

Considerations on IAQ metrics from regulatory and compliance point of view

Use of IAQ metrics in practice

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PM2.5

Temp.

Hum.

tVOC

CO₂

CO

Avoid kids' respiratory issues

Fight against sickness

get better nights' sleep

Gain body energy

Stay focused and productive

...200 € ...

... and take control of your indoor air quality!

A major focus of this workshop is...

- ... a better understanding of relevant IAQ metrics
- ... better ways to characterise the indoor air quality

→ This presentation is focusing on
possible applications of this knowledge in daily practice
and
in particular in relation to requirements



Structure of presentation

- Possible applications of an IAQ metrics
- Considerations about a metrics to be used for compliance checking
- Application - Energy metrics
- Application - IAQ metrics
- Conclusions



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Possible applications of an IAQ metrics?

- **Application A : To characterise the IAQ as part of surveys**
 - What is the IAQ in homes, an office building, in a school, ...



Application A : To characterise the IAQ as part of surveys

- **Questions to be answered in advance of the survey:**
 - What should be measured?
 - What are limit values? ...
- **When applied: Issues of concern...**
 - Correct measurement of IAQ parameters
 - Correct data analysis
 - No specific other issues (no requirement, liability,...)

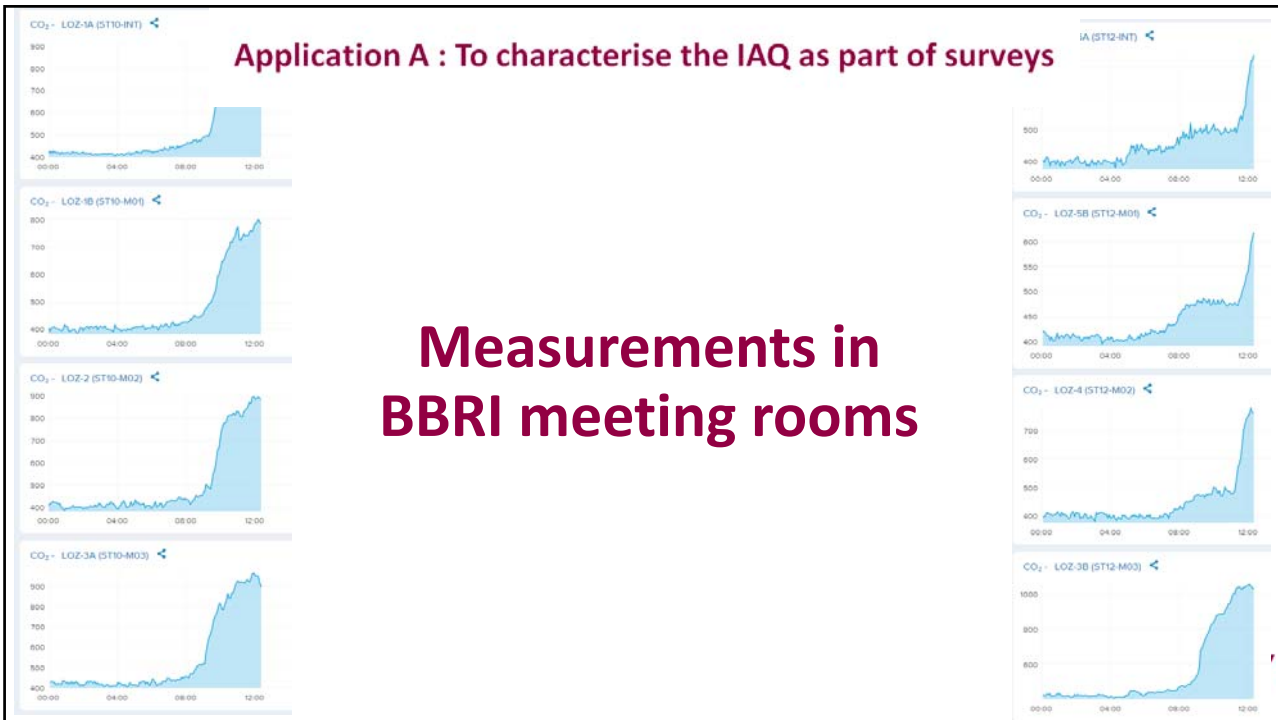


Application A : To characterise the IAQ as part of surveys



Application A : To characterise the IAQ as part of surveys

Measurements in BBRI meeting rooms



Possible applications of an IAQ metrics?

