Executive Summary:

Balancing the Financial Costs and Health Benefits of Optimising Energy Efficient Ventilation

Indoor air quality (IAQ) affects both the health and productivity of office workers, leading to important economic impacts. While IAQ management systems use a lot of energy and can be costly, these expenses are minor compared to the productivity benefits of healthy workspaces.

Since people spend over 90% of their time indoors, pollutants have serious health effects. Long-term exposure can lead to conditions like lung cancer, asthma, and leukemia, while short-term exposure can cause symptoms such as headaches, coughing, and eye irritation, known as Sick Building Syndrome (SBS).

Annex 86 introduces a methodology to estimate the harm and economic costs associated with poor IAQ in office buildings. Research of the health and environmental trade-offs in IAQ management, emphasises the health risks posed by poor IAQ far outweigh the impacts of the energy-related emissions from IAQ management systems. That is, **saving money through energy efficient but less effective IAQ management is likely to be a false economy** when considering broader societal and financial costs of health impacts

Main findings

- **Health impacts**: Exposure to indoor pollutants results in significant health-related costs. For pollutants like Particulate Matter (PM), formaldehyde, and acrolein, the cost per worker due to Disability Adjusted Life Years (DALYs) can be as high as €3,200 per year due to long term exposure (Cony & Laverge, 2022). Figure 1 shows, for example, the annual cost per person per year of particulate matter exposure, a major contributor to DALY.
- **Productivity losses**: SBS, which causes temporary symptoms such as headaches and concentration issues, leads to a measurable decrease in productivity. This loss can impact companies' bottom lines, with overall productivity losses estimated at 6% for workers experiencing multiple symptoms regularly, and an average annual cost of €2,300 (Figure 1).
- **Economic impact**: The total cost of poor IAQ in office buildings is a combination of DALY costs and SBS-related productivity losses. For a building with poor IAQ and multiple employees, these costs can accumulate, significantly affecting operational efficiency and the economy at large.

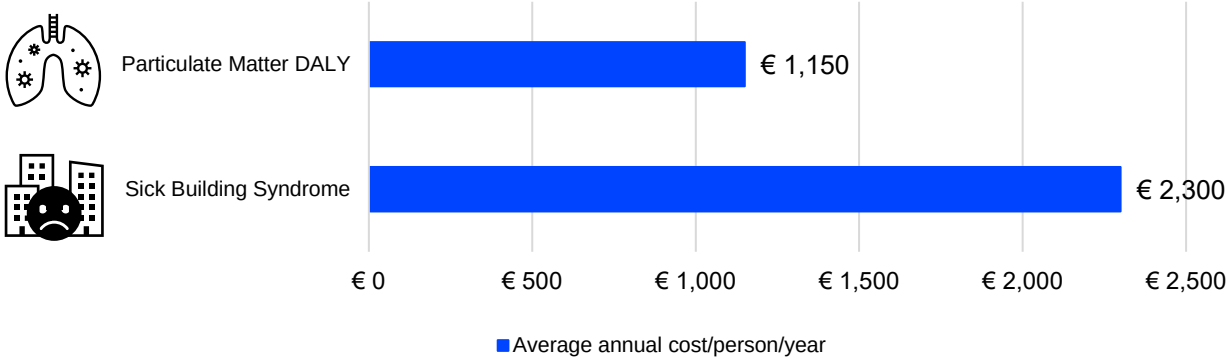

Figure 1 Selected economic impact costs of poor indoor air quality in France for health impact of particulate matter and productivity loss of SBS. (Cony & Laverge, 2022)

Policy implications

For health policymakers, this study highlights the need for adequate ventilation and IAQ control in office buildings to mitigate both health risks and economic losses. Investing in better IAQ management and ventilation systems can lead to substantial savings on healthcare costs and prevent productivity losses, ultimately improving public health and business performance.

- **Prioritise health over energy emissions in IAQ design**: Policymakers should ensure that IAQ systems are designed primarily to safeguard public health. The energy costs of ventilation systems should not lead to compromises in the performance of IAQ systems, as the health risks from poor indoor air quality can have high economic and health impacts.
- **Adopt IAQ standards**: Enforce stricter IAQ regulations for office buildings, particularly for pollutants like PM10/2.5, formaldehyde, nitrogen dioxide, radon and ozone. ANSI/ASHRAE Standards 62.1 and 62.2 specify minimum ventilation rates and other measures.
- **Promote ventilation improvements**: Encourage the adoption of advanced ventilation technologies to reduce pollutant concentration and improve air quality.
- **Increase awareness and monitoring**: Implement routine IAQ assessments in workplaces and raise awareness among employers regarding the health and productivity impacts of poor IAQ.

Background and context

In 2003, a U.S. study estimated that poor indoor air quality (IAQ) globally costs around €41 billion. In France, this cost was €19 billion in 2014. Costs differ by scale—individual, building, or national. However, there's limited and outdated research on accurately measuring these costs.

A 2022 report, *A Methodology to Assess Economic Impacts of Poor IAQ in Office Buildings from DALY and SBS Induced Costs*, offers a way to calculate the economic impact of poor IAQ in office spaces by focusing on two main areas:

- Disability Adjusted Life Years (DALYs): Measures years of healthy life lost due to poor IAQ.
- Sick Building Syndrome (SBS) Costs: Adds costs for productivity losses from non-chronic symptoms caused by poor air quality.

Another report by the same group looks at health and environmental trade-offs in IAQ management, highlighting that health risks from poor IAQ can have a larger economic and health impact than energy emissions from air management systems.

This new method estimates IAQ costs in office buildings by considering pollution levels and the number of workers. It calculates costs related to DALYs (healthcare expenses, lost life years, and reduced productivity) and SBS, with initial findings showing SBS costs may even surpass DALYs.

This approach helps decision-makers understand the financial impact of poor IAQ and plan cost-effective improvements for worker health and productivity.

Since office workers spend much time indoors, IAQ is crucial to their health and productivity, affecting both short-term and long-term well-being and carrying significant economic consequences.

Further reading

CONY, L., & LAVERGE, J. (2022). A Methodology to assess economical impacts of poor IAQ in office buildings from DALY and SBS induced costs. *CLIMA 2022 Conference*. https://doi.org/10.34641/clima.2022.297

About the author

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Contact: Dr Jelle Laverge, Ghent University

Department of Architecture & Urban Planning, Building Physics

Email Jelle.Laverge@ugent.be

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