

SHORT REPORT

Title

„Ventilation Innovation: From a Niche Phenomenon to Mainstream Adaptation. Development of a Diffusion Concept for Innovative Ventilation Technologies Based on a Barrier Analysis“

Background

Reaching the climate goals for the building sector requires increasing air tightness of buildings to minimize heat loss. Broad implementation of controlled ventilation systems with heat recovery is crucial to achieve these goals and to prevent risks to health and building fabric due to insufficient removal of pollutants and humidity. However, only a small share of residential buildings is currently equipped with such ventilation systems.

Research objective

This study aims to develop innovative strategies and action plans to help the diffusion of controlled ventilation systems with heat recovery in residential buildings, with a special focus on apartment buildings. The central research question seeks to identify actor-specific and structural barriers for the diffusion of efficient ventilation systems in apartment buildings and how these barriers can be addressed.

Within the study the perspectives of different stakeholders involved in the technology investment decision their role as well as their relation to each other were examined. Specifically, decision-makers from housing companies and private apartment (building) owners in their function as (potential) investors, as well as energy consultants and heating, ventilation and air conditioning (HVAC) engineers as technical experts were focused. The results of the study are meant to amongst others produce insights for policy makers to assess currently implemented policy instruments (promotion schemes, information campaigns, regulation) or their further development. Furthermore, the study aimed to improve transparency with regard to ventilation system specific costs for an apartment or building upgrade. Also the saving potential associated with a broad diffusion of efficient ventilation systems was examined and indicated which technology would be best suited for apartment building retrofits. To ensure practical relevance of the study results cooperation with the consumer advice center of Lower Saxony was established to study how the subject of (controlled) ventilation is currently addressed within publicly subsidized energy consultation and to identify ways for further improvement.

The research design consists of several consecutive steps:

- Literature and document analysis
Objective: Inventory of the action field “controlled ventilation”
Within this step various aspects were examined, such as the relevant stakeholders in the field of action and their role for the diffusion of efficient ventilation technologies, the legal framework governing their actions, analyses of costs and energy saving potential, as well as advantages and disadvantages of different ventilation systems. Furthermore, the current state of research with view to relevant actor-specific diffusion barriers was assessed, building on which a first draft of categories was established: here informational, economic, technical, regulative, psychological/normative and behavioral barriers were identified.
- Expert and in-depth interviews
Objective: Further analysis of the field of action and of stakeholder perspectives
Ten semi-structured, problem-centered expert interviews with energy consultants, representatives of HVAC companies, and housing companies, as well as ten guided in-depth interviews with private owners of apartment buildings or apartments were conducted. The interview guidelines were based on the research results. The interviews were evaluated using software for qualitative data analysis. Consequently, new findings with regard to barriers that had not been considered so far led to a new category: structural barriers.
- Online survey with residential housing companies, energy consultants and HVAC engineers, as well as representative household survey
Objective: Quantitative validation of the interview results
The survey participants were confronted with a set of closed items assessing their level of experience with controlled ventilation systems (with heat recovery) and their approval of several statements, in which hypotheses concerning different barriers and beforehand-identified causal mechanisms were subsumed.

At the end of the analysis, the results were integrated into a synopsis in which the relation and interaction between different actor-specific and structural barriers becomes apparent. Furthermore, their relevance for the diffusion of ventilation systems with heat recovery was studied and potential solutions were suggested.

Conclusion

As a result of the analysis, numerous actor-specific or structural barriers for the diffusion of efficient ventilation systems were identified, that can be clustered into seven categories. Based on the outcomes of the expert and in-depth interviews as well as the surveys, several options to support the diffusion of ventilation systems with heat recovery were pointed out. A so-called “silver bullet” was not found. Rather, a “package solution” seems to be appropriate, in which the different suggestions for action meet and interact. As policy makers cannot address all identified barriers, such an integrative approach requires the willingness of different stakeholders to act and cooperate.

