Special Issue

Building Ventilation and Air Quality: Integrated Approaches for Human Health, Energy Efficiency and Sustainable Environment

Message from the Guest Editors

Building ventilation and indoor/outdoor air quality are critically important due to extreme weather, health awareness, and people spending ~90% of their time indoors. Indoor pollutants often exceed outdoor levels from poor ventilation, material emissions, and occupant activities. Modern buildings also worsen urban heat islands via heat-absorbing materials, increasing ozone, pollutant levels, and cooling energy demands. Indoor and outdoor environments are interconnected through air exchange, allowing pollutants, heat, moisture, and pathogens to cross the building envelope. This demands an integrated air quality approach to support healthier, energy-efficient, and climate-resilient buildings aligned with Sustainable Development Goals. Advances in AI, machine learning, sensors, and digital twins now enable real-time monitoring, predictive control, occupant-centered strategies, and demand-controlled ventilation—improving health and cutting energy use in near-zero-energy buildings. We invite researchers, practitioners, and industry professionals to contribute to this timely collection.

Guest Editors

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About the Journal

Message from the Editor-in-Chief

Current urban environments are home to multi-modal transit systems, extensive energy grids, a building stock, and integrated services. Sprawling neighborhoods are composed of buildings that accommodate living and working quarters. However, it is expected that the cities and communities of the future will face complex and enormous challenges, including maintenance, interconnectivity, resilience, energy efficiency, and sustainability issues, to name but a few. A smart city uses advanced technologies and a digital infrastructure to improve the outcomes in every aspect of a city's operations. A smart building optimizes the experience of occupants, staff, and management by using a modern and connected environment. Innovations in technology that can bring dramatic improvements to design, planning, and policy are critical in developing the cities and buildings of the future.

Editor-in-Chief

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