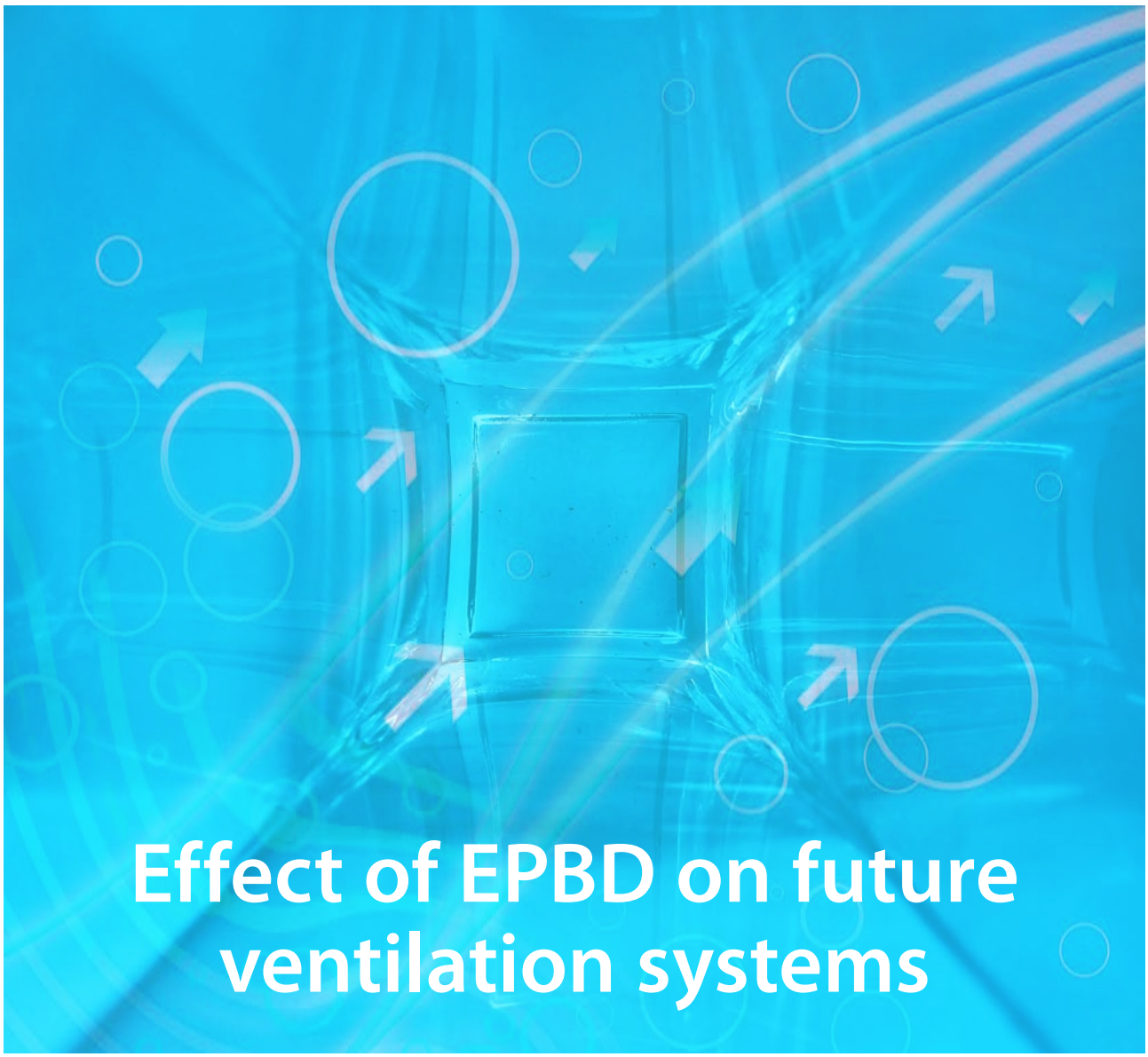

Effect of EPBD on future ventilation systems

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Introduction

In 2010, the EU adopted recast of the Directive on Energy Performance of Buildings (EPBD) (EC, 2010). This directive is a recast of an original EPBD directive from 2002 (EC, 2002). Among others, it sets more stringent requirements for insulation properties of building envelopes and requires that all new buildings in the EU to be nearly zero energy by 2020 (EC, 2011). Member States must transpose the directive into national regulations by July 2012.

