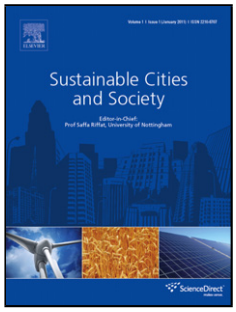

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Spatially explicit assessment on urban vitality: Case studies in Chicago and Wuhan

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Highlights:

- Urban vitality was decomposed into four aspects: Density, livability, accessibility, and diversity, and spatially explicit indices were calculated in a big data environment.
- We use Chicago in the US and Wuhan in China as examples to compare the urban vitality between the maturely developed megalopolis and rapidly developing metropolis.
- It is revealed that Chicago is superior in accessibility and diversity with highly decentralized distribution of urban vitality, whereas there are high values in density and livability in Wuhan with a ring-like spatial distribution of urban vitality.
- Block groups or community neighborhoods around the scenic spots or with large areas are highly likely to be influenced by their neighborhoods in Chicago and Wuhan

Abstract

This study focused on urban vitality assessment to address the increasing decentralized urban pattern and take precautions to urban decline. Using Chicago in the US and Wuhan in China as examples, urban vitality was decomposed into four aspects: density, livability, accessibility, and diversity. Spatially explicit indices were calculated, and the spatial pattern was analyzed in a big data environment. The ultimate urban vitality assessment was carried out by applying a spatial technique for order preference by similarity to ideal solution to rank. The following were revealed. (1) Chicago is superior in accessibility and diversity, whereas there are high values in density and livability in Wuhan. (2) Chicago has a grid-based urban pattern and is highly decentralized in urban vitality, and the spatial division of Wuhan is considerably irregular with a ring-like spatial distribution of urban vitality. (3) Block groups or community neighborhoods around the scenic spots or with large areas are highly likely to be influenced by their neighborhoods in Chicago and Wuhan. The indicator system on urban vitality assessment can be adjusted and extended in an all-around manner and can become profoundly robust and dynamic with the consideration of diversified spatial interactions.

Keywords: urban vitality; assessment; big data; Chicago; Wuhan

1. Introduction

The rapid urban sprawl and urban expansion have raised various concerns on urban revitalization and preservation (Chen et al., 2013; Wei et al., 2017). The strong auto-oriented development pattern in the US has resulted in an increasingly sprawled urban boundary, but density continues to decline in the urban core area in a number of megacities (Barrington-Leigh, 2015; Ewing et al., 2017). In China, the emerging phenomenon of "land-dominated urbanization," "ghost city," and "urban decline" in the unprecedented urbanization process have urged us to revitalize urban core areas (Li et al., 2015; Jin et al., 2017). An increasingly fragmented urban landscape pattern is a worldwide tendency, but people's livelihood still awaits comprehensive improvement (Jiao, 2015). City governors, planners, and related stakeholders are obliged to face the dilemma of excessive urban expansion or frustrating urban shrinkage to achieve a balanced urban spatial structure. The comprehension of urban vitality is of vital importance for the vibrant and sustainable urban development (Lang et al., 2016).