NEW SITE PLANNING AND DESIGN METHODOLOGY: MODELLING URBAN MORPHOLOGIES TO IMPROVE AIR POLLUTION DISPERSION FOR BETTER DESIGN PERFORMANCE OF RESIDENTIAL OPEN SPACE IN BEIJING

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1   ABSTRACT

Numerous researchers highlight the public health implications of long-term exposure to airpollution and investigate the influence of existing urban morphologies on air movement through Computational Fluids Dynamics (CFD) modelling. However, few researches explore the possibility of designing new urban morphologies and the associated open space which can positively influence on air pollution dispersion so as to improve landscape performance. This study aimed to explore this gap. Surrounded by office buildings and industrial sites in a highly polluted district in Beijing, a new residential development site presented a great opportunity to apply a research-driven design methodology that explores the role of digital techniques (CFD) and computational and real-time data in bridging the gap between scientific knowledge and design speculation. The study carried out CFD modelling of conventional and new urban morphologies to identify an optimised building configuration that positively influence on air pollution dispersion in the associated open space, and then to develop a series of microclimate adaptive design strategies that minimize residents' exposure to pollution in this open space. Through this methodology, we demonstrated the possibility of modifying wind speed and wind direction as a valuable strategy to reduce the effect of air pollution by the massing and siting of residential building blocks and topographic strategies. Then the detailed design of external spaces was developed with the ambition to maximise the usability of open space during low air pollution periods, and to encourage responsive micro-atmospheric behaviours through the combined effects of landform manipulation, spatial and material design.

1.1   Keywords

landscape, design, pollution, performance, China