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Editorial: Data-driven approaches to enable urban transformation

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Editorial on the Research Topic
Data-driven approaches to enable urban transformation

With the emergence of urban artificial intelligence, data-driven approaches have been applied to various dimensions of urban affairs to capture their forms and functions (Batty, 2022). The contemporary goals of data-driven science are to foster openness in scientific approaches, to utilize open data or technology, and to disseminate the resulting products, such as open prototype tools or analytics, for informed decision-making. Further, such work can help improve the livability of cities by proposing alternative governance and business models (Cugurullo, 2020; Anselin and Rey, 2022). Openness in data provision and scientific culture give individuals as well as organizations the chance to explore, reproduce, replicate, reinvestigate, and identify the solutions and services to manage and foster the dynamics of transformation (Kedron et al., 2021). The extent to which cities and urban regions can successfully transform depends on their responses to contemporary innovation and emerging challenges, as well as their evidence-based decision capabilities (Wolfram, 2016; Karvonen et al., 2021; Nahiduzzaman et al., 2021). Data-driven approaches can provide valuable insights into real-world decision-making for sustainability transformation, particularly in research that incorporates popular geospatial methods or active and passive sensing systems (Grêt-Regamey et al., 2021). At the same time, such approaches make it easier to meet today's regulatory requirements, such as the FAIR principles, and to further the work of the Open Science movement (Wilkinson et al., 2016; Boeckhout et al., 2018; Degbelo, 2021). Nevertheless, recent trends reflect a lack of digital competence and a certain deficit, even bias, in emerging data sources that have created a new group of vulnerable urban communities and neighborhoods in the absence of bottom-up approaches to planning, governance, implementation, and service provision. While data-driven urban transformation needs to be driven by sustainable choices, it is vital that social, environmental, and economic dimensions also be given due consideration (Bibri, 2021). As emerging digital technologies become adopted in smart cities for reasons of functionality and utility

(Barns, 2020), the data being generated by these systems must be harnessed to transform cities and the lives of their residents. This is the focus of the presented Research Topic.

The aim here was to gather examples of critical dimensions of data-driven applications by gauging the trajectory of urban transformations. The gathered research articles represent an overview of such realities from the Global North and South, specifically from North America (USA), Europe (Belgium), South-East Asia (Indonesia), and South Asia (Bangladesh). The first paper, "*Tracking a circular economy transition through jobs: Method development and application in two cities*" (Muñoz et al.), written by researchers from UNEP-Paris, Circular Jobs Initiatives and AMS-Institute, Amsterdam, proposes a data-driven methodology to explore progress toward the green and circular economy (CE) by tracking a jobs measure. The bounded city system-based approach is used as a quantitative indicator in strategic policy-making and to monitor progress toward the CE. The empirical evidence from Belgium confirms the importance of multi-level coordination between local and national actors to implement the circular local economy along with data-driven quantitative measurement indicators. Further study is required to extend the CE to developing countries; the challenge here is to take account of the large informal economy as well as people's vulnerable socio-economic profiles. The second paper from a group of researchers at the University of Connecticut (Storrs) investigates transit-oriented development (TOD) with open spatial data to envision the development of local transformative policy and optimum site selection. Ray et al. shed light on the adoption of spatial data linked to a co-creative multi-actor decision environment in the network governance of TOD. Adopting a mixed approach, i.e., quantitative geospatial methods and qualitative stakeholder interviews, the empirical study identifies the governance challenges of state interventions alongside the weak status quo of geospatial data when attempting to manage the stifling paradigm shift of state support for TOD projects. de Vries and Schrey demonstrate a method of adopting multi-sourced open global geodata for local action to support urban transformation, here simulated and modeled for Jakarta (Indonesia). In particular, they measure the requirements for spatial expansion, forest encroachment, and sustainable energy infrastructure. The study finds that many scenarios could have contributed to spatial conflict between renewable energy production and existing mining infrastructures. Hasan et al. adopt a geospatial approach in the context of data-scarcity for resilient and inclusive land-use planning and disaster management. Involving key stakeholders, they analyze the frequency of fire-related hazards and intensity in different categories, such as type of structure, land use,

source of fire, and damage and losses, across multiple spatial-temporal dimensions. They suggest that key actors must be involved from the initial steps of the research process; in this way, the data-driven approach can overcome the limitations of data access. The findings can also be easily integrated to help formulate emergency plans and transformation measures for safe and resilient cities. This study could be further extended to help create sub-regional disaster risk profiles for both fire-risk mitigation and response planning, particularly for developing countries with constrained resources and data availability.

The specific Research Topic presented here explores the thematic domain of data-driven approaches and proven technologies that offer innovative solutions for local and emerging urban issues while addressing environmental and social concerns. Contributions to this Research Topic largely focus on the spatio-temporal and practice-oriented themes of sustainable urban transformation. All papers published in this Research Topic offer combined quantitative-qualitative approaches with a balance of active and passive sensing systems. This allows policymakers and the wider public to learn from data analytics and to integrate multi-sourced open data and scientific insights within an urban context to advance a knowledge society. As reproducibility and replicability are only addressed to a limited extent, it is necessary to spread the call for action and to remove barriers to cultural change in the production of scientific knowledge on urban transformation.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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.

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