Project details

Short title: Ventilation Innovation: From a Niche Phenomenon to Mainstream Adaptation

Researchers / Project manager:

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Characters (max. 4300)

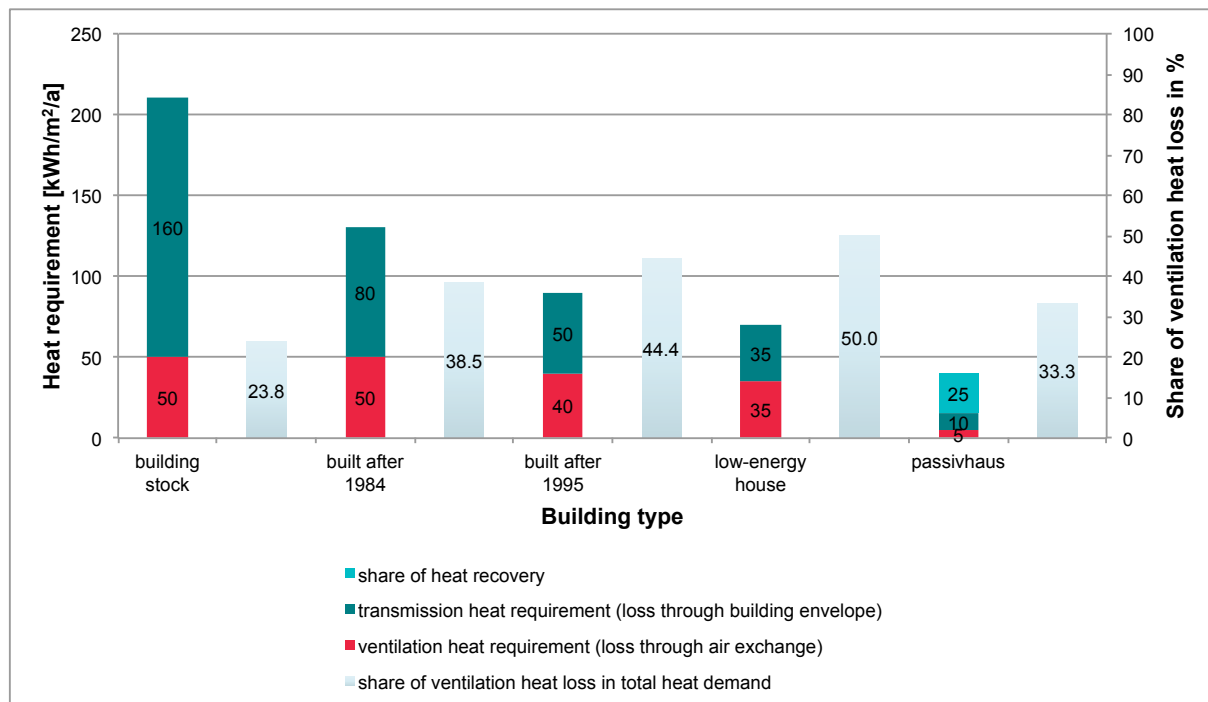
Budget: 261,131.00 €

Share of federal grant: 172,791.70 €

