

Guest editorial: Learned lessons and design implementations towards sustainable architecture

Special issue 47(3) of the *Open House International* is dedicated to design lessons, methods and implementations towards sustainable architecture. The topic is widely recognized as an important issue in contemporary architectural discourse. Distinctive characteristics of sustainable architecture appear in different countries and regions, relying on climatic conditions, cultures and traditions, all of which shape idiosyncratic architectural designs towards sustainability (Hart, 2011; Park, 2014). As this notion is deeply rooted in the environment, culture and custom of a society and has developed to adapt to surrounding nature, its significance in the aspects of culture and human civilization cannot be overemphasized. In the past few decades, sustainable architecture has been promoted to reduce the negative environmental impacts of buildings by employing numerous design methods, energy efficiencies, materials and waste managements and to make architecture more sustainable (Lechner and Andrasik, 2021).

The topic has triggered a large body of research into the interactive relation between learned lessons and design implementations (Abdelkader and Park, 2018). Lessons learned from prior design strategies as well as local and regional architecture may be adaptable and applicable to the development of contemporary sustainable architecture in different climates and regions and vice versa (Le *et al.*, 2013). Many architects not only simply imitate the sustainable methods in their designs but also try to grasp or adapt the principles and lessons to suit the needs of a modern setting. Hence, the sustainability lessons could be regarded as valuable insights or knowledge resources to develop more resilient alternatives of sustainable architecture, whereby traditional passive approaches can be reinforced with contemporary active technologies (Yeang, 2008; Mileto *et al.*, 2015; Sayigh, 2019). The collaborative approach is thought to accelerate progress for sustainable architecture.

Many excellent articles were submitted presenting the results of studies and insights following the aims of the journal and the topics, which were difficult to choose from. For the issue, only ten articles were selected for publication that attests to the interest of the theme of the call for papers. The diverse spectrum of design research opens opportunities for developing an architecture that is more climate-responsive, adaptive and durable. The articles selected for publication range geographically from Africa to the USA and from the Middle to the Far East. The scope is also broad, from a building to residential blocks, architecture, to open public spaces. The topics addressed fall into three main groups. The first is concerned with design strategies and principles in different climates and regions. The second deals with initiatives, techniques and strategies learned from sustainability studies. The third is concerned with innovative concepts and insights for building implementations.

Christian Koranteng, David Nyame-Tawiah, Kwabena Abrokwa Gyimah and Barbara Simons in “An explorative study on the potential of green roofs providing thermal comfort conditions for indoor spaces in Kumasi, Ghana” evaluate green roofs to determine whether they could provide thermal comfort within residential buildings in the region. By collecting years of weather data and conducting test cells to determine the potential of green roofs on



temperature development, this study suggests some benefits of using green roofs for indoor temperature reduction and subsequent energy use reduction. Moreover, they also used a simulation model of the thermal performance of the test cells to investigate appropriate variables for temperature reduction and to explore design options for temperature reduction.

In “Application of green building concepts and technologies for sustainable building development in Sub-Saharan Africa: the case of Ghana,” Lee Felix Anzagira, Daniel Duah, Edward Badu, Eric Kwame Simpeh, Samuel Amos-Abanyie and Alexander Marful undertake a questionnaire survey analysis of the selected construction stakeholders to measure the current level of the adoption and application of green building concepts and technologies in Ghana. The study identifies that the preference for using green building technologies is in the order of “optimizing site planning, building orientation, and configuration,” “use of natural ventilation,” “integrative use of natural lighting with electric lighting systems,” “application of energy-efficient lighting systems,” and “use of permeable paving: low-traffic areas.”

Lakshmi Visakha Vishnubhotla, Sornambiga Shanmugam and Srinivas Tadepalli in “Developing climate-responsive passive strategies for residential envelopes in the warm humid climate of South India” present a stepwise simulation approach to find the optimum result of sustainable strategies, such as optimum orientation, insulation thickness, window-wall ratio and cross-ventilation and shading depth impact in a single detached house in two cities (Tiruchirappalli and Coimbatore in India). In conclusion, the authors summarize design guidelines for the cities to what optimum values of each strategy are readily applicable to any residential design in both cities, during the daytime and nighttime.