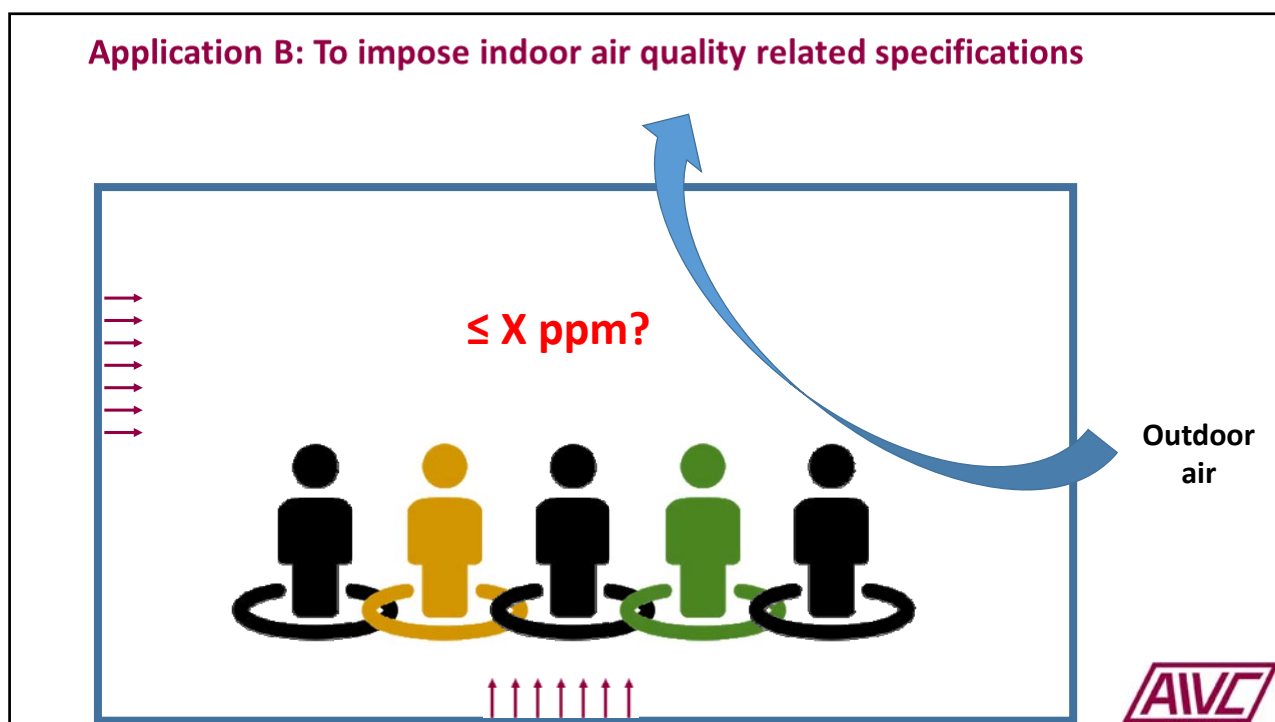
- **Application A : To characterise the IAQ as part of surveys**
→What is the IAQ in an office building, in a school, ...
- **Application B: To impose indoor air quality related specifications**
(e.g. for working conditions, school environment, ...)
→If above the limit(s), specific measure, e.g. no longer to work, or to occupy a building



Application B: To impose indoor air quality related specifications (e.g. for working conditions, school environment, ...)

- **Possible users:**
 - Government, employees, students, health organisations, unions, ...
- **If above the limit(s):**
 - specific measure might be taken, e.g. no longer required/allowed to work, ...
- **Use of findings:**
 - Possible actions regarding usability
 - Possible target people: employers, Building owners,
- **When applied: Issues of concern**
 - When is indoor climate not acceptable
 - Which actions?
 - Liability issues?
 - ...





Example: new Belgian regulation for workplaces

- Federal requirement (since beginning 2016) applicable to all new and existing buildings with employees:
 - $\text{CO}_2 \leq 800$ ppm
 - If 'not possible': $\text{CO}_2 \leq 1200$ ppm
- In first instance, it concerns the relation between employer and employee