The directive itself is not descriptive and does not provide any suggestions how to achieve the adopted stringent energy goals. A very worrying scenario is that in order to limit overall building energy consumption, ventilation rates will be reduced to reduce energy use. However, at the same time a considerable amount of evidence links low building ventilation rates with health and comfort problems in building occupants. The implementation of the EPBD recast should not cause a reduction of ventilation rates and consequentially related health and comfort problems for building occupants.

In order to get better understanding on how the latest modifications of the EU legislation on energy use in buildings are expected to affect ventilation practice and indoor air quality information was collected from

a group of experts on ventilation in several European countries.

Questionnaire was focused on how the EPBD recast will influence indoor air quality in buildings and use of ventilation technologies to cope with the stricter goals. The questionnaire comprised of 11 questions with multiple choices for responses.

Results

Data from 17 countries (Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, The Netherlands, Norway, Portugal, Romania, Slovakia, Slovenia, United Kingdom) was received covering geographically all parts of the Europe. The charts presented below provide a review of answers which were provided on the received questionnaires. The reference year for the data is 2011. The question which was presented to the respondents is printed on the top of each pie cart which summarised the responses. The numbers inside the each section of pie chart indicate the national responses in numbers and percentage from the total.

Slightly more than half of the respondents answered that they expect IAQ will increase due to EPBD recast problems to increase (**Question 1**). Some countries suggest that problems will decrease due to the more use of ventilation, which will be required to fulfil EPBD requirements, and because more buildings are expected be better ventilated due to increase in need for heat recovery systems and increase of hybrid ventilation systems over natural ventilation.

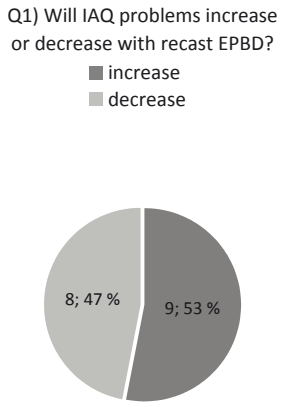
Majority national experts expect that regulations on ventilation will be revised (**Question 2**). Most of those who do not expect regulations to be revised have already revised regulations in the past couple of years. Dates of existing regulations and expected regulations for countries which provided answers are:

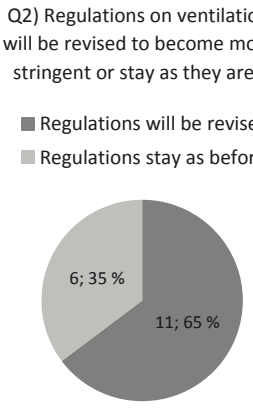
- Czech Republic: were revised 2007 for working environment and 2011 for dwellings
- Denmark: will be revised in 2012
- Finland: were revised 2010, in force 2011
- Germany: will stay as today from 2009
- Hungary: will be revised in the end of 2011
- Netherlands: will stay as today from 2003
- Norway: will stay as today from 2007
- Portugal: will be revised in 2012
- Romania: will be revised after new CEN standards are validated
- UK: will stay as today from 2010 until next revisions in 2013/16

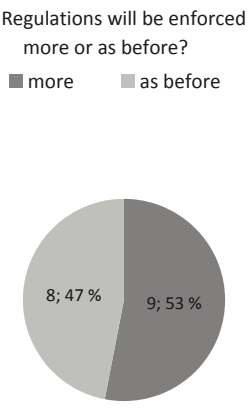
Slightly less than half of the respondents think that regulations will be enforced more and slightly less than half think that they will be enforced less (**Question 3**). None has thinks that regulations will be enforced as before.

