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Editorial: Towards sustainable urban development: Use of geographic big data for spatial planning

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Editorial on the Research Topic
Towards Sustainable Urban Development: Use of Geographic Big Data for Spatial Planning

Since the introduction of geo-big data, we have been able to observe how its role in social development and human–environment interactions has grown through the years. Multiple examples of geo-big data applications can be found in leisure space optimization, traffic prediction, agricultural planning, air quality monitoring, livelihood improvement, social justice, forest management, interregional development, green space accessibility, and environmental diagnosis. This extensive use of geo-big data facilitates sharing of spatial information and spatial data mining, and it can be applied to geographic assessment, prediction, analysis, and planning. The geo-big data era provides a new opportunity for the transformation of spatial planning and sustainable decision-making by revealing spatial regularity based on geo-big data [see (Jing and Liu, 2018; Jing et al., 2021)].

The goal of this Research Topic is to introduce academic output that adopts geospatial big data to facilitate intelligent urban governance. In the rapid process of urbanization, geo-big data serves as a crucial factor of technological innovation that covers all the aspects of urban systems (i.e., fundamental infrastructures, traffic networks, architectures, energy systems, *etc.*). Based on smart spatial analytical platforms and geospatial artificial intelligence technologies, geospatial big data can be used to empower urban governance in an intelligent and smart way, serving as an engine to monitor, assess, diagnose, and ultimately tackle urban problems, and optimize urban systems towards sustainable development.

This Research Topic has collected 24 publications on sustainable development and smart spatial planning decision-making involving multi-source geo-big data. Wang et al. proposed strategies for leisure agriculture optimization by exploring its spatiality and competitiveness utilizing user-generated content (including leisure agriculture sites) with a case study of Wuhan, China. Cai et al. analyzed the spatial and temporal features of urban expansion during the latest decade based on remote sensing images and socioeconomic statical data and revealed the imbalance and spatial disorder of urban expansion in Zhengzhou, China. Luo et al. proposed a

safety evaluation framework for assessing active travel traffic safety near a park green space (PGS) through POI data and similar and found that the walking mode is safer than the cycling mode in terms of road facilities near a PGS. Wang et al. used spatial analytical techniques to study the tempo–spatial interaction between cropland expansion and urbanization and revealed the socioeconomic determinants via land use data and statical data in the middle section of the Yangtze River. Bai et al. constructed an urban model for extracting urban built-up areas based on nighttime light data, analyzed the spatiotemporal factors of China's urban built-up area expansion, and revealed the agglomeration-to-dispersion trend of urban built-up area expansion. Zheng et al. proposed a packaged method for traffic flow prediction in consideration of weather conditions based on real traffic video data and suggested that the algorithm outperformed the previous solutions (with 10% higher accuracy). He and Tang put forward a new notion and method of large-scale industrial land identification by using POI data and a random forest model and researched the spatial pattern of industrial land in China. Wu et al. explored the distributive characteristics of rural residential land concerning natural reserves and non-natural reserves based on land use data and statistical yearbooks in Hubei. Liu et al. carried out a scientometric analysis of research output on the tempo-spatial distribution and dynamic evolution of remote sensing based on the Web of Sciences database and revealed the global spatial pattern of those academic publications in a significant dispersion. Xia et al. adopted mobile phone data to assess urban spatial vitality and found an evident center–periphery pattern in Changsha, China. Yin et al. explored environmental drivers of vitalizing urban coastal zones based on multi-source geo-big data. Huang et al. used multi-source data (i.e., mobile phone signaling data, GPS data, land use data, and smart card data) for targeted bus exterior advertising. Zhang et al. adopted street network data and Flickr photo location data to measure the heterogeneity of street networks for a better understanding of urban activities and urban space. Hou et al. revealed the spatial patterns and driving mechanisms of heritage trees in an ancient city in China through geospatial analysis methods and a geographically weighted regression model. Zhang et al. measured the competitiveness of civil aviation airports and revealed their spatiotemporal dynamics in the Yangtze River Economic Belt through a series of spatial analytical methods (e.g., spatial auto-correlation, *etc.*) combining POI data and fundamental geographical data and similar. Zhang et al. analyzed the economy-information-coupling connection complex network structure based on Baidu search index data of the Beijing Tianjin Hebei Urban Agglomeration. Xu and Wang researched urban PGS accessibility on different scales (subdistrict, community, and residential quarter) by the Gaussian-based two-step floating catchment area method combining park green data, road networks, residential quarter data, *etc.* Zhang et al. evaluated the barriers of labor flow, technology flow, and capital flow with multi-source big data (e.g., Baidu Migration data) and analyzed how factors influence the barrier of the three typical production flows in the Chengdu–Chongqing urban agglomeration, China. Yang et al. spatialized the impact of environmental and socioeconomic factors on the changes in inventory, self-consumption, and livestock sales in Kyrgyzstan through mainly spatial regression analysis. Huang et al. employed nighttime light images to measure the changes in the refugee population before and after the war in Ukraine. Yang et al. proposed a multi-strategy sparrow search algorithm to deal with the UAV trajectory planning issue for maximizing the UAV efficiency and minimizing the flight distance in a three-dimensional environment. Li et al. took residential land price data and characterized the spatiotemporal network structure and the regional correlation in Hebei Province, China. Liu et al. combined location-based service big data to simulate commuting under floods according to the minimum time–cost principle and found that inconsistent spatial distribution exists among commuting loss, flood exposure hot spots, and road vulnerability. Zhang et al. unraveled the cooperation and competition between the conventional railway and high-speed railway based on railway timetable data and railway location data in China.

We are convinced that this academic output can benefit both the academic community and political decision-makers, targeting smart and sustainable spatial planning development by means of multi-source geographical data and analytical techniques. Moreover, current studies may also inspire information engineers to advance the development of pertinent information system platforms and toolboxes.

The Guest Editors are thankful for the Editorial Team's assistance. We are grateful to the invited reviewers for their professional comments which have helped to improve the articles. Last but not least, we also appreciate the authors; they have believed in and selected this Research Topic to contribute their wisdom for advancing academic progress in this domain.

Author contributions

All the guest editors conceptualize this editorial together. Specifically, YJ and JC are responsible for writing this editorial. DM and YC are responsible for editing the whole editorial.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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