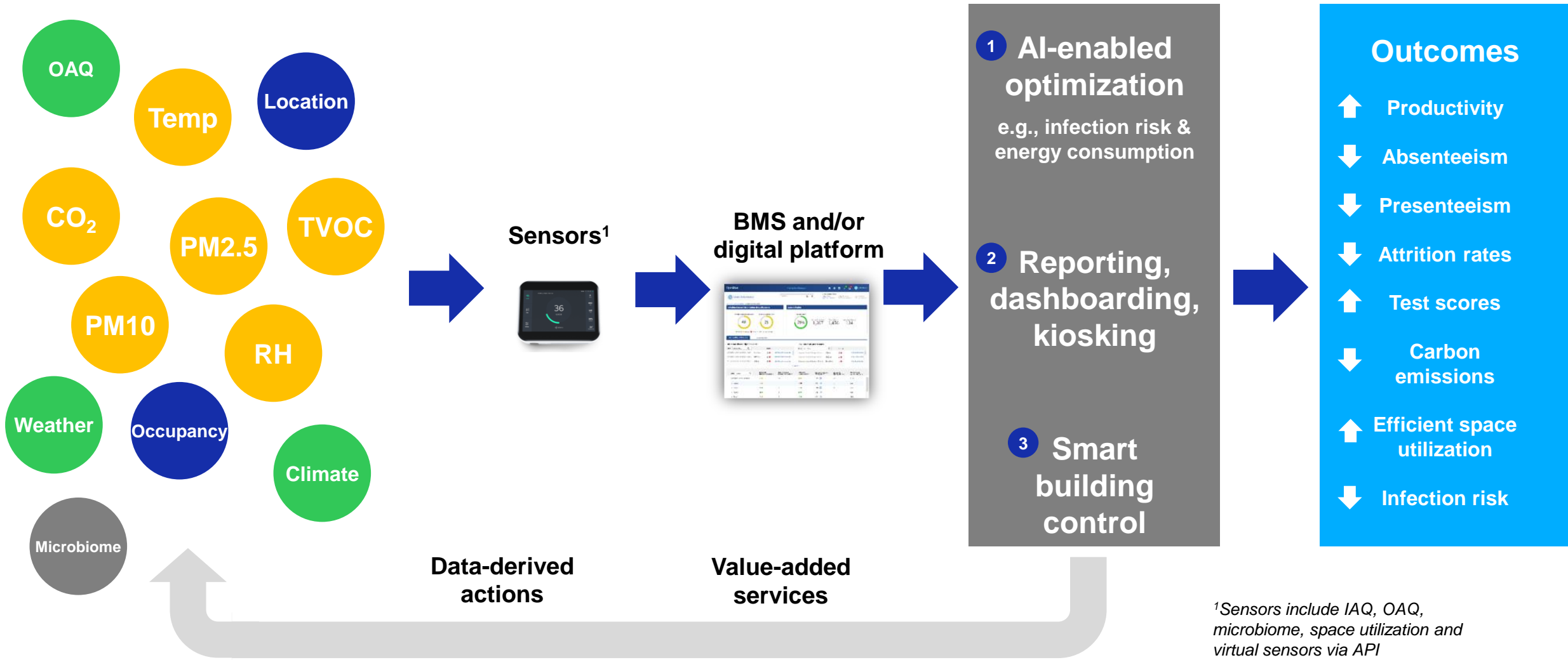


Controls and digital analytics



Control for occupant comfort, wellness and minimize energy consumption – powerful data analytics

