



CONCEPT PAPER

INDOOR ENVIRONMENTAL QUALITY IN NEARLY ZERO ENERGY SCHOOLS

POOR IEQ

DETERIORATES

LEARNING PERFORMANCES & RESPIRATORY DISEASES

HIGH IEQ

REQUIRES

ENERGY USE IN BUILDINGS

SCHOOL BUILDINGS SHOULD BE
(RE)DESIGNED

TO MEET **HEALTH & NEARLY ZERO ENERGY GOALS**

the REHVA-ISHRAE concept paper

Indoor Environmental Quality (IEQ) is an important determinant of health and wellbeing. This is true for adults, but even more so for **children**. Children are continuously developing their lungs and other organs, which explains why they are more susceptible to e.g. air pollution. Traditionally, research and policy have been focusing on the environmental quality *outdoors*, while missing to address the fact that most people, including children, spend most of their time indoors. The two dominant indoor environments for children are the **home environment** and the **school environment**. In this seminar we focus on the latter one.

According to the World Health Organisation everybody has the **right to breath in healthy air** indoors¹. In the last decade a lot of attention has been paid to health problems and indoor climate complaints of those working indoor. As a result, in recent years many office buildings have been transformed from 'sick' to 'healthy' buildings. However, similar interventions are still missing in school buildings, where scholars are often not consulted with regard of their satisfaction about indoor comfort conditions. Without intervention, fine particles and CO₂ concentrations in schools could be higher (even three times or more) than in offices. Similarly, indoor temperatures in classrooms are often uncomfortably warm or cold and lighting conditions are far from optimal, while office buildings have well-filtered, airconditioned, well-illuminated and acoustically insulated spaces.

Several studies have shown that poor IEQ reduces children's **learning performances**. Furthermore, we know that suboptimal air quality in classrooms can have severe health consequences, like the development of chronic **respiratory diseases** and (indoor climate-related) allergies. In many European countries more than 20% of children have developed such diseases by the age of 12. This number in India is probably similar or even higher.

To warrant a healthy indoor environment, especially at school, we need to use energy for heating, cooling, ventilation or lighting of classrooms. **Energy performance** of schools should be optimized ensuring proper air quality, thermal, acoustic and visual comfort as mandatory goals. To have a proper balance between the initial investment and the recurring energy bills, the comprehensive approach of carefully designed school envelope and HVAC system should be followed, and not only reducing the delivered services to save energy. Another reason to minimize energy use in schools is of course to fight global warming. European countries as well as India have decided to ratify the Paris Agreement on Climate Change, which implies that all buildings, including schools, should be optimized, not just in terms of IEQ but also in terms of energy performance.

School is the place where young people stay for most of their day: a comfortable and healthy environment is necessary to safeguard their well-being indoor and to make sure they make the most out of their learning opportunities. Therefore, such indoor environments should be designed/redesigned with the health of children (and teachers) in mind, while making sure that the energy use of the schools is as low as reasonably achievable. Ideally, such energy use should be at the **Net Zero Energy level** with respect to non-renewable energy. Existing schools, all around the world, often do *not* meet neither the energy performance nor the IEQ criteria that children (and other school building users) are entitled to, as prescribed in standards and building codes. This is not acceptable because children are our future and we must take care of them as we must take care of the environment. Hence, **immediate action is needed**.

As a first step to make this happen, REHVA and ISHRAE are committed to **develop a comprehensive guidebook** that describes how to design a school building with high IEQ and energy performance levels, promoting increased learning performance by enhancing climatization, ventilation and lighting systems. A team of European and Indian experts from ISHRAE and REHVA is currently working on this guidebook, whose publication is foreseen in early 2019. The contents build upon an existing REHVA guidebook² and will be organized in two parts; Part I will cover the necessity of good IEQ and energy sustainability, basic principles of healthy building design and reduction of energy use. Reference to the distinct life cycle stages that a school building goes through will be presented. Part II will present practical examples from European and Indian case studies, where technical solutions enable the designer to achieve the expected goals in terms of health and energy performance.

Besides the guidebook, other actions are needed, for example, at the policy and school funding level. REHVA and ISHRAE are committed to teaming-up with governmental institutions, national and international organisations that are as motivated as we are to invest in **future generations** and to improve the Indoor Environmental Quality and Energy Performance of schools wherever they are placed, with the end objective as: healthy, energy efficient schools for all.

¹ WHO, 2000. Right to good healthy indoor air. World Health Organisation (WHO), Bilthoven, The Netherlands.

² d'Ambrosio F.R. (ed.) et al, 2010. Indoor environment and energy efficiency in schools - Part 1 Principles, summary of the key contents of REHVA Guidebook no 13. Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA), Brussels, Belgium