

Indoor Air Quality Society

- IAQS brings together, industry, academia and regulators in an international collaborative network.
- We are a partnership of international experts with a long record of research, publication and advocacy in IAQ.
 - Inform,
 - Educate,
 - Enable and support debate,
 - Influence policy-makers and governmental bodies.
- IAQS is a non-profit organization based in Belgium.



www.iaqsociety.org





SUSTAINABLE PLACES – DRIVEN BY INDOOR ENVIRONMENTAL QUALITY (IEQ)

Visualization and introduction to empower professionals and communities for Indoor Air Quality understanding

Chosen application: schools

Project presentation: Arvika, Sweden

Presenter: Mikael Börjesson, Director Future Solutions & Public Affairs – Swegon Group, member of IAQS



VISUALIZE
THE
INVISIBLE –
INDOOR
CLIMATE

Operation carbon
Built in carbon



Indoor climate



VENTILATION AND INDOOR CLIMATE IN SCHOOLS: RESEARCH-BASED EVIDENCE

Improving school air quality through scientific studies

A photograph of a classroom with rows of wooden desks and chairs, a blackboard, and a window on the left. The room is brightly lit, and the ceiling has several recessed light fixtures.

WHY VENTILATION MATTERS

Child Vulnerability to Poor Air

Children breathe more air relative to body weight making them more vulnerable to poor indoor air quality in schools. (Schools for Health, 2021)

Impact of Poor Ventilation

Indoor air quality (IAQ) and thermal comfort directly impact health and cognitive performance. (Brink et al., 2020)

Importance of Indoor Environment

Many schools fail to provide sufficient outdoor air supply and are often too warm (Turunen et al., 2014).

A blurred photograph of a classroom. A student with long brown hair, wearing a black jacket and a white face mask, is sitting at a white desk, writing in a pink notebook. The background shows other desks and chairs, and a window with light coming through.

TEMPERATURE AND PERFORMANCE

Impact of Lower Temperatures

Lowering classroom temperature from 25°C to 20°C improves student speed by 4% in arithmetic and language tests. (Wargocki et al., 2013)

Math Score Improvement

Each 1°C decrease between 20°C and 25°C increases average math scores by 12 to 13 points. (Wargocki et al., 2013).

Heat Impact on Exam Failure

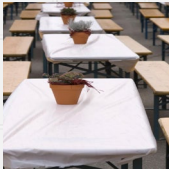
Students are 12.3% more likely to fail exams on 32°C days compared to 24°C days, highlighting heat's negative effect. (NYC study, 2013)

COMFORT, HEALTH AND ABSENTEEISM



Health Effects of High CO₂

Elevated CO₂ levels above 1,000 ppm cause fatigue, poor concentration, blurred vision, and panic attacks in students. (Fisk, 2017)



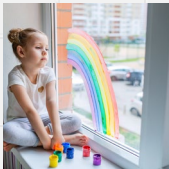
Ventilation Improves Performance

Increasing ventilation rates correlates with a 2.9% improvement in math and 2.7% in reading scores per 1 l/s per person increase. (Haverinen-Shaughnessy et al., 2011)



Reduced Absenteeism

Better ventilation reduces student absenteeism by 1.6% per 1 l/s per person increase and up to 20% by lowering CO₂ by 1,000 ppm. (Mendell et al., 2013)



Ventilation and Health

Low ventilation rates increase absenteeism and respiratory problems in school environments. (Chatzidiakou et al., 2012)



Improved Air Supply Benefits

Doubling outdoor air supply improves schoolwork performance by up to 14% for sensitive tasks. (Wargocki et al., 2016)



IN PRACTICE

Sweden - Arvika municipality - Minnebergsskolan

"A school for everyone" where all students would feel included and feel good.