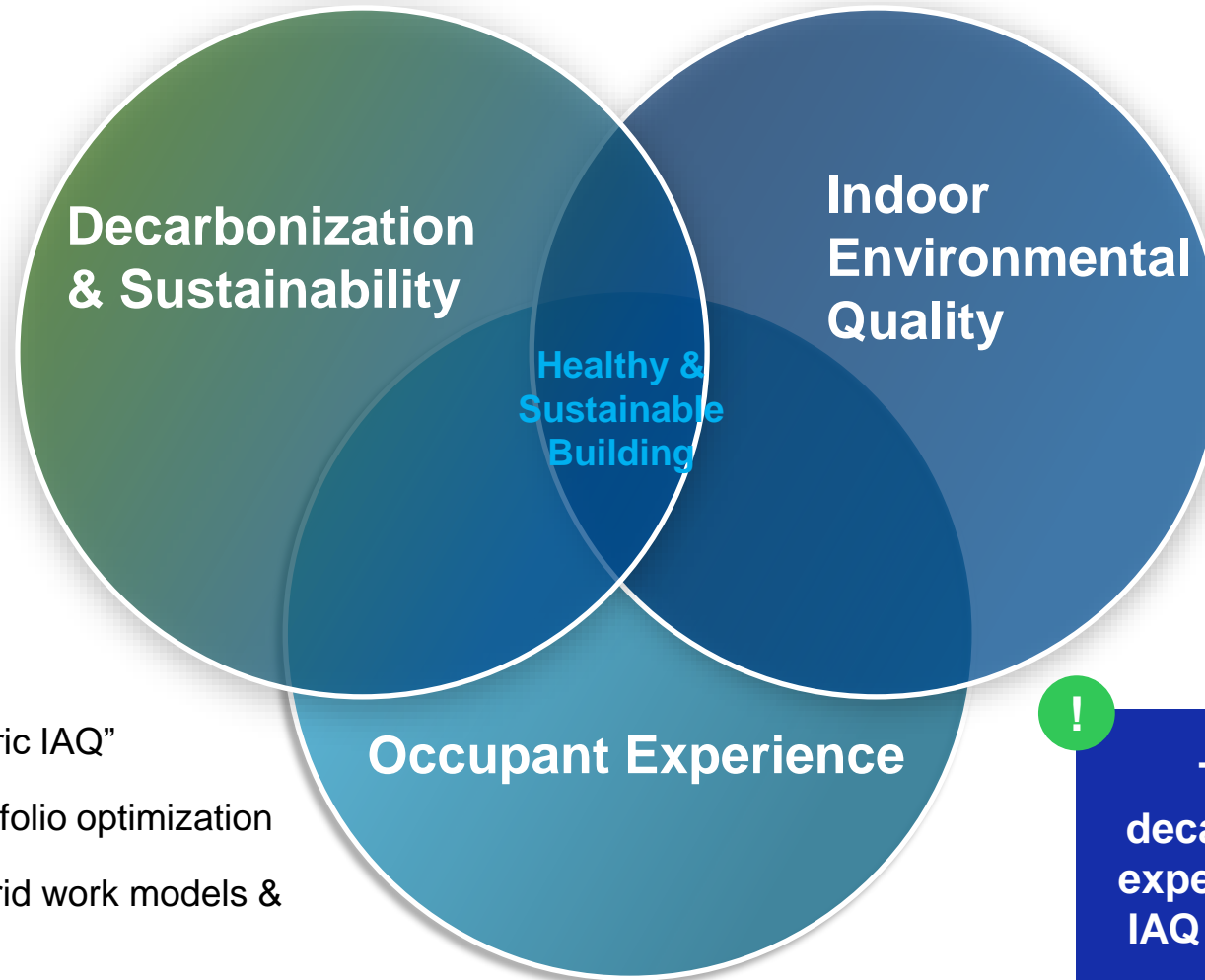
With IAQ, data and controls systems are critical



Healthy Buildings & IAQ were just important during COVID, right?