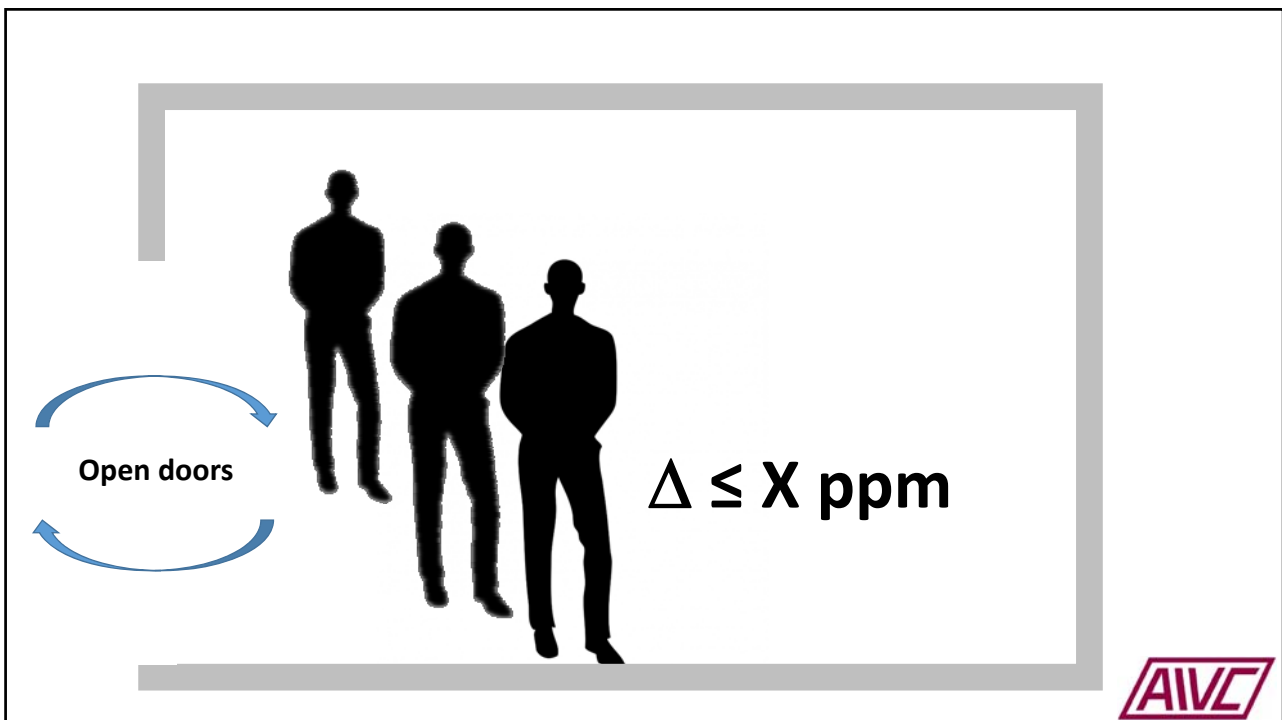
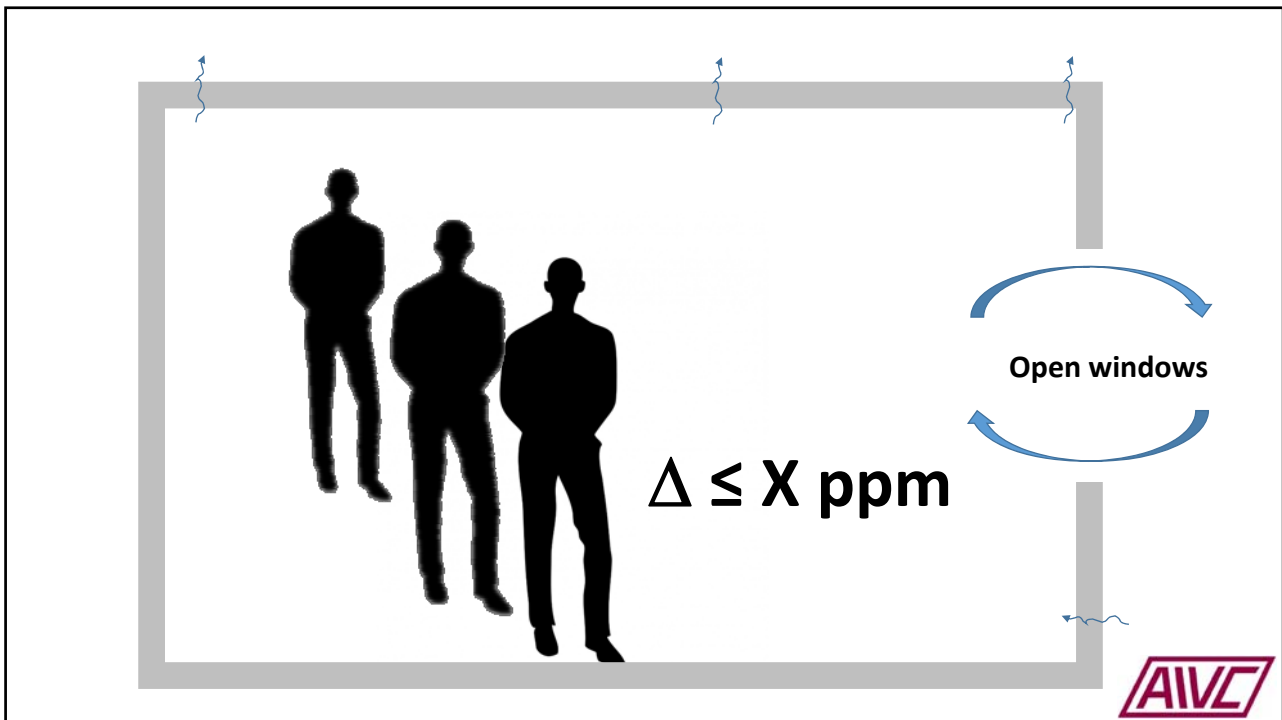
Employer ↔ Employee