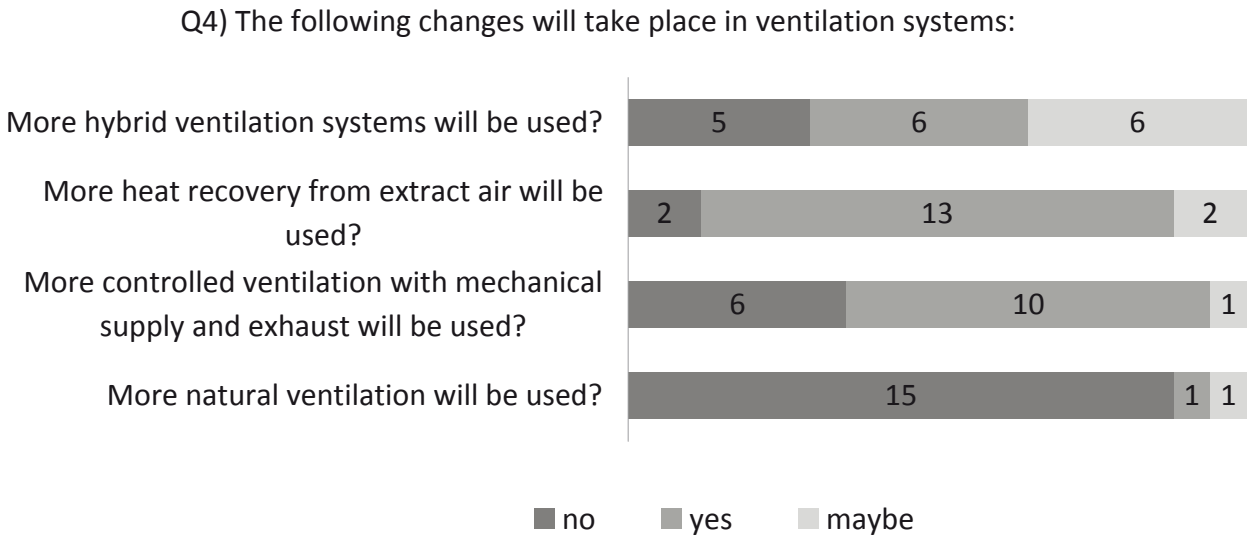
The most conclusive answer in the whole questionnaire (**Question 4**) is regarding the use of natural ventilation, which will most probably decrease in the future. The second most convincing answer was regarding the use of heat recovery where only two southern European countries answered that they do not expect that more of it will be used. Such answers are expected as both countries have hot climate with little demand for heating. Answers regarding controlled ventilation and hybrid ventilation systems are not conclusive. The question on use of controlled ventilation with mechanical supply and exhaust may indicate that more of it will be used in the future.

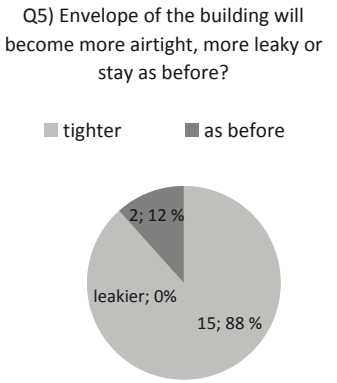
Vast majority agrees that requirements on envelopes of building will get tighter (**Question 5**). Only two countries expect that tightness will stay as before (those coun-

