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Energy implications of the Chinese-driven morphological transformation of Lusaka, Zambia

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ABSTRACT

In Africa, ongoing urban fabric restructuring is often affected by exogenous factors. Nowadays, Lusaka is confronted with sprawling graftings of new portions of urban textures. Arguably, this is a consequence of massive foreign investments in the real estate sector from Chinese investors, and such a phenomenon has not been investigated in its energy implications yet.

This study attempts to understand how the spatial fixing of the Chinese capital impacts Lusaka's urban development towards carbon neutrality. For this purpose, snowball sampling was adopted for in-depth semi-structured interviews with relevant Zambian stakeholders. Thereafter, both long-standing and newly built environments have been investigated in their morphological dimensions, employing demographical data, remote sensing, and three-dimensional digital twins. Finally, simulations of on-site energy production at the district scale have been conducted. Results from the interviews show that, despite investors’ interest in sustainability, there is a considerable unsustainable urban-growth-related electricity demand. Environmental pressures have been noted in the transformation of natural landscapes, with a recurrence of new mass housing and compact urban patterns. Findings show that the new settlements hinder the urgently needed urban energy transition.

This research aims to contribute to urban development strategies and guidelines for the promotion of synergies between real estate investment-related policies and environment-driven urban solutions, thus encouraging both the acceptance of investments in respect of the city's contextualized specificities and the introduction of a comprehensive urban vision—currently absent—an umbrella for strategies towards Lusaka's sustainable urban development.

Video to this article can be found online at https://doi.org/10.1016/j.sctalk.2023.100261.
Figures and tables

Fig. 1. Aerial views of a peripheral area of Lusaka, Zambia. Source: authors’ elaboration by remote sensing.

Fig. 2. Urban patterns categorization. Source: authors’ elaboration from satellite images.
Fig. 3. Urban patterns classification within Lusaka city boundaries. '00': industrial/commercial/institutional/religious areas. '01–03' as per Table 1. '04': non-built. Source: authors' elaboration by visual identification on remote sensing, October 2022.

Fig. 4. A. Site historical satellite view (2015), provided by the Ministry of Lands and Natural Resources of Zambia. B. Site satellite views in October 2022. C. Built area individuation. D. Results of morphological dimensions investigation on 3D digital twins. Source: authors' elaboration. A, B, C from satellite images.
CRediT authorship contribution statement

Federica Fiacco: Conceptualization, Methodology, Investigation, Data curation, Writing – original draft, Visualization. Kezala Jere: Conceptualization, Methodology, Investigation. Gianni Talamini: Resources, Supervision, Conceptualization, Methodology.

Data availability

Data will be made available on request.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Further reading


Federica Fiacco is a PhD Fellow at the Department of Architecture and Civil Engineering of City University of Hong Kong. Her research focuses on climatic-sensitive urban design strategies, and the relation between urban morphologies and urban energy transition in fast-growing cities.

Kezala Jere is a professional architect who evaluates the urban dynamics of cities by analysing the growth of informal settlements and their causal factors. He evaluates the spatial changes of informal settlements and related causalities over time and correlates these changes to the development of policy, legal, and regulatory frameworks that have directly and/or indirectly influenced the observed changes. In addition, he develops strategic policy recommendations to assist the City and the various government Ministries tasked with addressing the issue of informal settlement in the city. Kezala Jere has more than eight years of experience in urban data collection, analysis, and production in specific cities. In addition, his study at a variety of university departments in the field of Digital Humanities has provided him with valuable insights into the challenges and opportunities we face in the ever-changing digital world. Therefore, the practices and training of students to use various cutting-edge tools to analyse social and cultural data have inspired him to investigate new analysis tools and techniques, such as open source computer vision applications.

Gianni Talamini (PhD) is an associate professor at the City University of Hong Kong, where he teaches urban design and architecture. Gianni does research on the notion of organic urbanism and the relationship between society and space. He works for an environmentally symbiotic, culturally leavened, and spatially just society.