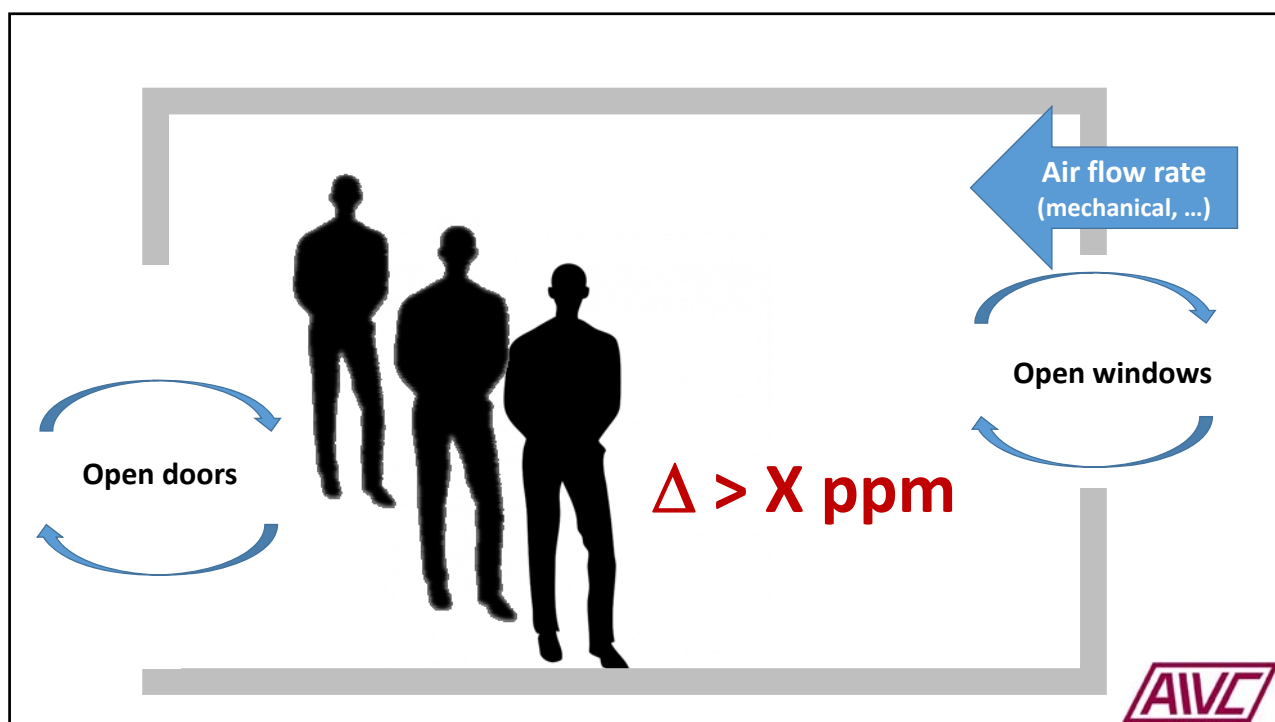


$\Delta \leq X \text{ ppm}$

Air flow rate
(mechanical, ...)







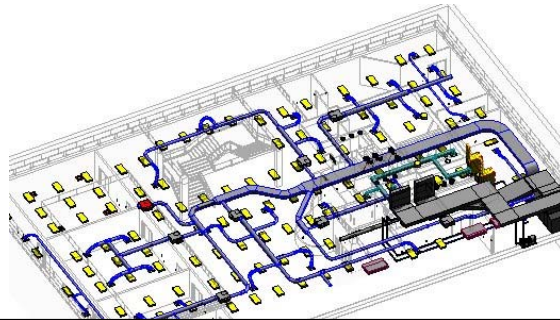
Possible applications of an IAQ metrics?

- **Application A : To characterise the IAQ as part of surveys**
→What is the IAQ in an office building, in a school, ...
- **Application B: To impose indoor air quality related specifications**
(e.g. for working conditions, school environment, ...)
→If above the limit(s), specific measure, e.g. no longer to work, or to occupy a building
- **Application C: To impose IAQ related building and installation specifications**
→The objective is then to deliver products and installations which meet the criteria

Application C: To impose IAQ related building and installation specifications

Who might be concerned with these specifications:

- HVAC sector
 - Ventilation
 - Air cleaning/filtering
- Building material suppliers (carpets, painting,)
- ...



Application C: To impose IAQ related building and installation specifications



IAQ metrics - To whom addressed?

- To building and installation designers?
- To employers?
- To researchers?
- To government?
- To citizens?
- ...?

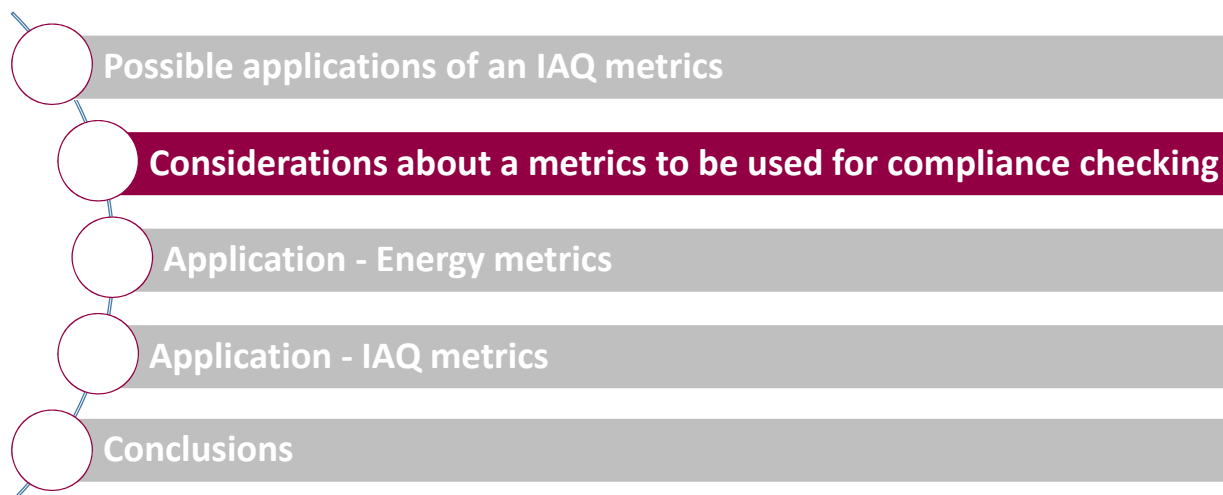


How to deal with liabilities?

- This can be a very crucial aspect
- Important to take into account from the beginning



Structure of presentation



Considerations about a metrics to be used for compliance checking

1. Clear and robust technical specifications

- In case of measurement methods: robust procedures
- In case of calculation methods: robust and transparent procedures
- No barrier for effective innovative solutions
- ...

2. Clear procedures to assess non-compliance and possible sanctions

- This is very important for obtaining and maintaining societal support
- Which deviations from requirements are tolerable?
- What kind of sanctions?
- ...

3. Effective and sustainable enforcement system



Considerations about a metrics to be used for compliance checking

1. Clear technical specifications

- Which variables to be measured?
- Specifications about measurement equipment
- Specifications about measurement duration
- Specifications about measurement location
- Who can measure?
- ...



Considerations about a metrics to be used for compliance checking

2. Clear procedures to assess non-compliance and possible sanctions

Questions...