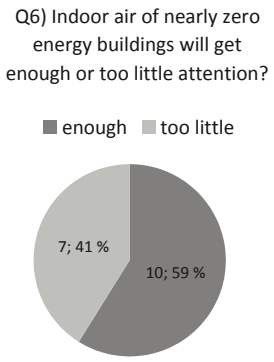


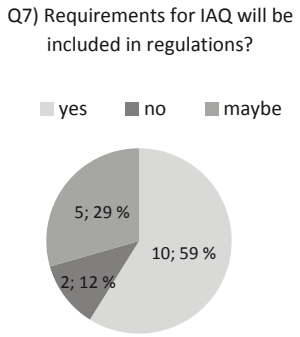


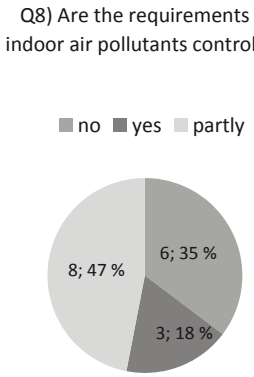


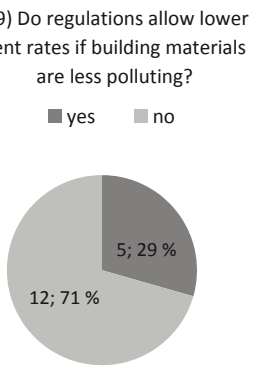












tries have already stringent requirements for airtightness).

Majority of respondents considered that indoor air of nearly zero energy buildings will get enough attention (**Question 6**).

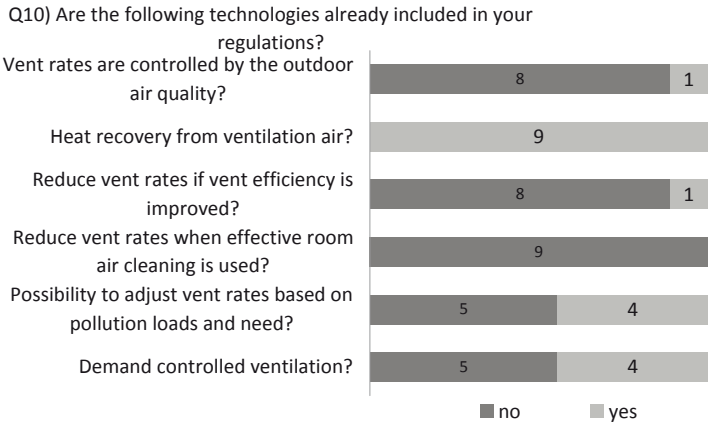
The majority of ca. 60% thinks that IAQ will be included in ventilation regulations (**Question 7**). Additional 30% think that IAQ requirements may be included in their regulations in the future. Only ca. 10% of respondents think that IAQ requirements will not be included in the regulation. It is important to note, that the same respondents also expect that IAQ related problems will increase, IAQ of nearly zero building will get too little attention and that regulations will not be changed. Such an answer suggests that countries which do not intend to change ventilation regulations and include IAQ requirements may face IAQ related problems in the future.

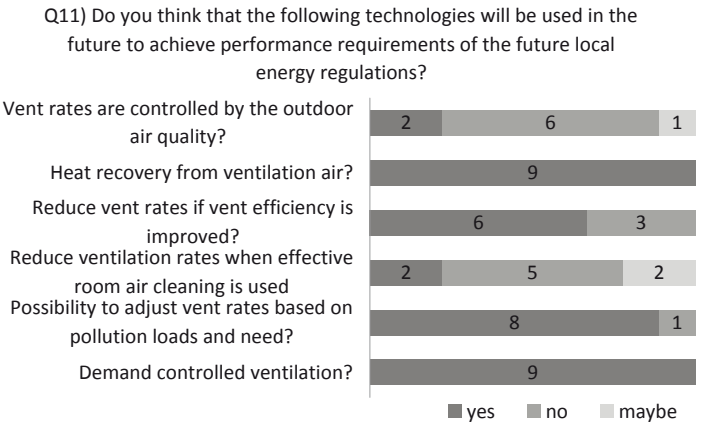
When asked in **Question 8** if the requirements for indoor air pollutants are controlled, slightly less than half with 47% answered "partly", 35% answered "yes" and only three or 18% "no". Only two of the respondents

provided additional the explanation to answers "partly" and "yes".