- Net zero strategies
- Energy-efficient upgrades
- Building electrification
- Heat pump technologies
- Green building certifications
- ESG reporting

- “Occupant-centric IAQ”
- Real estate portfolio optimization
- Support for hybrid work models & hotdesking



- Indoor air quality (IAQ) monitoring & control
- Enhanced ventilation and filtration strategies
- Supplemental disinfection through UVGI
- Infection risk & energy optimization
- Healthy building certifications



The intersection of IAQ, decarbonization, and occupant experience will drive a focus on IAQ improvements for years to come.

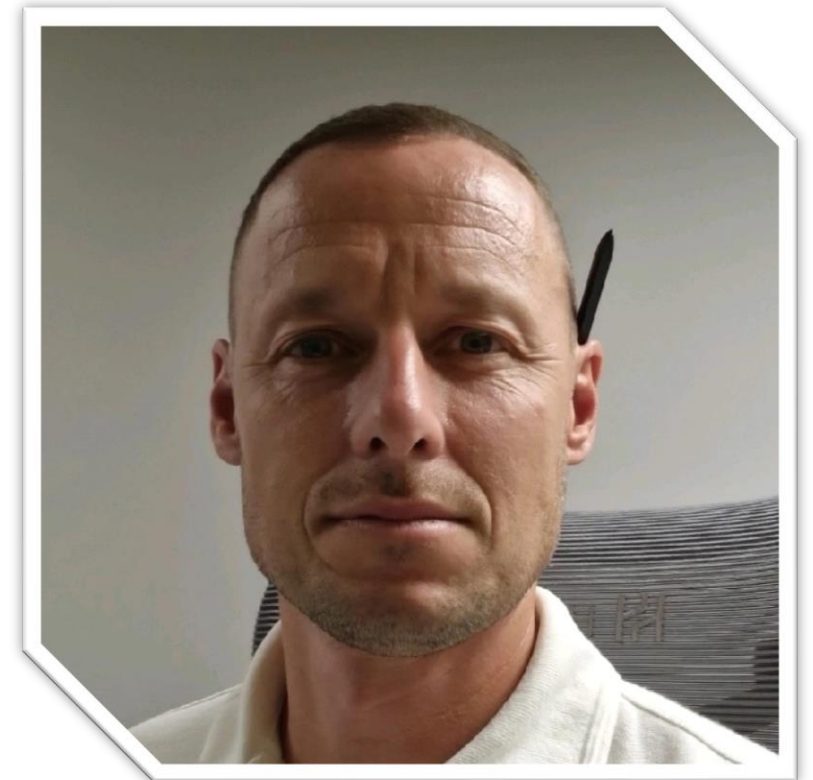
Panel discussion: **Transposing and Implementing the EPBD Recast Changes (intro)**

Nathan Wood

Chairperson IEQ Working

GCP EUROPE

The voice of Efficient building engineering services





#WorldVentil8Day

Nathan Wood

GCP - IEQ Taskforce Chairman

EPBD Recast & IEQ

26th October 2023

GCP EUROPE

#WV8D - Raise awareness of Ventilation



A Beginner's Guide to Indoor Air Quality



Guide to Good Practice For Indoor Air Quality for Health & Well-being Guide



Buildings as Safe Haven's Guide

World Ventil8 Day – 8th November

As a champion of the importance of ventilation in improving our health and wellbeing, BESA are a founding member of World Ventil8 Day.



WorldVentila8Day - Supporters:





AIRAH JOINS PEAK BODIES CALLING FOR GOVERNMENT-ENDORSED VENTILATION GUIDANCE

Tuesday, September 28, 2021

A coalition of nine industry peak bodies has called for the development of credible, government-endorsed, public information regarding the airborne transmission of COVID-19 and the importance of indoor air quality.

A letter addressed to federal Minister for Health and Aged Care, Greg Hunt, has been signed by the Association of Consulting Architects; the Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH); the Air Conditioning & Mechanical Contractors Association of Australia (AMCA Australia); the Chartered Institution of Building Services Engineers (CIBSE Australia & New Zealand); the Facilities Management Association of Australia (FMA); the Green Building Council of Australia (GBCA); the Indoor Air Quality Association Australia (IAQAA); Master Plumbers; and Standards Australia.