- When is the requirement considered not to be met?
- Who is considered to be liable?
- What kind of action is foreseen?
 - Remedial measures?
 - Sanctions?
- What possibilities for actions in case of non-agreement?
- ...



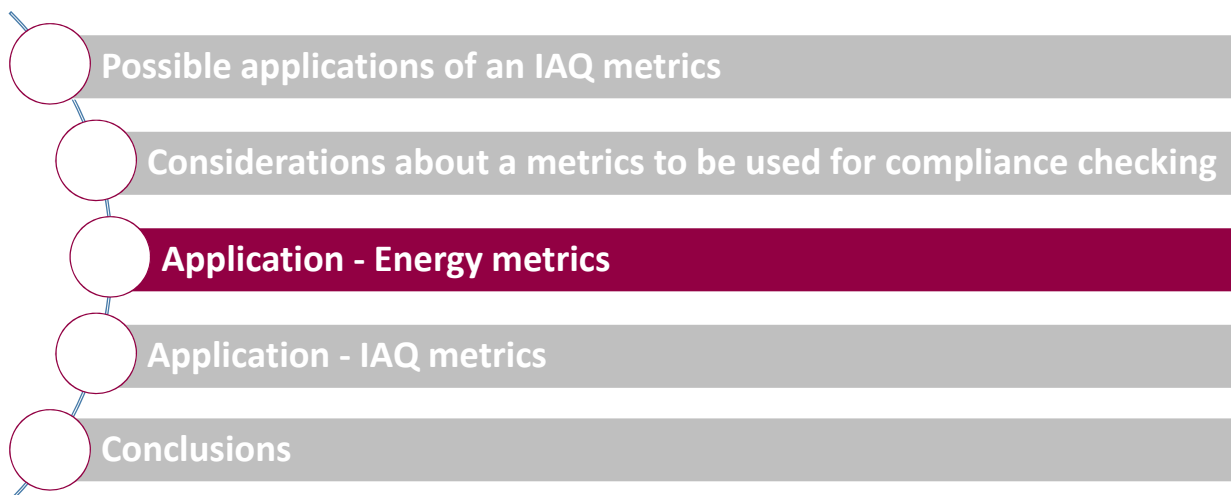
Considerations about a metrics to be used for compliance checking

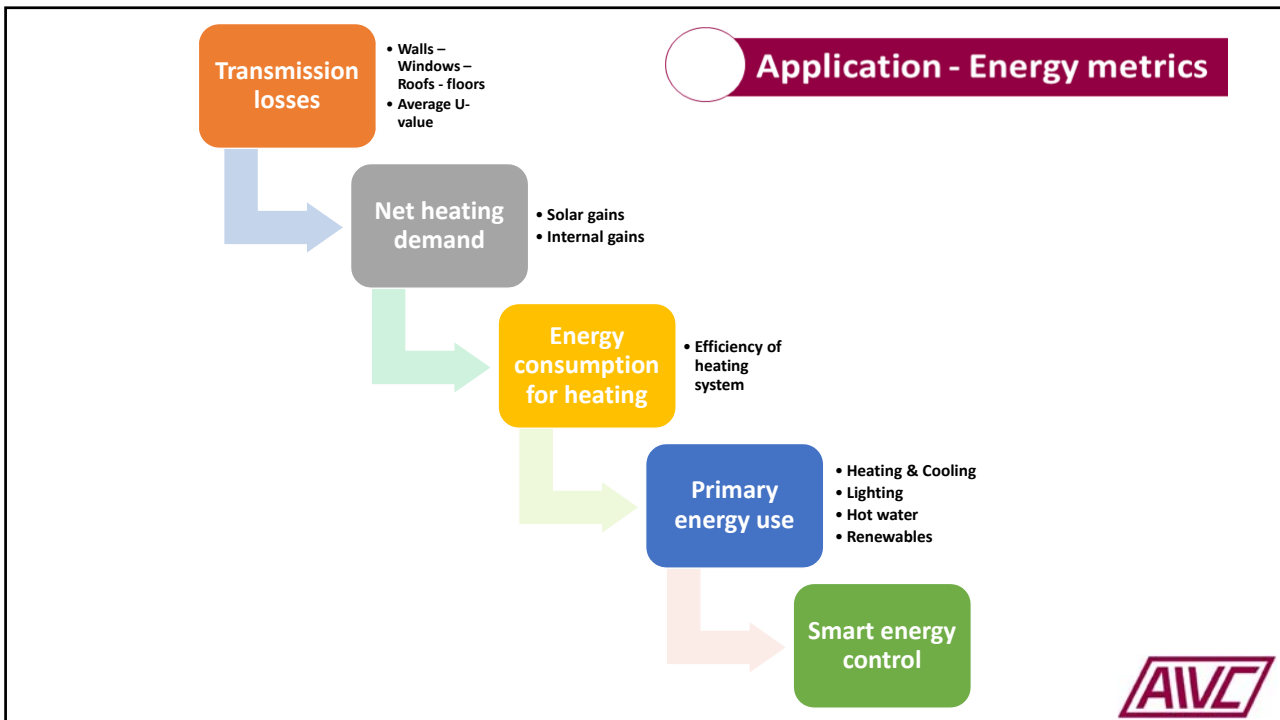
3. Sustainable enforcement system

- Resources needed for compliance checks and enforcement
 - Staff (technical, legal, ...)
 - Equipment
 - ...



