Draft for a Health-related Performance Assessment Framework for Smart Ventilation
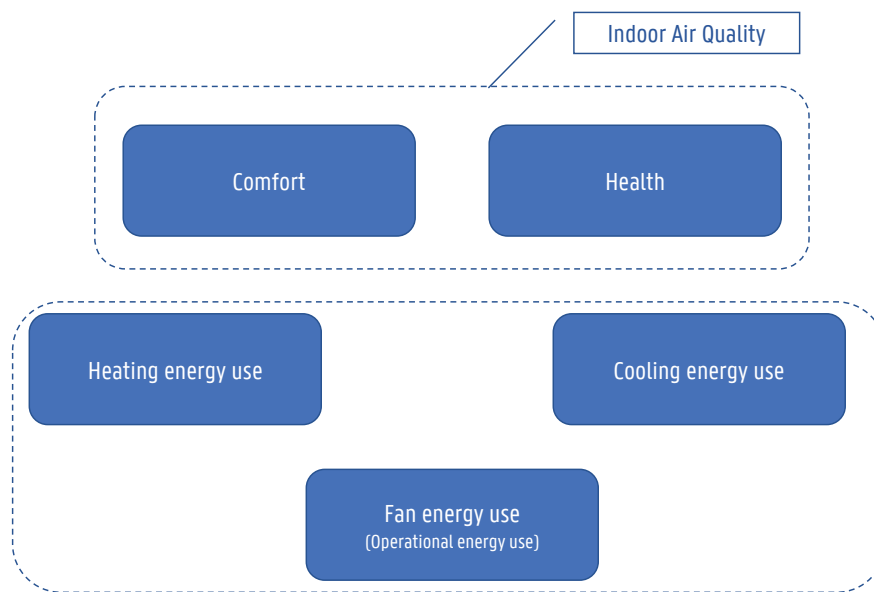
Ir.-Arch. Klaas De Jonge, Janneke Ghijsels

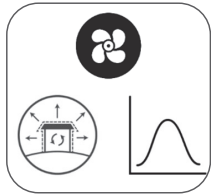Prof. Dr. Ir.-Arch. Jelle Laverge

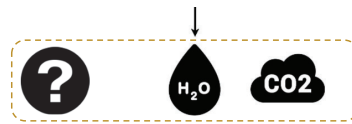FACULTY OF ENGINEERING AND ARCHITECTURE
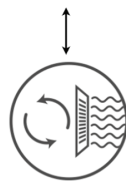
GHENT UNIVERSITY

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VENTILATION

Indoor Air Quality

Comfort

Health

Heating energy use

Cooling energy use

Fan energy use
(Operational energy use)
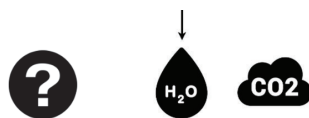
Building

Pollutants

COMFORT

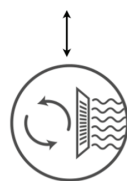Smart ventilation system

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Building
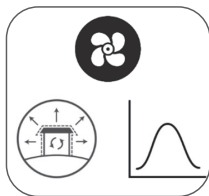
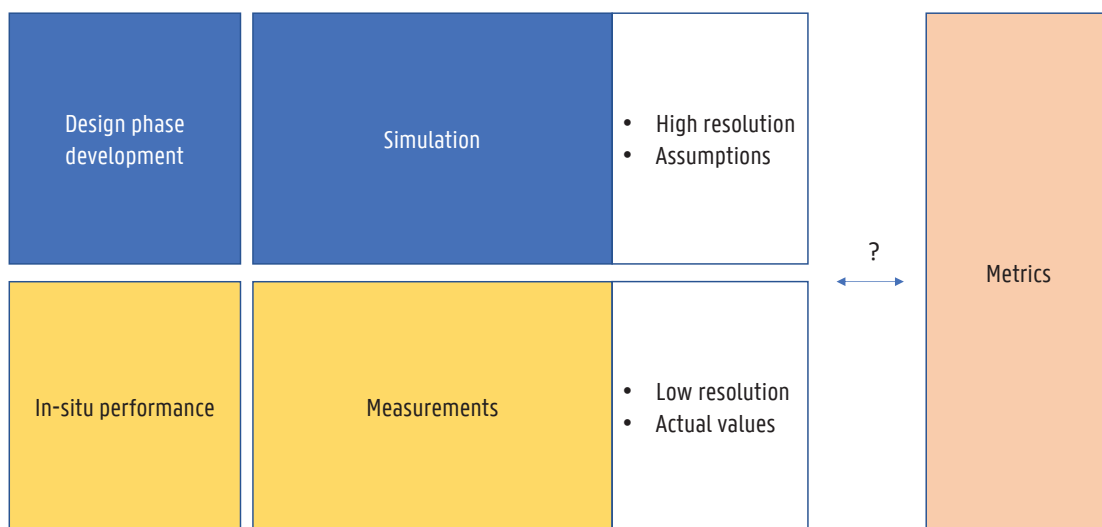## Pollutants
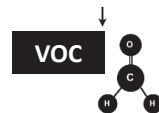
VOC   PM   O₃

