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Article

Sustainable planning and design: Urban climate solutions for healthy, livable urban and rural areas

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Editorial

Sustainable planning and design: Urban climate solutions for healthy, livable urban and rural areas



More than half of the world's population lives in urban areas. However, we are now facing various urban environmental problems. In the context of global climate change, the heat island effect further exacerbates abnormal weather phenomena, such as heat waves, as well as health risks to urban populations such as respiratory distress and heat stroke, resulting in adverse effects on the urban climate and human comfort. Research on health-and-comfort-oriented urban planning and design has been emphasized in recent years. Urban planners, managers, and designers should encourage urban management and environmental planning/designs in order to provide a better climate in both urban and rural areas.

Cities are planned, managed, and designed based on local climate concerns related to the built environment while taking into consideration solutions leading to sustainable design. The main technical measures are usually categorized as occurring at the meso-scale or micro-scale. At the meso scale are urban wind corridor planning analyses based on land use and development intensity, quantitative studies of the heat island effect based on high-resolution remote sensing technology, and green space ecological planning intended to mitigate the urban heat island using geographic information systems.

This special issue is composed of three articles. They provide insights into challenges related to sustainable solutions and offer potential research directions. The first paper discusses urban heat island mitigation solutions from a meso-scale perspective. A ventilation corridor is an important technique that can be used to mitigate local climate problems. Previous studies have often analyzed the volume of ventilation from the perspective of geometric morphology; however, there has been a lack of discussion on the performance of ventilation corridors. Fang et al. designed ventilation corridors addressing temperature influences based on land cover in order to improve urban ventilation efficiency. A more strategic, integrated process could help to ensure that multiple ventilation corridors are provided to the areas of cities that need them most.

The second paper discusses improvements in human comfort from a micro-scale perspective. At the micro scale are wind and heat simulation applications of CFD (Computational Fluid Dynamics) technology. These simulations are intended to optimize urban space planning and architectural designs for research and parks or green spaces as well as urban street tree landscape designs intended to improve human comfort and mitigate heat risks. Trees play an important part in landscaping as well as in thermal environment modifications. It has been shown that trees offer a cooling effect to some extent that may mitigate thermal stress. Tree crown characteristics are closely linked with the cooling performance of trees. Wang et al. found that trees with wider crowns and/or shorter trunks create optimal microclimates and maximize human thermal comfort in summer. This information provides optimistic approaches for further urban design and planning directed toward climate modifications.

The third paper discusses spatial suitability assessments of proposed sustainable solutions for hilly areas. Spatial planning of infrastructure facilities is a challenging task in hilly areas because of topographical variations, ecological sensitivity, and extreme climatic conditions. Kapoor et al. took a case study for implementation of a developed methodology that is a useful aid to decision making for practitioners involved in the planning of infrastructure facilities in hilly areas. The developed methodology was applied for performing a spatial suitability assessment of the allocation of land for constructing facilities on a case study site located in a hilly area to ensure sustainable development in this location.

This special issue was organized with generous support from the Editor-in-Chief Shih-Kung Lai to explore insights into sustainable urban development incorporating urban climate strategies and innovations. Our hope is that this special issue provides further information on local climate strategies that will lead to improvements in urban and rural environments from a sustainable development perspective.

Dr. Chun-Ming Hsieh is currently an associate professor in the Department of Urban Planning, Tongji University. He has a bachelor's

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degree in civil engineering from National Taiwan University and a master's degree and doctoral degree in urban engineering from the University of Tokyo. He served as an assistant professor in the Department of Urban Planning at National Cheng Kung University. He received the Young Investigator Award (Taiwan) and participated in the Pujiang Talent Research Project (Shanghai). He has devoted himself to research in fields related to urban planning and environmental and energy issues, including healthy cities, health-and-comfort-oriented architectural and urban design, the urban climate, wind corridor planning, CFD heat island simulations, and urban green energy planning. He is currently the Associate Editor of The Journal of Urban Management.

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