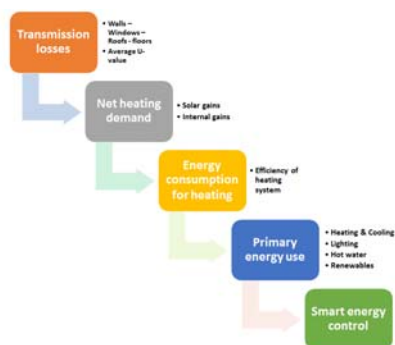
Structure of presentation

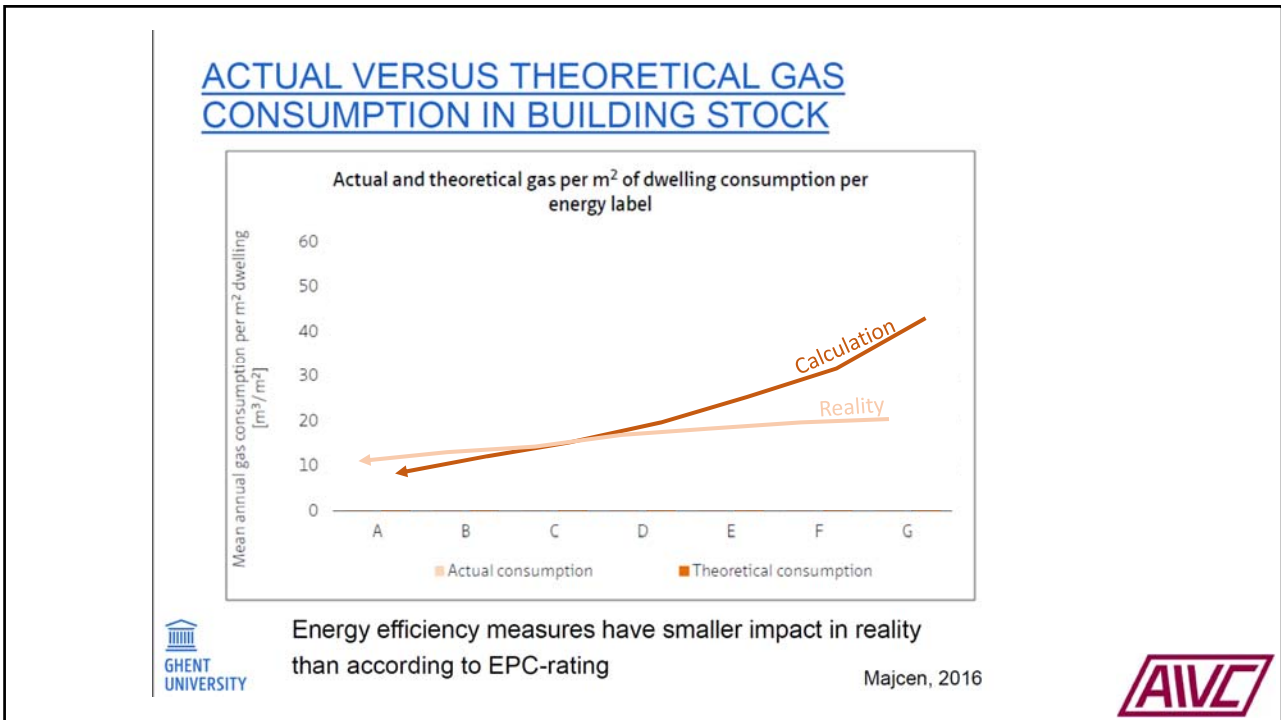
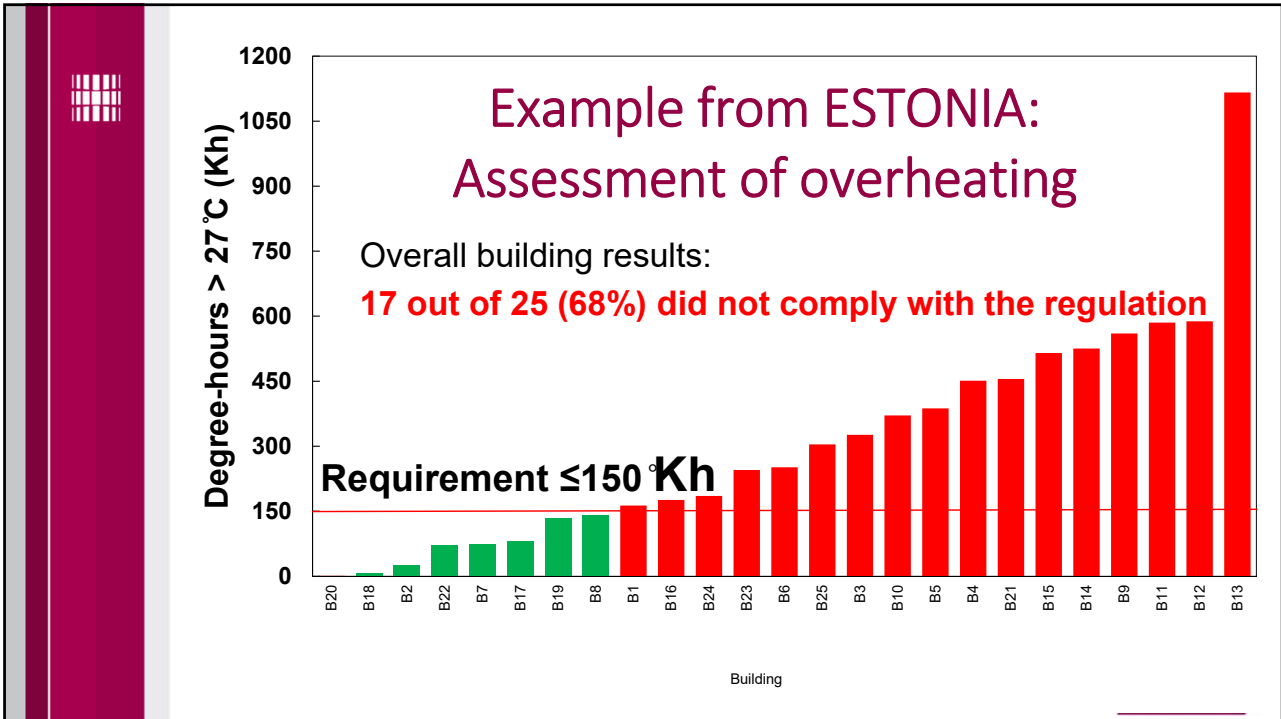