Internet of Things for increased student health

Testbed for IoT

Sensors that measure acoustics, sound, light, heat and CO2 levels

SUSTAINABLE



INCLUSIVE

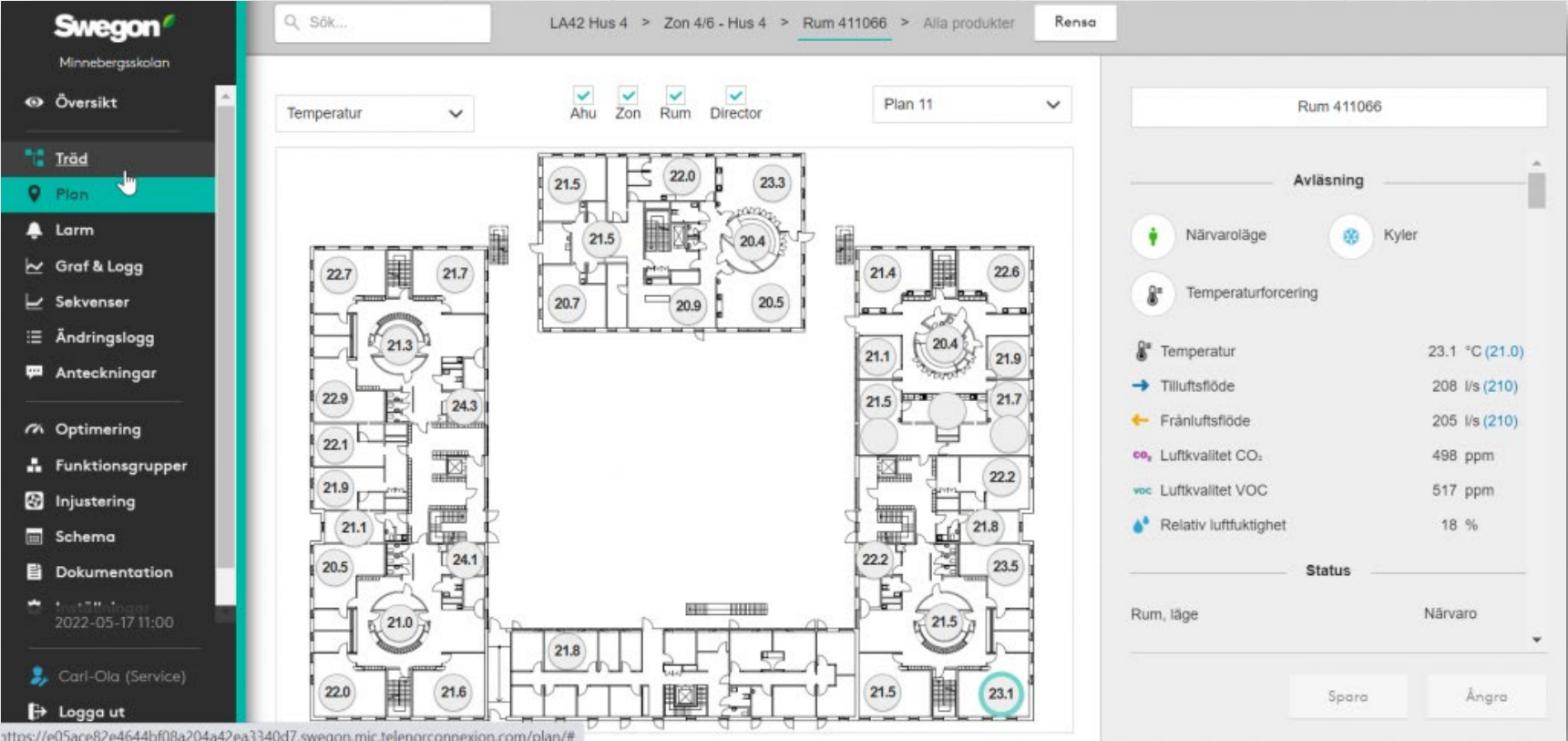


BEAUTIFUL

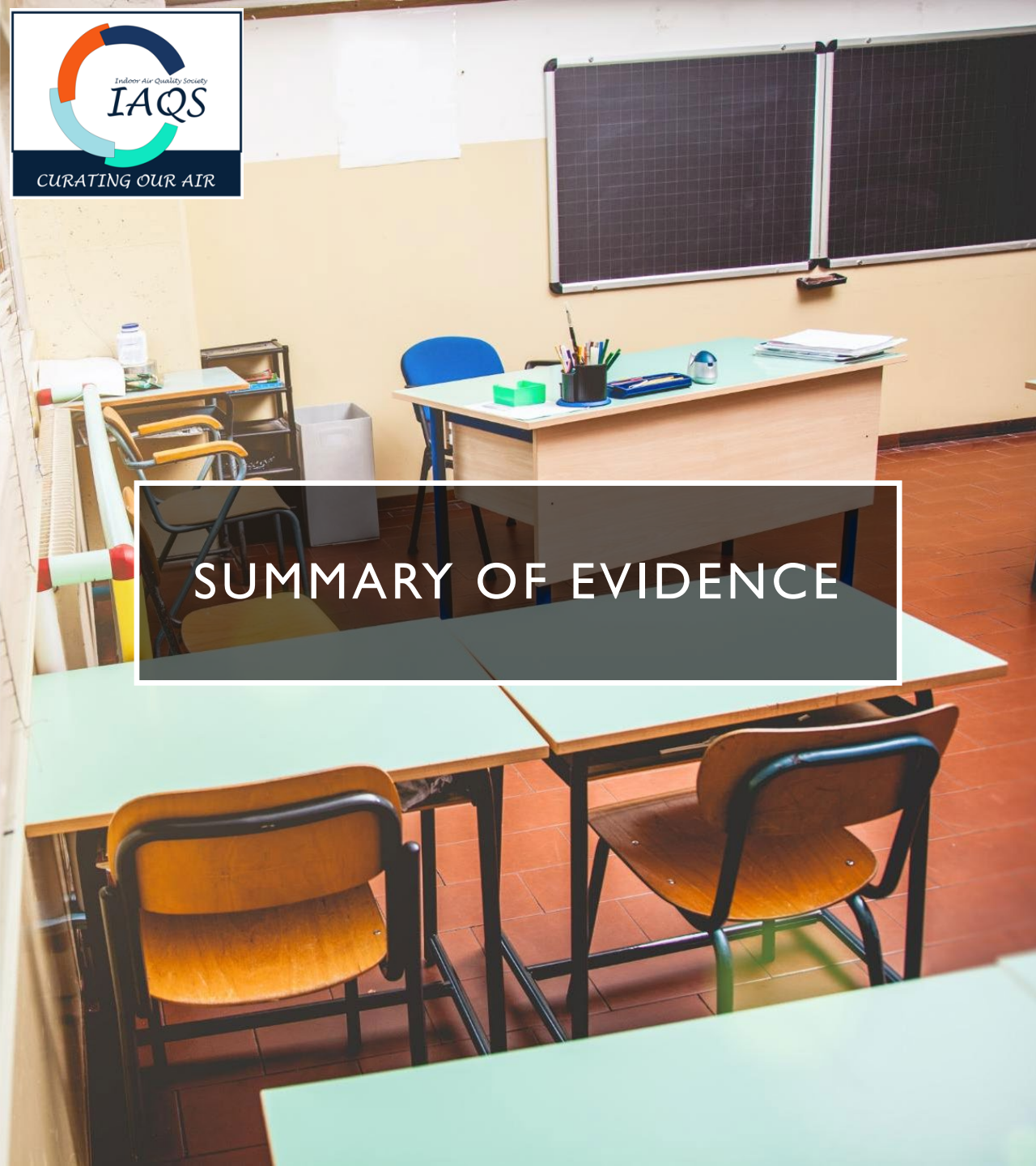


TOOLS TO VISUALIZE THE INVISIBLE

"Swegon measures temperatures and occupancy in all halls and some selected rooms are also supplemented with air quality sensors, which provide information about CO2 and volatile organic compounds. All data is collected in the cloud and can be retrieved through an API as a basis for those who want to build applications."



The screenshot displays the Swegon control interface for 'Minnebergskolan'. The interface includes a sidebar menu with options like 'Översikt', 'Träd', 'Plan', 'Larm', 'Graf & Logg', 'Sekvenser', 'Ändringslogg', 'Anteckningar', 'Optimering', 'Funktionsgrupper', 'Injustering', 'Schema', 'Dokumentation', and 'Logga ut'. The main area shows a floor plan with room numbers and temperature readings. A detailed view of 'Rum 411066' is shown on the right, displaying various parameters such as 'Närvaroläge', 'Kyler', 'Temperatur', 'Tilluftsflöde', 'Frånluftsflöde', 'Luftkvalitet CO2', 'Luftkvalitet VOC', and 'Relativ luftfuktighet'. The temperature is currently 23.1 °C (21.0).



SUMMARY OF EVIDENCE

Healthy Air, Healthy Minds

Protect Health: Clean air reduces illness and keeps students in class.

Boost Learning: Better air means sharper focus and stronger academic performance.

Invest Wisely: Ventilated schools are investments in both public health and future generations.



What Must Be Done – Now

Legislation: Set and enforce strong ventilation standards in schools.

Incentives: Highlight and reward successful models to accelerate change.

Funding: Prioritize resources—our children’s health and education come first.