Internal and External Environmental Conditions (element 4)

The measurement and monitoring of internal and external environmental conditions enables the researcher to understand the thermal and other environmental conditions in a building. When analysed in relation to occupancy and energy use, these parameters can assist in understanding the relationship between comfort levels, energy use and environmental conditions.

Level 3: Spot measuring / logging / monitoring additional IAQ / IEQ parameters lvl1

Cost: ₹₹₹/₹₹	Time: ⧖⧖⧖	Skills: 🖐🖐🖐

When balancing time, resources and intent of a study, it is important to establish what parameters are 'needed' vs. what is 'nice to have'. Temperature and RH are generally needed when doing any basic evaluation. The remaining are generally 'nice to have' and are only needed for specific objectives. As examples:

- Lux measurements are 'nice to have' and may be only necessary in specific studies, e.g. to establish the effectiveness of design in attempting to provide a claimed level of daylight for a space to meet specific standards.
- Noise (dB) measurements are also a 'nice to have' and may be only necessary in specific complaints or the impact of a busy road nearby. To validate claims of noise it is recommended that spot measurements are taken over a period of at least 5 minutes, with an average then taken.
- Indoor 'wind' (m/s) speed is helpful when collecting data for Predicted Mean Vote (PMV) calculations[1].
- CO_2 concentration is nice to have when studying airflow, stuffiness, window use, and ventilation effectiveness.

Potential tools:

- CO_2 loggers/meters
- Other specific loggers for parameters to be measured
- Material to affix loggers to walls or other surfaces

The table below lists recommended minimum resolution and accuracy for logging and monitoring devices.

Measurement	Resolution	Accuracy
CO_2	10ppm	±50ppm
Light	0.2 lux	±0.5
Wind speed	0.5 m/s	±5%
Global radiation	1 W/m^2	±10%

These parameters can be spot read, logged or monitored where these parameters meet the objective of particular studies. Refer to indoor air quality study of Kendriya Vidyalaya School[2] for methods to measure IAQ parameters in India.

[1] A.S.H.R.A.E. Standard, 2010. Standard 55-2010:"Thermal Environmental Conditions for Human Occupancy"; ASHRAE. Atlanta USA.

[2] Chithra, V.S. and Nagendra, S.S., 2012. Indoor air quality investigations in a naturally ventilated school building located close to an urban roadway in Chennai, India. Building and Environment, 54, pp.159-167.