

Relative humidity indoors. Case of low relative humidity.

The quality of the air we breathe in indoor spaces is incredibly important for our health and well-being and it is often overlooked. You may not realize it, but the air inside our homes, offices, and other indoor spaces can often be more polluted than the air outside. This is because indoor air can become contaminated with a range of pollutants, such as dust, mould, and chemicals from cleaning products and building materials.

Within the **K-HEALTHinAIR pills (K-pills)**, we will study different issues affecting IAQ and potential solutions that can be applied to get healthier indoors. In this K-pill, we will see the impact of using plants, in fact a vertical garden, indoors in order to keep the relative humidity of the air in proper values in dry indoor environments.

In this case, we use MANN+HUMMEL's air quality management platform qlair (<https://i-qlair.com>) combined with two Kaiterra Sensedge Mini sensors for the monitoring of two different meeting rooms in an office building. One of the meeting room is a plain meeting room and the other has a vertical garden in one of the walls (see pictures below). Both rooms have HVAC system and mechanical ventilation with similar settings. The IAQ monitor can provide continuous values (1-hour granularity) of carbon dioxide (CO₂), particle matter (PM₁₀ and PM_{2.5}), total volatile organic compounds (tVOC), temperature and relative humidity.

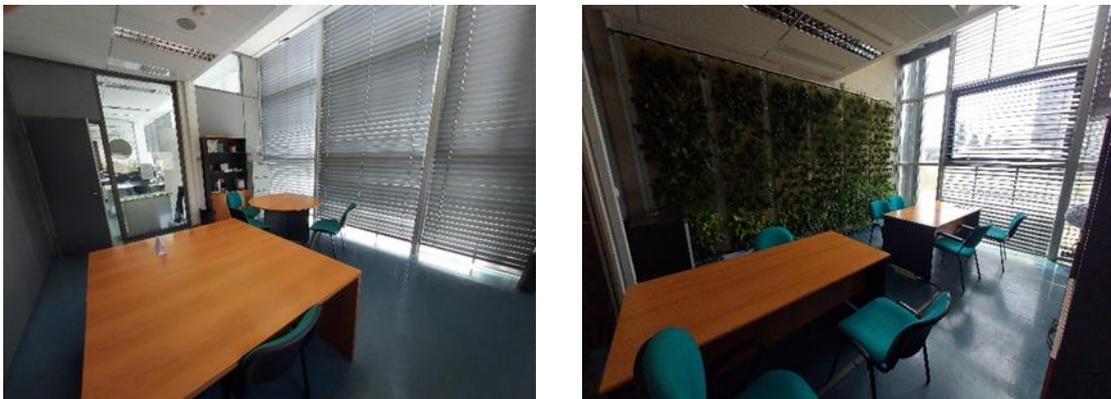
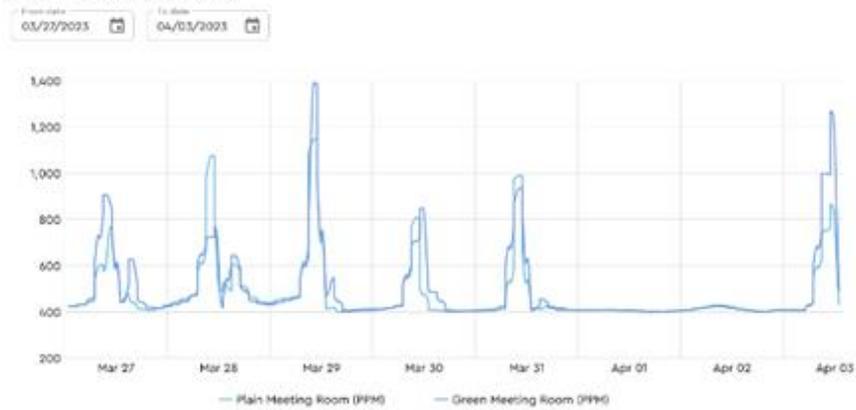


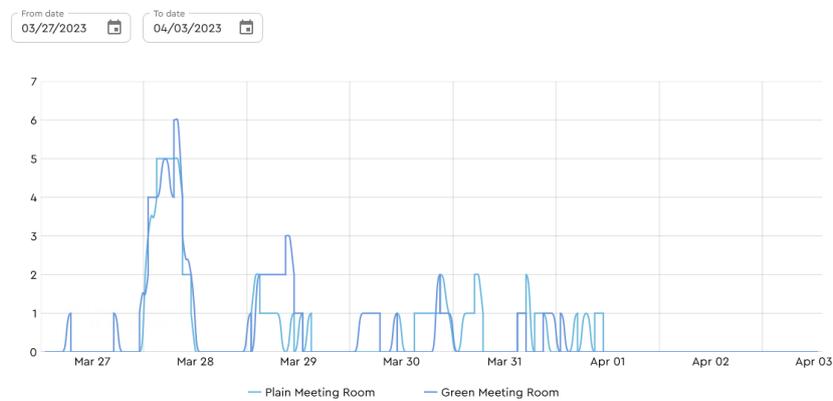
Figure 1. Plain meeting room (left) and green meeting room (right).

The evolution of the CO₂ during one week, we can see that the level of occupancy is similar for both rooms, well a little big higher in the case of the green room. Regarding PM, there are no major differences and both has low levels.

