



Editorial: Building More Sustainable and Resilient Urban Energy Infrastructures

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Editorial on the Research Topic

Building More Sustainable and Resilient Urban Energy Infrastructures

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Energy sustainability is one of the most important and challenging issues in humanity's future urban development and has been highlighted in the Sustainable Development Goals (SDGs); specifically in the 7th SDG, where more than 190 member countries of the United Nations have committed to "ensure access to affordable, reliable, sustainable and modern energy for all" (SDG 7) by 2030. In this avenue, mounting evidence shows that our energy infrastructures can be very vulnerable to climate change, natural disasters, and global pandemics. During the unprecedented development and expansion of cities and the building of energy infrastructures to support them, we are facing ever greater challenges in realizing both sustainable and resilient energy infrastructures that do minimal harm to our environment.

Nowadays, cities are highly globalized and urban energy infrastructures not only include local electricity transmissions and household end users, but additionally energy supply chains that go beyond urban and national boundaries to boost the growth and development of our cities. Because of the COVID-19 crisis and the broader climate challenge, our demand of understanding the relationship between urban well beings and energy infrastructure have been unprecedentedly strong. To capture the dynamics of energy infrastructures and their underlying causes, we should embrace interdisciplinary fields of energy, environment and social studies. Now, there is a strong and emerging trend focusing on the evaluation of urban energy infrastructures across the spatial scales of cities, regions, countries and the world. The Research Topic on "Building More Sustainable and Resilient Urban Energy Infrastructures" gathers advanced research approaches, integrated indicators, and applications to improve the sustainability and resilience of urban energy infrastructures.

The study by Wei et al. completes a detailed sector-level inventory of energy-related GHG emissions for 167 cities worldwide; where by, in three successive studies they

identify the major sources of emissions, track historical emission changes, and analyze near-term (2020s), mid-term (2030s), and long-term (2040–50s) carbon reduction targets of cities. Because of the profound impact of urban activities on global climate change, the accounting of GHG emissions at the city level is of great practical value for policy-makers and sustainable energy practitioners. This study provides a basis for future climate change research, i.e., it provides a more consistent sector-level inventory of urban GHG emissions and climate targets, which covers a wide range and variety of cities around the world. It maximizes the consistency of approach and data that allow a fairer and more transparent evaluation of decarbonization progress in cities.

The study by Cheshmehzangi and Dawodu explores the impact of Floor Area Ratio (FAR), the ratio of accumulated built floor areas against the size of a site/plot, on energy consumption in Ningbo (China). The rapid development of cities has led to a significant increase in the FAR of residential areas, which is a key factor leading to an increase in energy consumption that cannot be ignored. Few energy consumption-related studies have addressed FAR at this stage, this study is an innovative step toward the frontier where FAR acts on energy consumption. Considering the alarming number of new residential developments underway worldwide, especially in developing countries, this study advances empirical directions for urban stakeholders to achieve more energy-efficient building configurations and spatial layouts.

The study by Tian et al. focuses on the unsustainability of imported fossil energy in remote island communities and how solar energy can increase the utilization of clean renewable energy in those areas. Based on a simple equation developed by the U.S. National Renewable Energy Laboratory, this study uses a low-cost method with easily available data sources suitable for developing and remote island communities to assess the potential of rooftop solar systems. The study applies this methodology in two major cities of the Galápagos Islands, Ecuador, i.e., Puerto Baquerizo Moreno and Puerto Ayora, and provides recommendations for the relevant policy-makers to address and provide practical solutions to their unsustainable fossil-fuel dependence. The presented methodology can be replicated in other remote island urban communities to help achieve energy self-sufficiency and sustainable urban energy infrastructures; especially in areas where the initial assessment of costs may be a barrier to developing solar energy due their remoteness.

In a study conducted by Cao et al. an investigation of the urban micro-climate and human thermal comfort levels in

Chigang Community (Guangzhou, China) reveal how blue-green infrastructures (BGIs) in urban planning, e.g., lakes and urban vegetation, play an important role in moderating climate. Similar to the second study, urban planning and spatial layouts are considered to be significant factors that directly or indirectly affect the climate. This study uses the envio-met model to simulate different BGIs scenarios and confirms that in terms of thermal comfort, the addition of water bodies reduce the thermal stress of the surrounding environment and that vertical greenery has a better cooling and humidifying effect before noon. In addition, the optimal scenario presented in the study results increases the proportion of “neutral” thermal comfort by 1.65%. The study proposes plausible scenario simulations and effective solutions to improve the urban thermal environment. Towards this end, they advocate the construction of BGIs as being more beneficial for sustainable development.

AUTHOR CONTRIBUTIONS

SC is an associate editor; AK and JY are guest editors of *Frontiers in Sustainable Cities*. SC led as the primary author and AK and JY contributed to writing and editing of the editorial article. All authors contributed to the article and approved the submitted version.

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