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Editorial

Ventilation and Indoor Air Quality

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Indoor air quality (IAQ) issues became important in the 1980s to protect the public's health and well-being. Since then, people have become aware of the fact that buildings not only provide them with a sense of security but can also significantly affect their health and well-being.

A significant number of scientific organizations and universities undertake research in the field of IAQ to this day, and the number of discoveries in this field is increasing. Ventilation and IAQ standards have been developed over the years by professional associations for engineering design and standard organizations such as CEN (European Committee for Standardization), ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) or ISO (International Organization for Standardization). Since the COVID-19 crisis, the interest in IAQ and ventilation has grown exponentially—even though ventilation is not enough to eliminate the risk of airborne virus exposure. Ventilation is a critical part of a larger strategy to improve IAQ issues in modern buildings, including schools, restaurants, public transport vehicles, and spaces. Poor indoor air quality has been linked to sick building syndrome, reduced productivity of office workers, and impaired learning over the last several decades. Ventilation enables the removal of air pollutants and can help in controlling indoor humidity as well as contaminant levels.

In connection with the growing need to determine the level of indoor air pollution, new research centers performing tests and investigating new methods have been created with research scopes including an increasing number of harmful substances and test methods. This Special Issue, titled "Ventilation and Indoor Air Quality", aims to provide readers with a comprehensive summary of the case studies based on the current work being carried out to solve ventilation and IAQ problems. It presents 19 papers related to regulations, homes, modelling, field studies, and technology related to IAQ. The papers are published in *Atmosphere*, *Environments*, *Buildings*, and *IJERPH*. The focus of the papers ranges from data collection to modelling.

Government agencies and professional associations develop indoor air quality standards and guidelines to protect public health. This Special Issue has two technical papers on the efforts of the government and health organizations. The paper by Hu and Cheng [1] discusses the efforts of the Taiwanese government in regulating IAQ since 2011. Eventually, the Taiwanese government implemented the self-managed IAQ certification in 2021. The authors conducted a questionnaire survey before the Taiwanese government officially implemented the certification. They found that the proposed IAQ certification complies with international standards and has continuous monitoring and information disclosure methods. In another paper, Wakefield and Glantz [2] examined efforts by health organizations seeking comprehensive smoke-free ordinances over Louisiana casinos and bars.

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They found that ongoing local campaigns, social justice themes, and cultural messaging with coalitions in cities can secure smoke-free laws covering casinos and bars and that local ordinance campaigns are a viable method for advancing smoke-free protections over those venues in states where the state legislatures are resistant to action.

People naturally love their places of residence and would like them to be safe for families and guests. Four papers have been published in this issue to study IAQ problems in homes and apartments. Research by Moreno-Rangel et al. [3] focuses on indoor air quality in Latin America's Passivhaus homes. They concluded that Passivhaus dwellings could provide better and healthier indoor air quality in Latin America. A similar theme was examined in the homes of those employees working from home during the COVID-19 pandemic by Roh et al. [4]. In this research, the authors suggested that working from home might have a detrimental health impact due to poor IAQ and providing interventions to remote employees. The IAQ issues caused by unregulated chemical substances in Korean residential environments, i.e., in homes, are explored by Kim et al. [5]. Authors suggest that it is essential to reduce the emissions of α-pinene and limonene through the processing of wood, extending its drying period, and determining the most appropriate time of use. The performance of a five-story apartment building equipped with modern passive stack ventilation in Nordic conditions was examined by Kravchenko et al. [6]. The results show a significant effect of poor maintenance and the possibility of opening windows to control the CO_2 concentration.

IAQ modelling is a cost-effective alternative to experimental studies, although it may be associated with greater uncertainties in the obtained results. This issue has six modelling papers dealing with different aspects of indoor air quality. Zhao et al. [7] showed that errors in predicting household formaldehyde concentrations using a time-varying model were substantially less than those using a traditional constant emission rate model, despite requiring less unique building information. Rasmussen and Cornelius [8] developed a theoretical model for balancing an acceptable radon concentration in indoor air. Matheis et al. [9] presented a computational modelling study of the transmission of SARS-CoV-2 in the main types of public transport vehicles and stations to comparatively assess the relative theoretical risk of infection of travelers. Yu et al. [10] investigated the mediating effects between solid fuel use and self-rated health by using structural equation modelling (SEM). Air flow distribution and contamination control in an operating room have been examined by Wang et al. [11] using computational fluid dynamics (CFD) and field measurements. Under normal operating conditions, the contaminant concentration slightly increased while performing surgery, with an average value of 420 ppm. Abdullah and Alibaba [12] proposed a performance-based window design model for optimized natural ventilated offices.

Experimental work gives an insight into the physical processes involved in originating IAQ problems as well as solving them. Four provided papers discuss the new type of experimental work. Oda et al. [13] examined the different approaches undertaken in Japan to prevent COVID-19 against pollen and house dust antigens in patients with allergic rhinitis. The study found that 47.5% of the pollinosis patients reported improvement in nasal symptoms after the three seasons of pollen dispersion in the COVID-19 era based on the clinical records of the patients. Guo et al. [14] measured air quality inside three different brands of new vehicles. A higher concentration and different volatile organic compounds (VOCs) released from the indoor materials were observed during sunny conditions. Wallenius et al. [15] examined the data collected from 2010 to 2019 on VOC and formaldehyde in Finnish offices, schools, kindergartens, and health care offices. They found that the concentrations of individual VOCs and formaldehyde in these work environments were generally very low and posed no health risks which is due to the reduction in the use of formaldehyde resins in indoor products. The characteristics of airflow to prevent the dissemination of contaminants such as viruses were studied by Kim et al. [16] using a mobile slipstream measuring device in a motorcar.

This Special Issue contains three papers related to indoor quality technologies and applicable techniques. The paper by Alexei et al. [17] tested the effectiveness of a novel

window windcatcher device (WWC) for improving natural ventilation in buildings. The proposed window windcatcher has been shown to improve both thermal comfort and indoor air quality. Another interesting paper by Siebler et al. [18] evaluated indoor airborne virus transmissions using two methods (a generalized experimental set up and a trace gas method) for several ventilation measures. Readers will enjoy a review of indoor air quality cleansing technologies by Mata et al. [19]. The paper discusses physicochemical as well as biological technologies. Meta et al. [19] concludes that the optimum solution may involve the use of a combination of technologies to solve IAQ problems.

Overall, this Special Issue provides new information to the readers and introduce new research areas for solving IAQ problems. It is hoped that readers of this Special Issue will be inspired and their minds stimulated to conduct further research on IAQ issues.

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