Majority of countries (71%) do not allow lower ventilation rates if less polluting building materials. However, four countries allow lower ventilation rates in the case of on non-polluting materials used, each country defining this option in a different way:

1. ventilation rates can be reduced based on EN 15251 which is included in national regulations
2. in offices, ventilation rate can be reduced from 2 l/s/m² to 0.7 l/s/m²
3. values given in regulations are for non-polluting materials, designers should increase values by 50% when polluting materials are used
4. ventilation rates in regulations are given for low emission buildings and non-low emission buildings and for many object types, including offices, schools and kindergartens. For all three cases, required ventilation rate for building can be reduced from 2.9 to 1.4 m³/h/m². The regulation does not mention lower ventilation rates in dwellings, where 0.5 is set as a minimum air change rate.





In most countries, ventilation rates cannot be controlled by the outdoor air quality (**Questions 10**). It is also not possible to reduce ventilation rates if ventilation efficiency is improved or if effective room air cleaning is used. On the other hand, heat recovery from ventilation air is required in all countries responding to this question. Possibility to adjust ventilation rates based on pollution loads or needs and demand controlled ventilation are included in regulations of slightly less than half of the responding countries.

All the respondents think that demand controlled ventilation and heat recovery will be used in the future (**Question 11**). The answers are almost uniform also when asked about the possibility to adjust ventilation rates based on pollution loads and need. All except one from nine think that this technology is going to be used in the future. Two thirds of the respondents also think that reducing ventilation rates if ventilation efficiency is improved accepted in the future. Concerning the questions on ventilation rates controlled by the outdoor air quality and reducing the ventilation rates if effective room air cleaning is used, no predictions can be made based on the received answers, as most of the respondents answered "maybe" for both questions.

Summary

The 2010 recast of the Directive on Energy Performance of Buildings (EPBD) requires among others that all new buildings in the EU are built as nearly zero energy by 2020. A very probable scenario is that in order to limit overall building energy consumption, ventilation rates will be reduced.

The following conclusions can be made based on the results:

- IAQ related problems are expected to increase due to the tighter building envelopes and because requirements for the IAQ quality are not included in the EPBD. On the other hand, slightly less than half of the respondents think that IAQ will increase due to revised ventilation

regulation to tackle the IAQ problem.

- Majority of the respondents expect ventilation regulation to be revised in the near future. The rest do not expect their regulations to change soon because they have recently been revised.
- The opinion about the future enforcement of ventilation is split evenly with one half foreseeing regulation to be enforced less and the other half to be enforced more.
- According to the opinion of the majority, the future use of natural ventilation will decrease and the use of heat recovery will increase.

- Building envelopes will almost certainly get tighter.
- Majority thinks that IAQ will be for sure or probably included in future ventilation regulations with only 10% meaning that it will not be included. The analysis of results also indicates that countries which do not intend to change ventilation regulations and include IAQ requirements may face IAQ related problems.
- Most of the countries do not allow for possibility of reducing ventilation rates if less polluting materials are used and also do not allow to control ventilation rates based on the outdoor air quality.
- Reduction of ventilation rates if ventilation efficiency is improved or if effective room air cleaning is used is also not possible (and is not foreseen) in almost all countries in the survey.
- All the respondents think that demand controlled ventilation and heat recovery will be used in the future. A vast majority thinks that the technology to adjust ventilation rates based on the pollution loads and actual need will be used if the future.
- Two thirds of the respondents also think that ventilation rates will be adjusted with ventilation efficiency in the future.
- Use of heat recovery in hot climate is not expected to increase.

Conclusion

Comparison the answers from different European countries does not show any relation between responses and climate, geographic location or construction practice. On the base of answers provided by respondents we can conclude that EPBD recast may have different effects in each European country. One reason for that is the fact that individual countries have currently very different regulations, which will respond to the new EPBD in a different way.

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