Project duration: 24 months

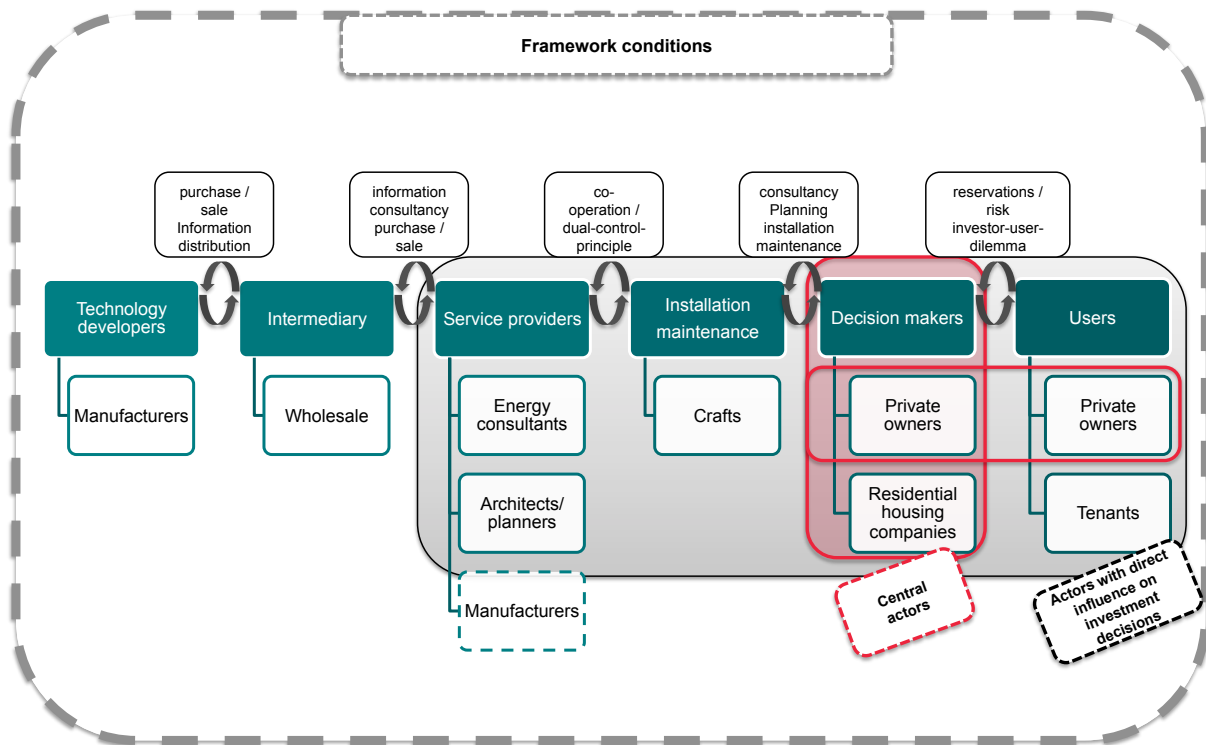
FIGURES

Figure 1 Share of heat loss through ventilation by building efficiency standard



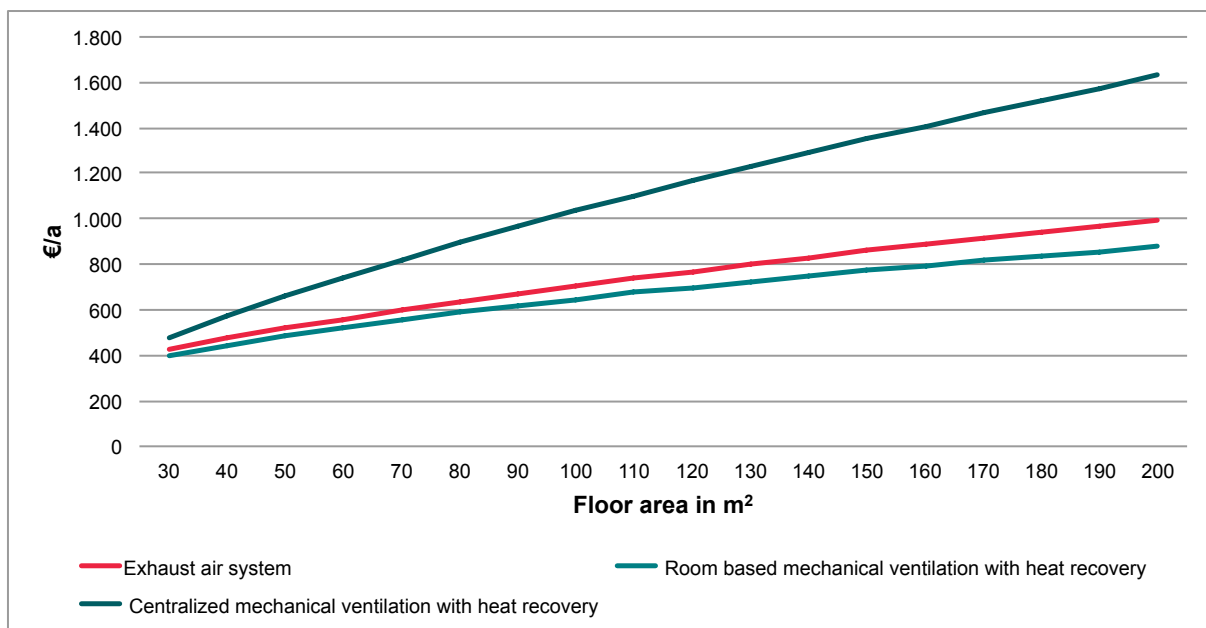
Source: Own depiction based on Händel (2011)

Figure 2 Actor constellation in the field of mechanical residential building ventilation