CO2 Measurement Comparison

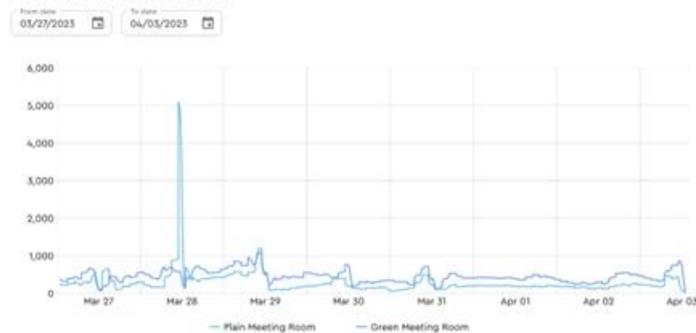


PM10 Measurement Comparison



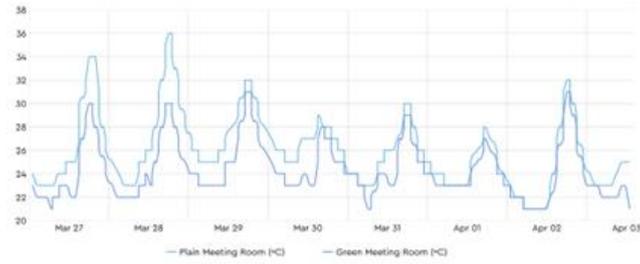
VOC profiles are also similar excepting in one “meeting” with an extra emission of non-identified VOC. In that case, we can see that the vertical garden has no influence on it under these low PM levels. Regarding **temperature**, with similar settings for the HVAC system and mechanical ventilation (no cooling system applied in this week), temperatures are higher in the plain meeting room, with major differences those days with higher sun irradiation and outdoor temperatures. It is associated to the evapotranspiration effect of the vertical garden.

VOC (PPB) Measurement Comparison



Temperature Measurement Comparison

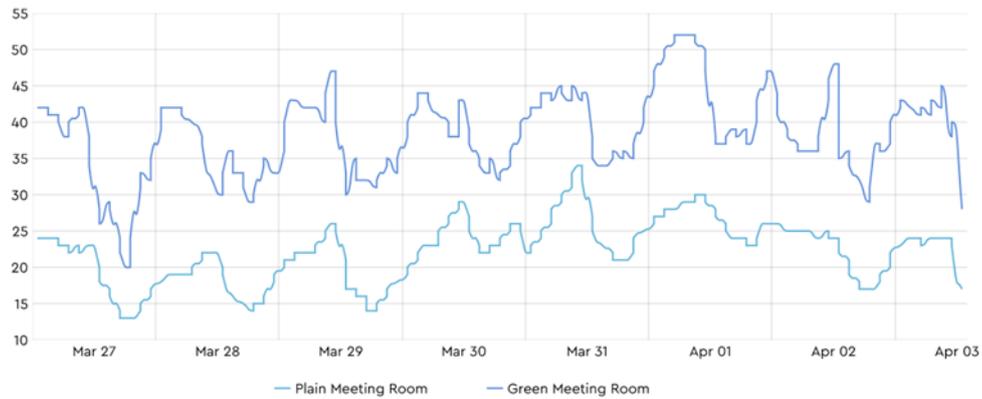
From date: 03/27/2023 To date: 04/03/2023



Finally, **relative humidity** is the most important factor in the comparison of both meeting rooms. Recommended levels are between 30% and 60%. In the case of the plain room, relative humidity levels are extremely low, with an average value of approx. 20%. In the green room the average value is approx. 35%.

Humidity Measurement Comparison

From date: 03/27/2023 To date: 04/03/2023



Low relative humidity in air can have various effects on human health, including:

Respiratory problems: Low humidity can dry out the mucous membranes in the nose and throat, making it easier for viruses and bacteria to enter the body. This can lead to an increased risk of respiratory infections, as well as worsen symptoms for those with asthma or allergies.

Skin irritation: Dry air can also cause skin to become dry and itchy, exacerbating conditions like eczema and psoriasis.

Dehydration: Low humidity can cause the body to lose moisture more quickly, leading to dehydration.

Eye irritation: Dry air can cause eyes to become dry and irritated, leading to discomfort and even vision problems in some cases.

Increased susceptibility to illness: When the air is dry, viruses and bacteria can survive and thrive for longer periods of time, making it easier to contract illnesses.

Overall, it's important to maintain a healthy level of humidity in the air to avoid these negative health effects.

Potential solutions

Use a humidifier: A humidifier is an appliance that adds moisture to the air, and can be used to increase the humidity levels in a home. They come in different sizes and types, such as ultrasonic or evaporative, and can be placed in different rooms depending on your needs.

Ventilate the home: Proper ventilation can help regulate humidity levels in a home. Opening windows and doors periodically can help exchange the dry indoor air with moist outdoor air, especially during the morning and evening when humidity levels are usually higher.

Use plants: Plants can act as natural humidifiers and help regulate humidity levels in a home. Some plants, such as *Spathiphyllum*, *Chlorophytum comosum* or *Nephrolepis exaltata*, are particularly effective at increasing indoor humidity.