HEALTH

Smart ventilation system

How to assess, score and check the performance?

Which pollutants?
Which sources?

How to assess, score and check the performance?

| Design phase development	Simulation	• High resolution • Assumptions		Metrics
In-situ performance	Measurements	• Low resolution • Actual values	?	

Key principles

Occupant-centric
- Exposure concentration (not room concentration)

Double check
1. Pass or fail: absolute limits
   - Maximum exposure concentration
   - Maximum (yearly) intake
   - Life-time average daily dose (HQ, LCR)
   - Better then reference systems

   → Minimum performance

2. Scoring
   - Metrics that allow relative rating
   - Energy-use
   - Disability adjusted life-years (DALY)

   → Relative performance
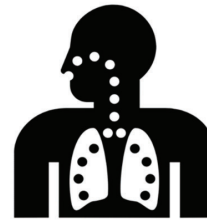
Applicable at different data resolutions

Which pollutants?
Which sources?

Proposed method

1. Measurement campaign

2. Identify pollutants of interest
   - Filter based on occurrence, concentration level and health impact

3. Identify sources
   - Occupants
   - Occupant activities
   - Building - furniture

1. Measurements

2. Identify pollutants

3. Identify sources

Add pollutants/sources
to simulation framework
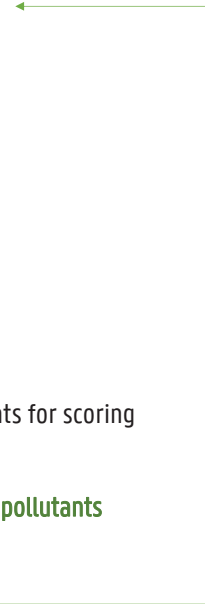
Design simulation framework

Evaluate pollutants for scoring
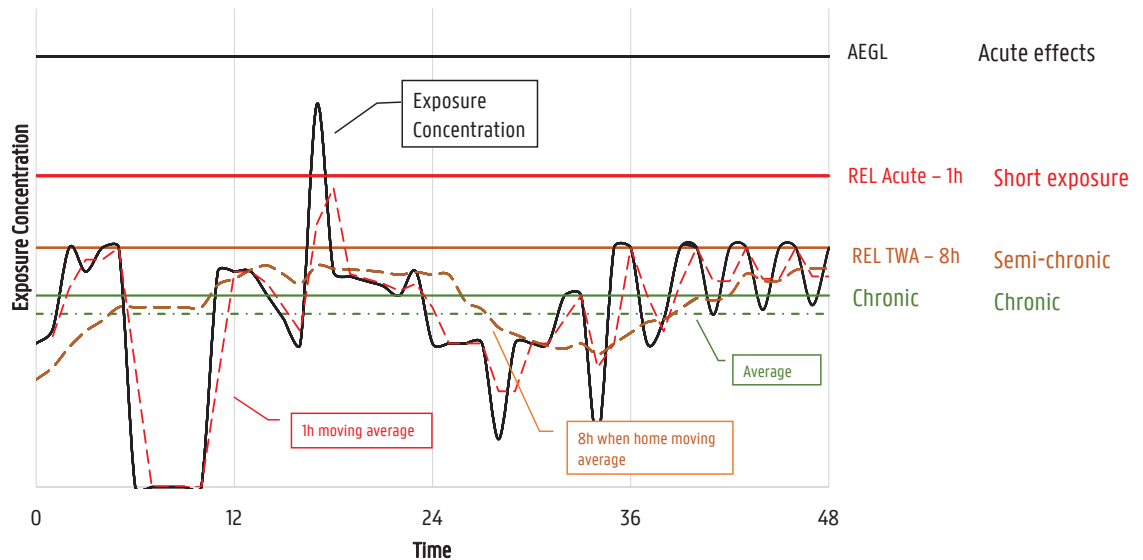
+

Identify other pollutants

Feedback:

