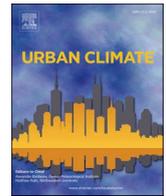




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Influences and pathways of urban form and lifestyle on carbon emission reduction

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ABSTRACT

Urban areas experience high carbon emissions, impeding sustainable development, and causing global environmental changes. Low-carbon planning and lifestyle have the co-benefit of reducing carbon emissions and mediating environmental threats. However, the relationship among carbon emissions, urban form, and lifestyle remains unclear, limiting low-carbon urban and societal development. Thus, the objective of this study was to simultaneously clarify the direct and indirect influences and pathways of lifestyle (i.e., expenditures on diet, housing, transport, and entertainment) and urban form characteristics (i.e., dispersion, patch area, fragmentation, and aggregation of building patches) on carbon emissions, and identify vital factors for mitigating carbon emissions. Moreover, a partial least squares model was established and analyzed using urban-scale data from 352 townships in Taiwan, which was used at novel spatial scales. The empirical results demonstrate that maximizing the building patch area and minimizing the dispersion, fragmentation, and aggregation of building patches can reduce carbon emissions. Furthermore, minimizing expenditures on diet, housing, transport, and entertainment would have a similar effect. The findings established that proper policies for lifestyle and urban form can reduce carbon emissions and serve as useful strategies for developing low-carbon societies and cities.

1. Introduction

Global environmental changes are primarily caused by accumulative greenhouse gas (GHG) emissions, which affect human well-being and natural ecosystems, further impeding sustainable development (IPCC, 2021). To mitigate global warming, research on decarbonization and carbon neutralization has received considerable attention in the last decade (Barthelmie et al., 2008; Holden et al., 2018; Birge and Berger, 2019; Li et al., 2019a; Duan et al., 2021; Dillman et al., 2021; Koide et al., 2021; Song et al., 2021).

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