

Special Issue on Buildings of the Future: Notes From Guest Editors

Buildings, where we spend over 90% of our time, will likely be driven by disruptive innovations in the next century, as science and technology developments have been shaping our lives. Today's buildings consume one-third of the global energy and contribute to one-third of greenhouse gas emissions. Emerging challenges such as vulnerability to a changing climate and resource scarcity make it imperative to develop a forward-looking vision.

Familiar near-term goals for buildings include making them “net zero ready,” followed by “net zero energy,” in which the actual annual source energy consumption is balanced by onsite renewable energy, and finally “carbon neutral,” in which both the operating and the embodied sources of carbon are taken into account. Assuming that buildings can achieve carbon neutrality, what then? What are the other desired outcomes for ubiquitous building services? The U.S. Department of Energy Building Technologies Office, in collaboration with the Pacific Northwest National Laboratory, led a discussion of the desired long-term future of typical U.S. buildings through a series of panel discussions, webinars, and workshops. The objective is to define a set of building attributes, complete with corresponding metrics and targets that can serve as the long-term goal for residential and commercial buildings in the U.S. These attributes include not only energy and carbon emissions but also the health, wellbeing, and productivity of building occupants, how buildings integrate with the larger community and ecosystem around them, how buildings are constructed and/or manufactured to optimize resource use, and their resilience and flexibility to adapt to changes and be repurposed to meet future needs. Can we transform the way we design, build, and operate buildings to achieve these short-term and long-term goals? How may technology breakthroughs and innovative collaborations shift the paradigm? This vision, which will be published later in a separate article, aims to inspire scientists from various fields to explore revolutionary and integrated ways to truly achieve sustainable, healthy, adaptive, and productive buildings.

A series of panel discussions and workshops were organized among hundreds of forward thinkers in the fields of architecture, urban planning, security, energy, water, health, climatology, etc. This special issue is an extension of the yearlong discussion on *Buildings of the Future*. It is intended to provide an open forum to discuss the wide spectra of future buildings, such as whole building design concepts, specific technologies, and design and analysis approaches. The selected articles represent various perspectives from researchers, designers, educators, and policy makers in multiple building-related fields. Most authors were panelists and active participants of the *Buildings of the Future* vision discussion throughout the project period. It is hoped that this special issue will inspire more creative thinking and innovative ideas to inform future research, development, and strategic planning on the built environment, as described at the website.¹ Collaboration among researchers and practitioners in many fields is essential for us to reach the long-term goal of revolutionizing the built environment to minimize environmental impacts while achieving healthy, adaptive, and productive buildings.

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¹<http://futurebuildings.pnnl.gov>