New emerging pollutants?
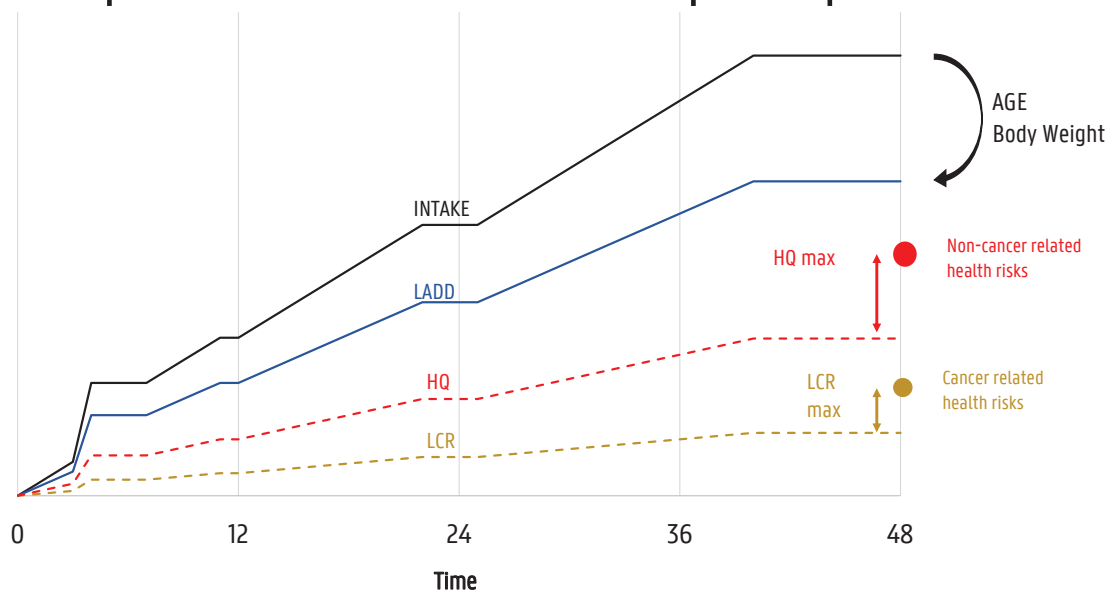
Rising concentration levels?

New sources?
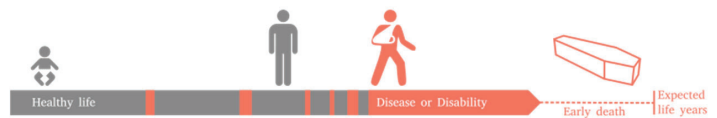
Case Belgium

DRAFT

Minimum performance metrics

Minimum performance metrics: occupant specific

Relative performance metric
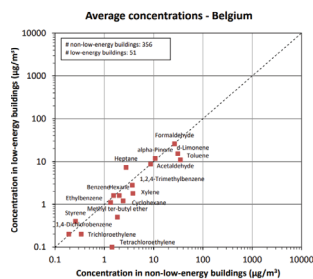
Disability Adjusted Life Year (DALY)
- Metric of harm
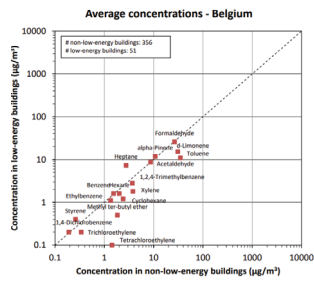- Sum-able