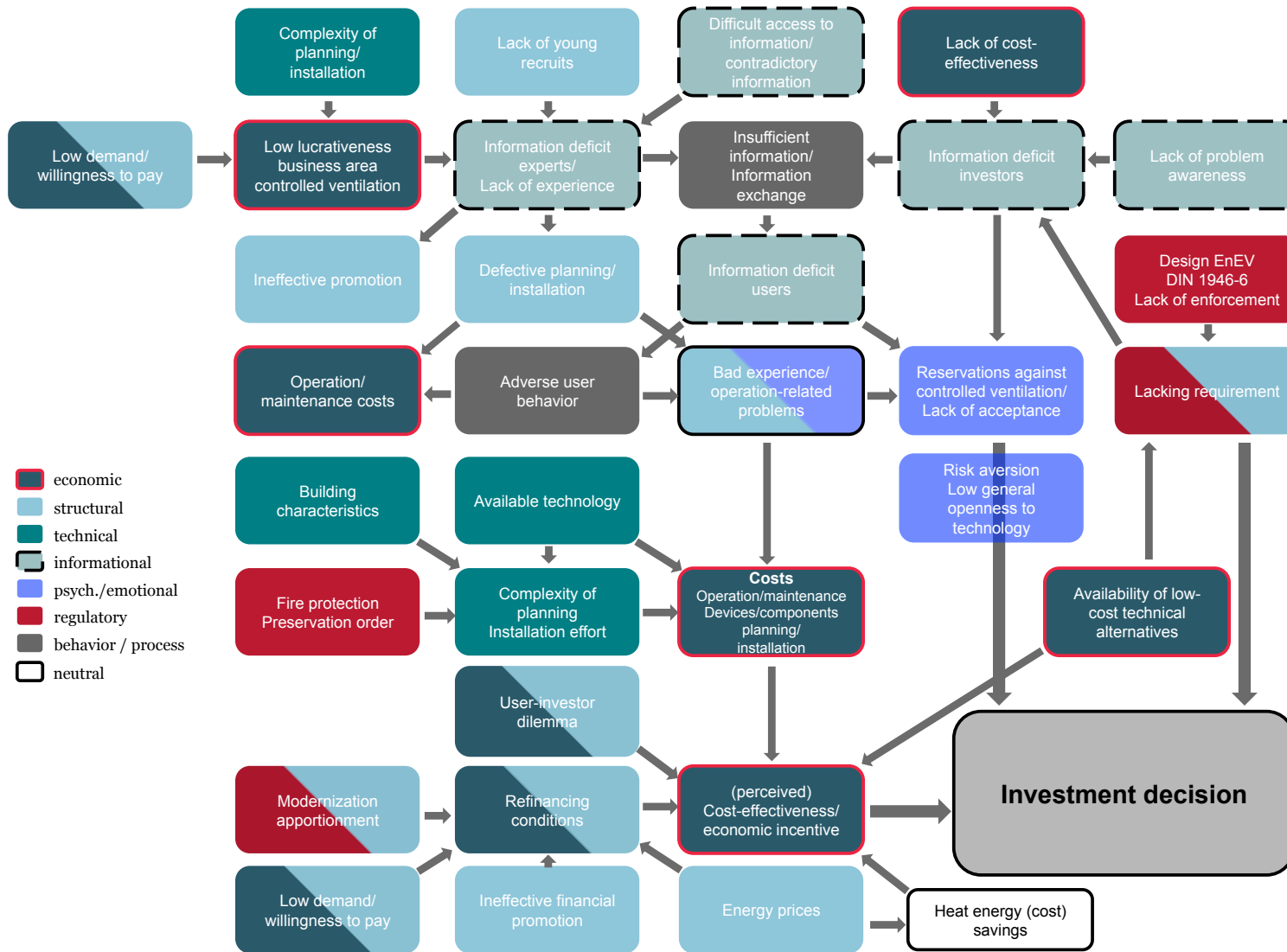
Source: Own depiction

Figure 3 Absolute cost of different ventilation system types per year and floor area



Source: Own calculation based on Pfluger (2004,), Händel (2010), Hinz (2015), Höß (2017)

Figure 4 Overview of diffusion barriers and cross links



Source: Own depiction based on barrier analysis

Figure 5 Elements of diffusion concept



PM = Policy Makers; M = Manufacturers; C = Crafts; HC = Housing Companies; PO = Private building owners; CAC = Consumer Advice Centre; EA = Energy Advisors

Source: Own depiction based on barrier analysis