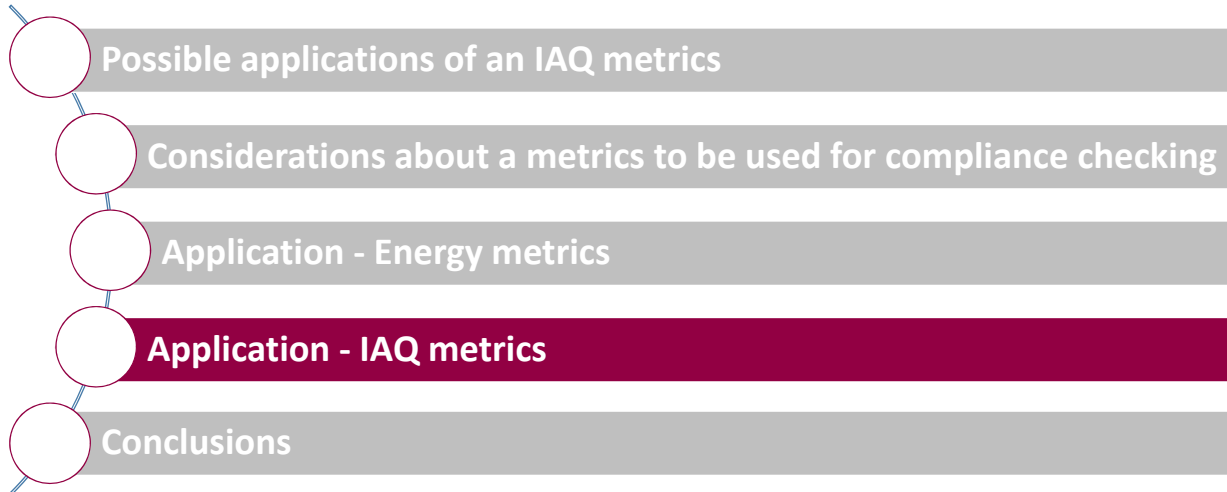
Important questions...

- Do people correctly report the energy metrics? Thermal comfort metrics?
- What is the degree of correlation between the calculated metrics and the reality?

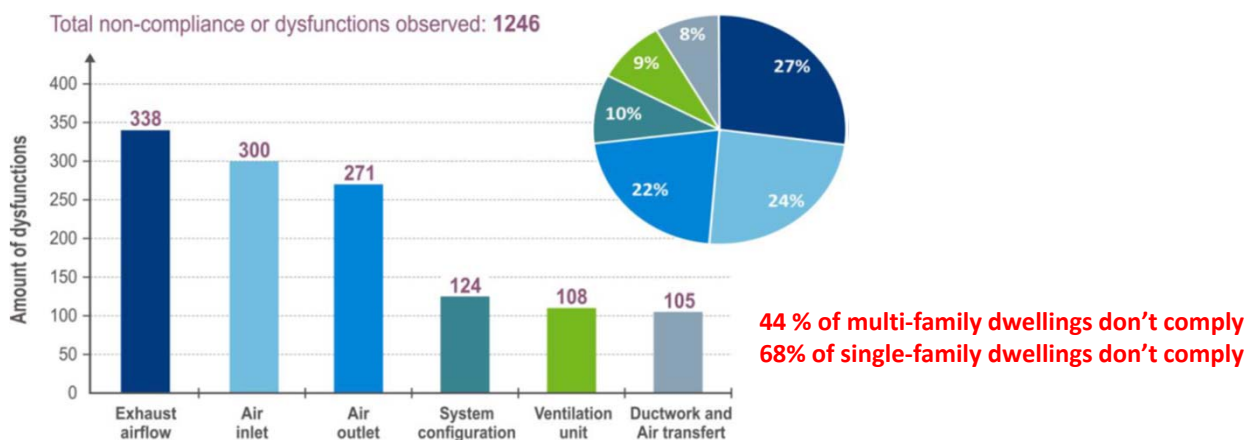




Structure of presentation



Example from FRANCE: Quality of ventilation systems in 1.287 new dwellings



Considerations about a metrics to be used for compliance checking

1. **Clear and robust technical specifications**
 - In case of measurement methods: robust procedures
 - In case of calculation methods: robust and transparent procedures
 - No barrier for interesting innovative solutions
 - ...
2. **Clear procedures to assess non-compliance and possible sanctions**
 - This is very important for obtaining and maintaining societal support
 - Which deviations from requirements are tolerable?
 - What kind of sanctions?
 - ...
3. **Effective and sustainable enforcement system**



Application - IAQ metrics

1. Clear and robust technical specifications

- Which IAQ variables to be measured?
- Specifications about measurement equipment
 - Accuracy, calibration frequency, ...
- Measurement duration?
 - Instantaneous?, 15 minutes?, 8 hours?, ...
- Measurement location(s)?
 - Where? How many measurement point? ...
- Who can measure / analyse results?
- Data analysis
- ...

