DESIGNING HEALTHY AND RESILIENT SCHOOL BUILDINGS

Diksha Vijapur[1] ; Christhina Candido[2]

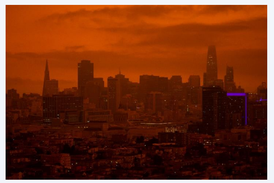
Faculty of Architecture, Building and Planning, The University of Melbourne, Parkville, VIC 3010, Australia

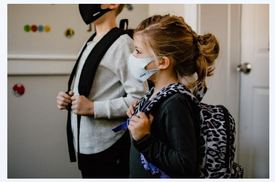
ABSTRACT

Enabling the potential to transform and adapt has become a substantial need, while designing Schools for the 21st century, due to:

- *Pedagogical transformation [1]*
- *Climate change resilience [2] and*
- *The covid-19 pandemic [3]*

In all these scenarios, the BUILT-ENVIRONMENT is identified to play a critical role, by providing healthy indoor environmental conditions, to enable schools to be operational.





OBJECTIVES

The outcomes of this study intend to identify gaps in current design guidelines, that could inform adaptation and resilience measures that need to be addressed in school building design, to:

- *Ensure a high-performance outcome for school building designs*
- *Safeguard the operational resilience and IEQ performance of school buildings*
- *Provide a healthy and safe environment for students*

In Australia, there is a significant growth in school infrastructure projects due to the population growth in many suburbs, and as part of this new infrastructure rollout, the design of learning spaces is changing at fast pace. It is critical that the key design priorities are adequately satisfied, in all the new School buildings, as well upgrading the existing building stock.

METHODS

The current research study reports Indoor Environmental Quality (IEQ) monitoring conducted in NSW Public Primary Schools. The monitoring was conducted pre-pandemic and also during the ongoing pandemic-restrictions.

The following IEQ parameters have been monitored:

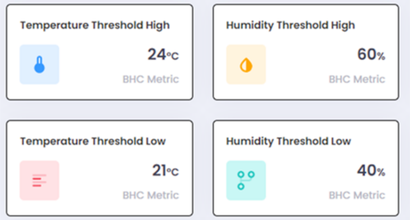
- *Indoor air temperature*
- *Relative Humidity*
- *Air-velocity*
- *Indoor air quality (CO2, PM2.5, PM10, TVOC)*

The Climate change projections for the IEQ monitoring locations are identified through the data provided by the NSW Government, through the Adapt NSW website. The likelihood of potential risks and their frequency are identified from the NarClim data, and compared against the IEQ monitoring data, to be able to identify the IEQ risk mitigation measures, for schools.

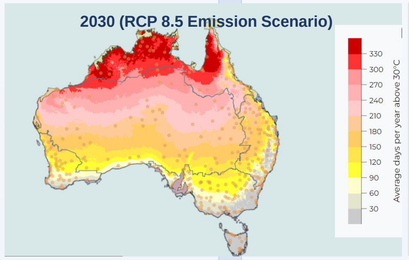
DISCUSSION

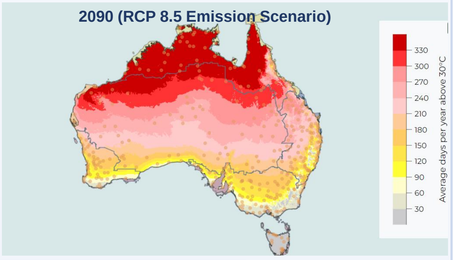
A recent review of current literature has revealed several gaps and shortcomings, and a lack of empirical evidence on IEQ within contemporary 21st century Primary School buildings (Vijapur, Candido, Göçer, & Wyver, 2021)[4]. This constitutes a significant challenge considering the extensive body of work from traditional classrooms showing the impact of IEQ on learning (Heschong, 1999)[5], academic performance (Bakó-Biró, Clements-Croome, Kochhar, Awbi, & Williams, 2012)[6] and overall satisfaction (De Dear, Kim, Candido, & Deuble, 2015; Haddad, Osmond, & King, 2017)[7,8]. Combined with the need for climate change resilience, it is a high priority for the Built environment professionals.

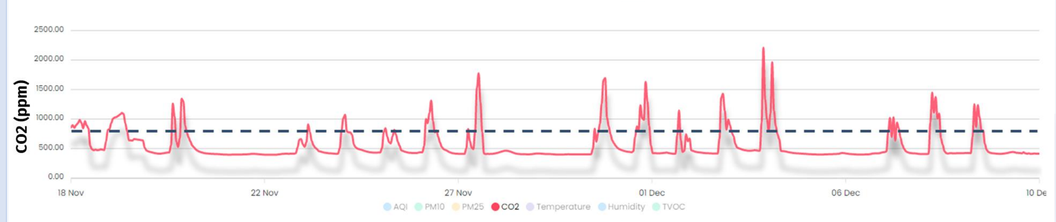
RESULTS

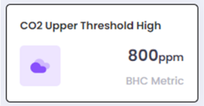


The graphs present IEQ monitoring data conducted in Primary school settings, from pre-pandemic scenario, and have been compared against the thresholds specified in the WELL Building Standard, due to its holistic approach relevant to the design and performance of healthy environments. It is observed that mitigation strategies are required, to cope with the future climate projections.









CONCLUSION

- *21st century has witnessed a paradigm shift in the physical design of learning environments.*
- *At the same time, there is an increasing urgency for the built-environment to be resilient to climate change, while protecting the indoor environmental conditions from the adverse impacts of unforeseen climate extremes.*
- *Covid-19 has put the spotlight on Indoor Air Quality and Occupant health*
- *School buildings are considered as one of the most important infrastructure, as they are expected to remain in the same operational model (i.e. Students attend school everyday and spend around 90% of their time indoors).*
- *Designing for Health and resilience are the need of the hour.*

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