Tian Feng, Yiru Huang and Bo Zhou in “Carbon emissions and in-building open public spaces: a case study on hypothetical building models in Shanghai” build a framework to assess the impact of life cycle carbon emissions on different in-building open public spaces in affordable housing. A parametric model of a typical affordable housing building in Shanghai, China, was constructed, and 36 variations of open public spaces were studied. The study reveals the results that the life cycle carbon emissions decrease with the application of the open public space, and the carbon reduction due to user transport is seven times higher than the carbon increment due to construction and long-term operation.

The paper by Hyoungsub Kim, Se Woong Kim, Yongjun Jo and Eujin Julia Kim, entitled “Findings from a field study of urban microclimate in Korea using mobile meteorological measurements” is about the study of the effects of building shadow and landscape features on the outdoor thermal environment of an open square in Seoul, Korea. Collecting high-resolution meteorological data through a mobile field measurement analyzes the thermal characteristics of the square. The findings of the study include the effects of shading from adjacent buildings around the square reduced hourly air temperature. While other landscape features, such as grass and foundation, have very little influence on improving outdoor thermal comfort, street trees in the East area of the square influenced the reduction of average physiologically equivalent temperature (PET) values.

Funda Gençer and Ilker Karadag in “Numerical evaluation of pedestrian-level wind and indoor thermal comfort of a historical monument, Mugla, Turkey” analyze thermal and wind comfort conditions of a historical mosque’s interior and outdoor spaces for planning of further conservation decisions. The analytic work provides important aerodynamic information on a building and its surrounding area for wind quality improvement in urban areas.

Salih Ceylan in “Vernacular architecture of Turkish eastern Black Sea region: a case study in Senoz (Büyükdere) Valley” aims to elaborate on the characteristics of vernacular architecture throughout the field survey and to examine its traditional design methods and principles for sustainability goals. The study reveals that the unique characteristics of the region’s vernacular architecture in construction and planning still exist, so they need to be

further studied and sustained. The lessons should apply the development of contemporary sustainable architecture in the region.

In “Analysis of vernacular houses in southern Vietnam, and potential applications of the learned lessons to contemporary urban street houses,” Le Thi Hong Na, Jin-Ho Park, Yangsook Jeon and Sejung Jung examine spatial layouts and sustainable features of vernacular house components that contribute to climate-adaptive strategies in southern Vietnam through the field survey. Based on learned lessons from the in-depth analysis, it dealt with a design application and how the lessons can be applied for the development of a contemporary housing design, particularly low-rise street houses in contemporary urban Vietnam.

Ender Peker in “Exploring Locally-produced Design Solutions for Thermal Comfort: A Socio-technical Assessment” explores design solutions for thermal comfort in the vernacular settlements of Mardin, Turkey. Throughout the analysis of 30 vernacular housing typologies, the author sets different attribute categories to measure the conditions of thermal comfort. The author concludes that the residential buildings in the heritage town were developed by considering how end-users interact, adapt and sustain their everyday life following the local climatic characteristics.

Zul-Atfi Ismail in “Implementation of BIM-based model checking technology for managing maintenance planning in green building ecosystem” discusses the main features of building information modeling-based model checking (BMC) tools and techniques currently being employed on such green building maintenance ecosystem. While highlighting the importance of early adoption of BMC in the design phase, the authors underscore the need to develop and implement computational methods and algorithm strategies to better increase maintenance safety, sustainability and construction planning.

The guest editor wishes to thank the authors as well as the reviewers who have contributed to this special issue of *Open House International*, 47(3). Your trust in working with us is an honor. I hope that this issue is most rewarding and its theme is valuable and inspiring to all who read it.

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