→ **Alternative procedure (code of practice for HVAC,)?**



Application - IAQ metrics

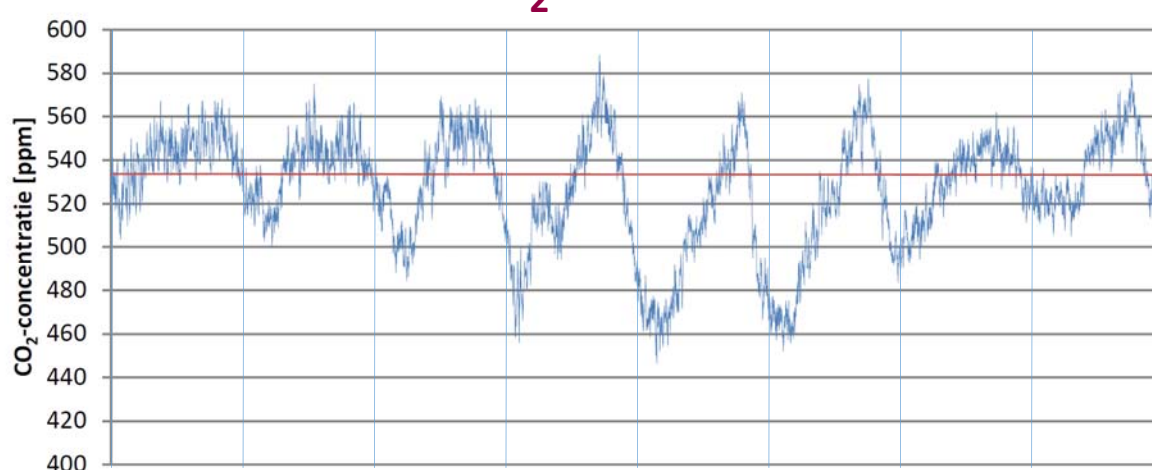
1. Clear and robust technical specifications

Example: CO₂ measurements

- CO₂ itself is not a pollutant of concern
 - CO₂ increase with respect to outdoors is important
- Which specifications for measurement equipment?
- Measurement location?
 - Occupants are the source
 - Inside: 1 point, multiple points
 - Outside: which location?



Outdoor CO₂ concentration...



Grafiek: verloop CO₂ concentratie van 2-10 juni '16
daidalos peutz



Considerations about a metrics to be used for compliance checking

2. Clear procedures to assess non-compliance and possible sanctions

Assume:

Requirement: Pollutant level $\leq X$

Questions...

- When is the requirement considered not to be met?
 - + 1%? + 10%?
- Who is considered to be liable?
- What kind of action is foreseen?
 - Remedial measures?
 - Sanctions?
- What possibilities for actions in case of non-agreement?
- ...



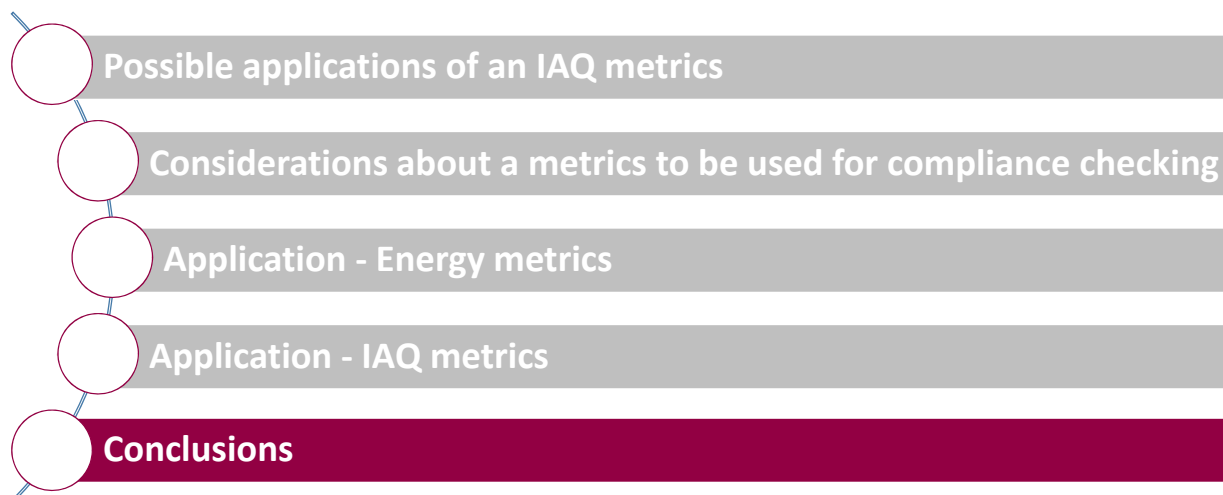
Application - IAQ metrics

3. Sustainable enforcement system

- Important that enforcement framework is in balance with the degree of non-compliance
- Active involvement of stakeholders is crucial to obtain and maintain societal support for such enforcement



Structure of presentation



Conclusions

- The development of specifications related to IAQ metrics should pay attention to the application in practice of such specifications, including enforcement and possible sanctioning
- One should focus on robust procedures regarding compliance checks and enforcement

