# “Towards Smart Ventilation” in Mid-sized buildings: Project content, objectives and structure, organization and work plan

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**KEYWORDS**

CFD, performance assessment, optimisation, air distribution

## 1 CONTEXT AND OBJECTIVES

A smart ventilation system is able to continually adjust itself to provide the desired indoor air quality (IAQ) while minimizing energy use, utility bills, thermal discomfort and noise. A smart ventilation system is also responsive to e.g. occupancy, outdoor conditions, direct sensing of contaminants and can provide information about e.g. IAQ, energy use and the need for maintenance or repair. Technically, all components for such systems are available in the market.

Current practice in the design of ventilation systems, however, is driven by minimum requirements for IAQ, minimum energy use and/or investment costs. For midsized buildings, where the system complexity exceeds the typical ‘all-in-one-box’ solutions that are available for single-family dwellings, the design of ventilation systems is very conservative and inefficient. No method exists today to select the most optimal system and room layout in a specific building based on a coherent set of indicators for design optimisation (i.e. indoor environmental quality (IEQ), energy use, life cycle costs, comfort, maintenance, resilience).

To meet this need, we want to determine a performance based method that approaches the design of a smart ventilation system as a whole, that is driven by optimisation and assesses the performance of the system during its whole life-cycle. Focus is on new and renovated midsized buildings with a design minimum airflow rate of more than 1000 m³/h such as apartment blocks, schools, elderly care homes and office buildings.

The specific scientific objectives are:

- define specific performance indicators for indirect performance metrics such as acoustics, resilience, functionality, user satisfaction and specific conditions such as partially heated buildings, bedrooms, care flats
- aggregate all performance parameters (energy use, IEQ, comfort, health and all other metrics listed above) into one general indicator for ventilation performance
- automate and optimise aerolic layout and integrated design of the air distribution systems based on the new performance indicator
- improve and optimise positioning of connections of the ventilation system to the outdoor environment and to the rooms of the buildings

## 2 ORGANIZATION AND WORK PLAN

The workplan consists of two work packages: WP2 performance assessment and WP3: optimisation of system design including a set of 6 tracks each addressing the aims as shown on Figure 1 and 2 respectively.

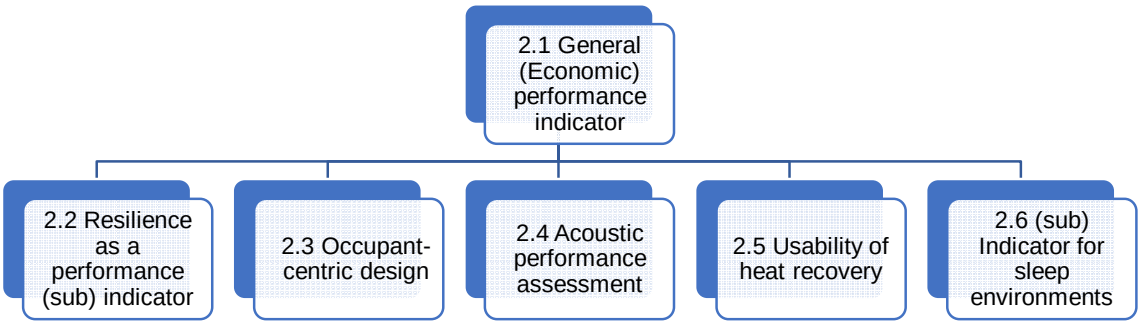


Figure 1: research tracks in WP2: performance assessment

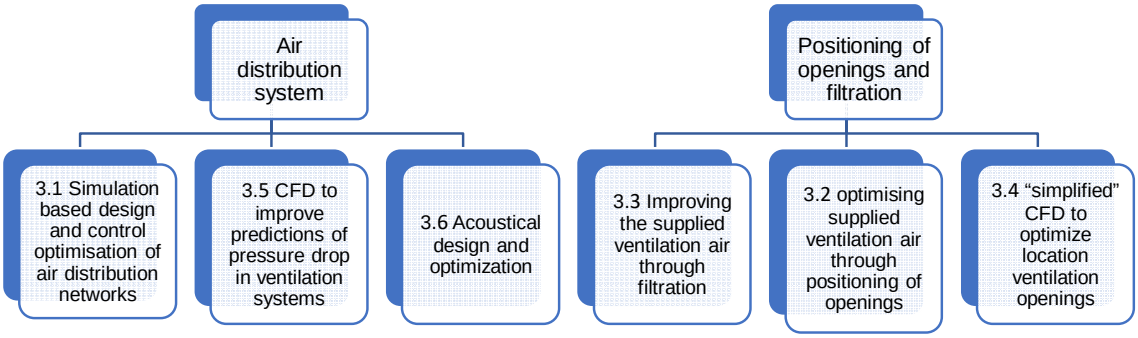


Figure 2: research tracks in WP3: Optimisation of system design

## 3 ACKNOWLEDGEMENTS

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