Improving Ventilation in Business Venues

Why Should I Ventilate My Venue?

Spaces with **poor ventilation** have been shown to **increase infections by nearly 50%** (1). Improving ventilation in your venue can help to reduce respiratory infections.

Infections This will keep your customers safe and has been shown to **reduce staff sick leave by 30%** (2).

Sick Leave **50%** **35%**

Short Term Improvements to Ventilation

Worried about keeping customers warm?

Open high level windows
The cold fresh air will mix with the warmer room air before reaching people. So, you and your customers won't feel cold.

Even just a small amount
Small air flow openings work well in winter. Cracking a window is better than nothing.

No opening windows?
If you only have larger openings, like your front door, use these for short periods of time to replace stale air with fresh air.

Make a ventilation plan
Ensure you have a clear plan for when you will replace the air and who is responsible.

Medium Term Improvements to Ventilation

Worried about energy costs?



Indoor Air Quality Guide

Best Practices for Design, Construction, and Commissioning



American Society of Heating, Refrigerating and Air-Conditioning Engineers
The American Institute of Air Conditioning Engineers
Sheet Metal and Air Conditioning Contractors' National Association
U.S. Green Building Council
U.S. Green Building



Ventilation Information Paper n° 43

July 2021

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International Energy Agency's
Energy in Buildings and Communities
Programme



Air Infiltration and Ventilation Centre

Residential ventilation and health

Marie Coggins, School of Physics, National University of Ireland Galway
Simon Jones, Aercon, Ireland

1 Context
AIVC Technical Note 68 (TN 68) Residential Ventilation and Health is one of the outcomes of the work performed under the framework of AIVC's project 'Ventilation & Health' and benefited from contributions by several authors and many practical discussions held during specific sessions at AIVC events. TN 68 summarises studies that prioritise pollutants in the indoor environment and presented a summary of pollutants driving the indoor health risks and their sources. The document also described methods to reduce exposure of occupants using different control strategies with a special emphasis on the role of ventilation.

2 Summary
The document starts with an overview of pollutants in domestic dwellings that have been measured, prioritises pollutants for mitigation in the indoor environment and identifies potential health outcomes. Furthermore, it describes control strategies to reduce health effects from these and other pollutants, including different strategies to reduce exposure and the role of ventilation. The last part of the document lists the research needs.

NOTES
1 Throughout the text reference is made to the literature used for the development of TN 68 (quoted as '99'). These citations are listed only in the reference section of TN 68. The reference list at the end of this document includes only new references used for the purpose of this summary.
2 Clicking on the book icon displayed next to each numbered chapter redirects and opens the corresponding chapter within AIVC TN 68.

3 Pollutants that have been measured in domestic dwellings
Hundreds of pollutants have been measured in domestic dwellings, and it is estimated that exposure to indoor air pollutants at home can constitute 60 – 90% of our total lifetime exposure. Both short term and long-term exposure to indoor pollutants has been implicated in the development of both acute and chronic human health effects such as asthma or allergic symptoms and respiratory and cardiovascular disease. Indoor air pollutants, chemical and biological, have both indoor and outdoor sources. Table 1 lists some of the pollutants measured indoors and shows the source of their origin, and their presence indoors and/or out.



Tackling indoor and outdoor air pollution for a healthier future



The Clean Air Programme is proactively tackling the air quality challenges facing us all today



Success in the "II Conference on Air Efficiency and Quality" of the CLUSTER IAQ and GNI in Madrid

Proposed modifications and guidelines for implementation of Article 11a 'Indoor environmental quality' in EPBD draft

REHVA
3E
Federation of European Heating, Ventilation and Air Conditioning Associations

EUROVENT
EUROPEAN INDUSTRY ASSOCIATION

NVG
NORDIC VENTILATION GROUP



HOUSEHOLD AIR POLLUTION

Over 3.2 million people
a year die prematurely from household air pollution (2019).
Household air pollution is mostly created by using kerosene and solid fuels such as wood with polluting stoves, open fires and lamps.