- Based on Logue et al. (2011)
- ID & IND method

Planemad CC BY-SA 3.0

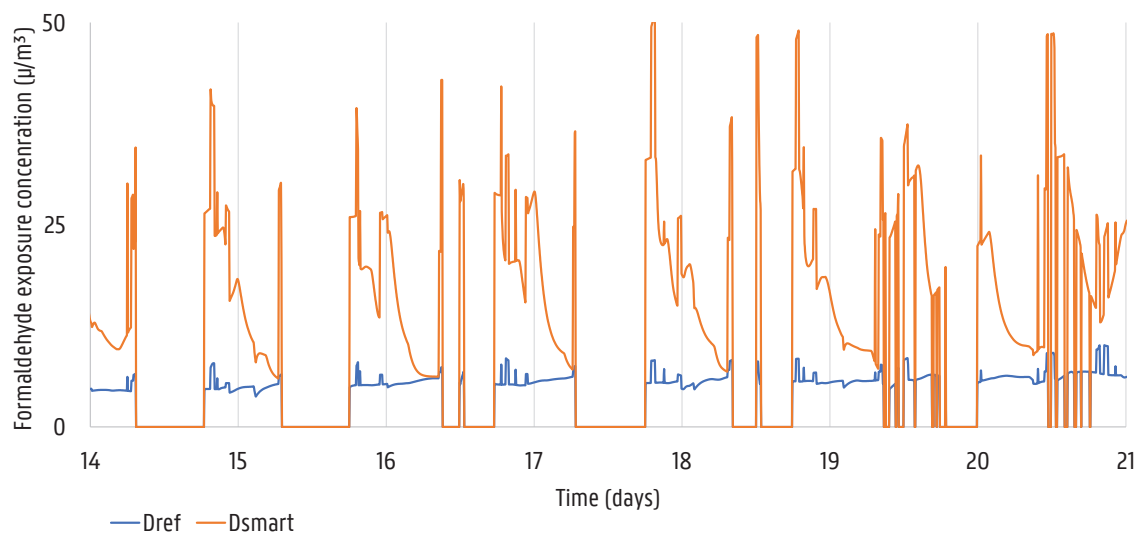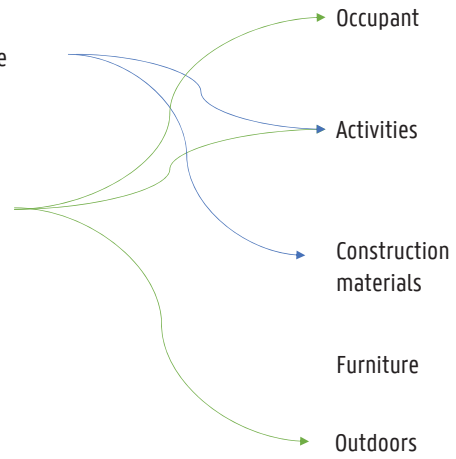---

2.

