

# Healthy learning environments

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## **Abstract**

A good school environment is paramount to the performance and health of the pupils and teachers. However, the quality of school buildings in the Netherlands is in general not so good, with 80% of them not complying with good practices for the indoor environment, while having high energy costs. When tackling these issues, School Boards around the country have two options: building new facilities, or upgrading the existing ones. Although they usually prefer new buildings, municipalities around the country are promoting the alternative. This presents opportunities for the sustainable renovation of potentially thousands of buildings, to make them not only energy efficient, but with a high quality indoor environment as well; Energy efficient schools with good indoor environment are at the heart of the project “Developing a model for the balance of energy use and indoor environment quality in school buildings”.

## **Keywords**

school environment; health; school buildings; Netherlands; indoor environment; energy costs; sustainability; renovation; energy efficiency

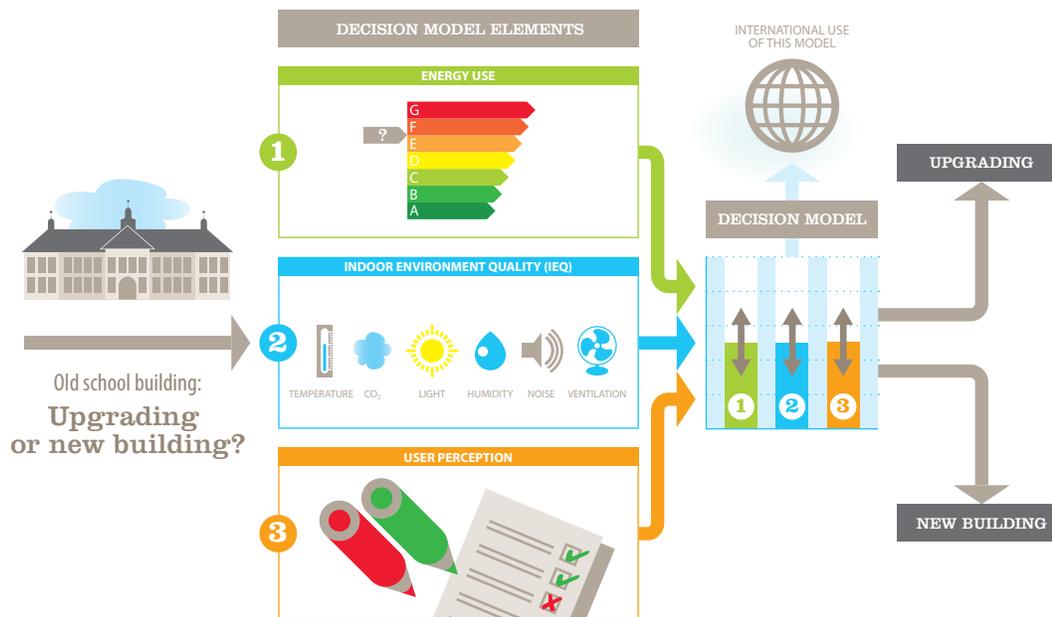


FIGURE 1 Graphical abstract

For years now, focus has been put in constructing buildings that are energy-efficient and energy-saving; however this comes sometimes at the cost of reducing the comfort and quality of the indoor environment, which translates in unsatisfied users –in a large part, students, teachers and staff-. In order to provide the best learning environment, a balance must be struck between energy use and indoor environment comfort and quality. The project aims at developing a tool that helps make visible to School Boards and Municipalities the interactions between indoor comfort and energy, by providing information related to these two streams. The information presented can be used for comparing the current status of the school buildings with ‘good’ school buildings, and to find a balance between indoor comfort and energy use. In order to do this, three aspects will be taken into consideration: Energy use, Indoor Environment Quality (IEQ), and the perception of the users. By means of a ‘Living Lab’ situation, measurements will be taken of the most relevant parameters: For the energy use, it means the current energy consumption of the building; for IEQ, measurements of CO<sub>2</sub> level, ventilation, (operative) temperature, relative humidity, lighting and noise level of the installations; the perception of the end users will be measured by means of questionnaires. All three flows of information will be used for the creation of a model where a balance –if possible- between energy use and indoor comfort will be found. Depending on the performance indicators, and the interest of the different stakeholders, each flow will have a different weight. The relationships between the three flows will influence each other, and recommendations will be given according to what is more important for the key stakeholders.

This project is part of a larger initiative, “Energy efficient, healthy learning environment 2.0”, which is started by OPTI-school, a Brabant based knowledge centre for optimal learning environments, committed in finding useful innovations that could be applied to address the issue at hand, namely, the quality of school buildings throughout the Netherlands. The outcome of this project can have a significant, positive impact for the Dutch society: ensuring a good indoor environment for the students while they participate in their academic life, and doing this in buildings that are more efficient in their energy use can only be deemed

as very desirable. It results in cost minimisation, a better learning and teaching environment in which performances optimise and absenteeism minimises. Furthermore, during the project there will be direct communication with the end users, and this is an opportunity that can be used to raise awareness among them about the importance of using energy in an efficient manner, and about having a comfortable, healthy indoor environment. They can also spread this awareness among others, like their parents and friends, to encourage efficient energy consumption, and a more responsible behaviour.

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