Women and children are the most at risk.

- 23%** from stroke
- 32%** from ischaemic heart disease
- 19%** from chronic obstructive pulmonary disease (COPD)
- 6%** from lung cancer
- 21%** are due to lower respiratory infections

HEALTH #AirPollution World Health Organization

Did you know...

Ventilation reduces sickness absence

A study from California showed a significant association between higher ventilation rates and lower sickness absence in schools. So, improve your ventilation and increase attendance.

www.worldventil8day.com

8th November
World Ventil8 Day

FIND TIME TO TAKE THE CLEAN AIR (HUMAN RIGHTS) BILL THROUGH THE HOUSE OF COMMONS



Petitions

UK Government and Parliament

Petition

Find time to take the Clean Air (Human Rights) Bill through the House of Commons

This Bill has been agreed by the House of Lords with cross-party support and we want the Government to find time to take it through the House of Commons, so that it can become law: <https://bills.parliament.uk/bills/3161>

[More details](#)

[Sign this petition](#)

11,274 signatures

[Show on a map](#)

100,000

info@worldventil8day.com

Please do get in touch if you have questions, media queries, want to get involved, share a resource or an event.

info@worldventil8day.com

Follow us on social media



GCP EUROPE

Panel discussion: **Transposing and Implementing the EPBD Recast Changes**



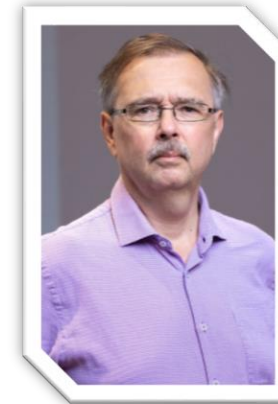
**Carsten
Dittmar**



**Claus
Händel**



**Henk
Kranenberg**



**Risto
Kosonen**



**Christina
Von
Westernhagen**



**Nathan
Wood**

Concluding Remarks and Way Forward

Risto Kosonen

Vice-President & Board Member

REHVA
3E Federation of
European Heating,
Ventilation and
Air Conditioning
Associations





EBPD Recast & IEQ: Navigating the future of Indoor Environment Quality

Policy webinar on 26th of October

Risto Kosonen

Conclusion Remarks in presentations

- IEQ affect work, learning and sleep: high IEQ is beneficial and poor IEQ costs a lot
 - Modest gains in work performance can deliver significant financial benefits
 - Poor Indoor Climate has considerable health consequences
- Demand to monitor IEQ to guarantee to indoor conditions
- Energy saving should not sacrifice IEQ
- Labelling scheme for IEQ is necessary

Concluding Remarks in presentations

- Existing buildings stock and demand for deep renovation
- IEQ-related changes in EBPD recast are still under discussion and significant changes for the draft is expected
- Revision work of existing standards

Concluding Remarks in panel discussion

- Existing building has poor performance-> deep renovation
- Quality control of product and systems in market should be emphasised
- Energy demand could drive poor indoor climate if we do utilize previous learnings of the meaning of the ventilation
- Many proven technologies and value-added service are available but are they well-known
- Different demand different building type (residential and hospital buildings)
- Finally, we want create great occupant experience

Concluding Remarks in panel discussion

- Requirement of commission through the whole life-cycle: lot of challenges in DBV systems in practice
- Utilization data and artificial intelligence -> data driven buildings
- Link to smart energy systems: demand response requires certain adaptation of indoor climate conditions
- Link to envelope: more airtight envelope and typical balancing accuracy of airflow rates creates significant pressure difference over envelope
- Pay-back time of retrofitting of ventilation system is long
- Deep renovation needed: do we have trained staff to conduct retrofitting ?