Formaldehyde
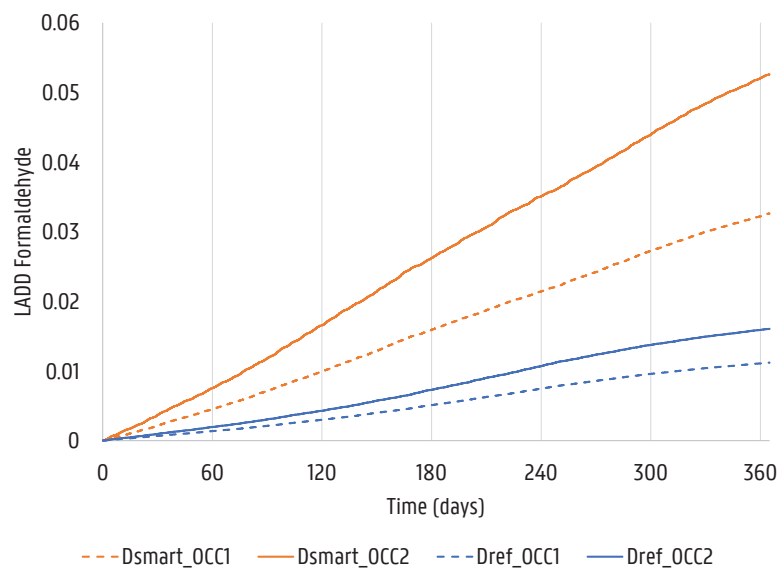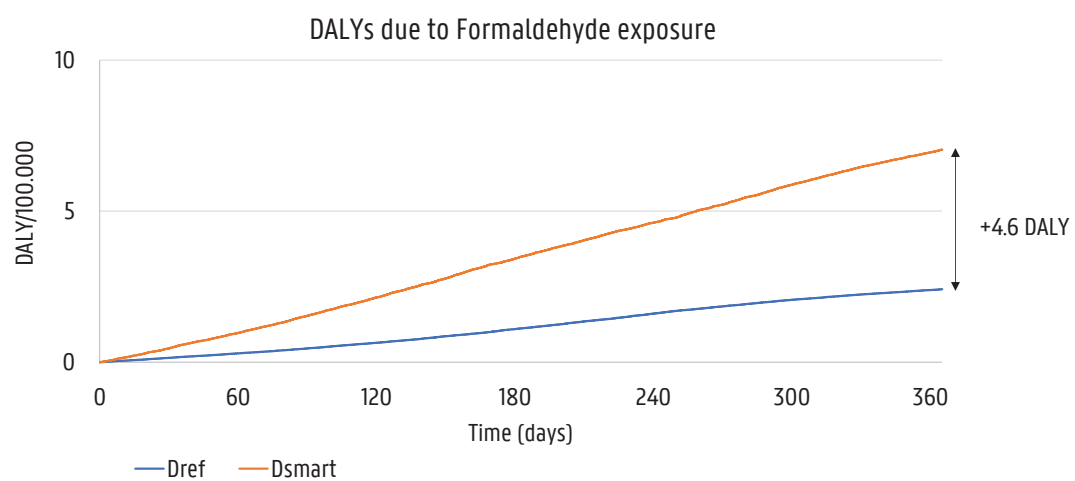Benzene
Limonene
Naphtanlene
Toluene
PM2.5
NO2
Ozone

3.

Average concentrations - Belgium

Formaldehyde
Benzene
Limonene
Naphtanlene
Toluene
PM2.5
NO2
Ozone

Occupant

Activities

Construction
materials

Furniture

Outdoors

		Dref	**Dsmart**
HQ		☑	☑
LCR		X	X

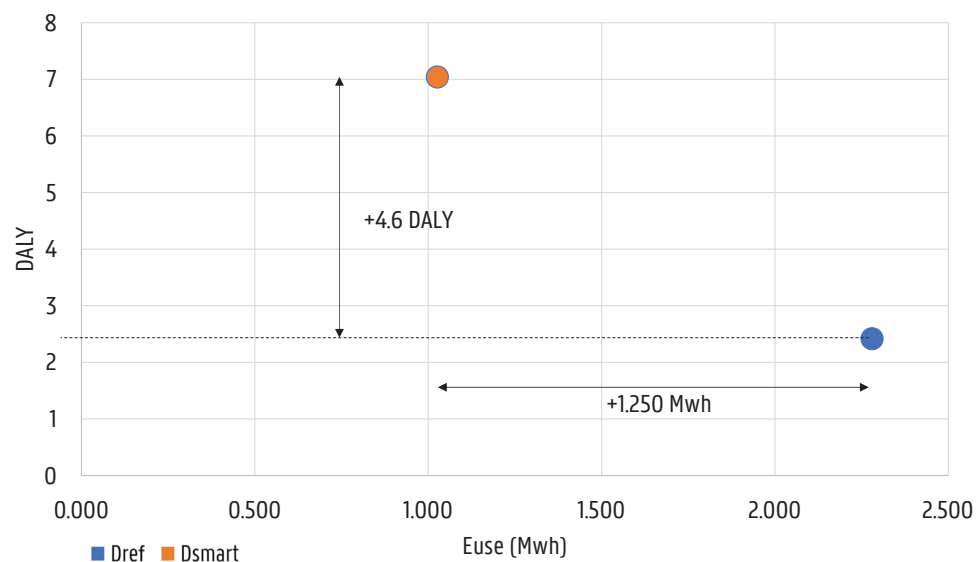DALYs due to Formaldehyde exposure

+4.6 DALY

FACULTY OF ENGINEERING
AND ARCHITECTURE

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FWO – Flanders Research Foundation (1SA7619N)

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