Join us on November 14th at the REHVA Brussels Summit's Policy Conference! [Register now!](#)



POLICY CONFERENCE

14 November 2023
09:00 - 17:00
Thon Hotel Bristol Stephanie, Avenue Louise 91, 1050 Brussels

Indoor Environmental Quality, Digitalisation and Skills in the Decarbonisation of Buildings

AGENDA

8:30 - 09:00	<i>Welcome coffee and registration</i>
09:00 - 09:10	Welcome and opening Cătălin Lungu, President, REHVA
SESSION 1 The EPBD refresh: IEQ and Skills in the Digital Age	
The Commission perspective Silvia Rezessy, Policy Officer, Unit B3, Buildings and Products, DG ENER	
The Council perspective Representative TBC	
09:10 - 10:30	REHVA's Views: Technical Guidance to Successful Trilogue Jarek Kurnitski, Chairperson, Technology & Research Committee, REHVA
Q&A	
10:30 - 11:00	<i>Coffee break</i>
SESSION 2 Reshaping Education & Training: Navigating IEQ & Digitalisation	
The BUILD UP Skills Initiative Amandine De Coster-Lacourt, Project Adviser, Unit D1, CINEA	
Redefining Renovation: REHVA's Push for IEQ & Digitalisation Proficiency Livio Mazzarella, Vice-President, REHVA	
11:00 - 12:15	EBC's Vision on Reshaping Renovation Skills for a Digital-IEQ Shift Spyros Mathioudakis, Policy Officer, European Builders Confederation
The Brains4Buildings Dutch Initiative: Data-driven learning communities Laure Itard, Project coordinator, Brains4Buildings project	
Q&A	
<i>Agenda continues on the following page</i>	

14 November 2023
09:00 - 17:00
Thon Hotel Bristol Stephanie, Avenue Louise 91, 1050 Brussels

Indoor Environmental Quality, Digitalisation and Skills in the Decarbonisation of Buildings

AGENDA

Smart Readiness Indicator (SRI) Observatory "launch before lunch"
An initiative of Smart Square



Smart Square project is funded by the European Union, under the Grant Agreement N° 101077241. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.



12:15 - 12:45	The Smart Readiness Indicator state of play Sylvain Robert, Project Adviser, Unit D1, CINEA
12:45 - 13:30	<i>Networking lunch</i>
SESSION 3 Funding the Future: Decarbonisation & IEQ Meets Digital and the Skills Shortfall	
EHI's Role in Fuelling Skills for the Digital Decarbonised-IEQ Age Federica Sabbati, Secretary General, European Heating Industry	
13:30 - 14:10	Creating a marketplace for building performance improvements Csaba de Csiky, Chairman, EnerSave Capital, Founding Member SEFA
Q&A	
Expert Insight: Funding the Leap to Decarbonised, Healthy & Digital Buildings Moderator: Johann Zirngibl, Vice-President, REHVA	
Panelists (short statements & discussion) Ilari Aho, Vice-President Sustainability & Regulatory Affairs, Uponor (EHI/WGBC) Mikael Börjesson, Director Competence, Sustainability and External relations, Swegon (Eurovent Association/Eurovent Certita Certification) Julie Kjestrup, Head Policy & Thought Leadership, Velux (EuroACE) Risto Kosonen, Vice-President, REHVA Henrik Kranenberg, Senior Manager, Daikin Europe (EPEE, EHPA, Eurovent Association)	
14:10 - 14:55	
14:55 - 15:00	Closing remarks Cătălin Lungu, President, REHVA
15:00 - 15:30	<i>Coffee break</i>
<i>Agenda continues on the following page</i>	

REHVA



EPBD Recast & IEQ: Navigating the Future of Indoor Environmental Quality



Policy webinar
Thursday, 26 October
11h00-12h50 CEST



EPEE



GCP EUROPE
The voice of efficient building engineering services