



Improving city-scale measures of livable sustainability: A study of urban measurement and assessment through application to the city of Birmingham, UK



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ABSTRACT

Despite the attention sustainability-related urban measurement and assessment methods have received it is still not well understood how accurate (or not) the various methods are; their limitations in holistic city performance assessment; or, how they can be effectively used to better the design of the urban environment, city services and policies. Necessarily, urban measurement and assessment methods focus upon what is known. However, reflecting upon the unknowns and their impacts has the potential to deliver crucial insights into the assessment of city performance and governance. To this end, this study applies and critiques the city performance measurement and assessment method UK City LIFE₁ in order to explore the challenges of, and prospects for, filling these gaps. UK City LIFE₁ is designed to measure 'livable sustainability' at the city scale for the purpose of aiding UK policy makers and urban design decisionmakers. Results suggest that definitional uncertainties, the availability and viability of data, and the design of the method introduce inaccuracy, uncertainty and bias into data interpretation. This, combined with the complexity of city systems and the nascent 'science of cities', prevents causal effects from being fully described, potentially rendering decision-makers impotent. However, the language of 'realizing the multiple benefits of interventions' and 'coupling and uncoupling relationships' alongside making the unknown explicit has the potential to empower decisionmakers in the face of absent and disconnected data and interpretational challenges.

1. Introduction

Cities are now the dominant form for human habitation (United Nations, Department of Economic and Social Affairs, Population Division, 2014), the dominant depleters of planetary resources (Bai, 2007) and the dominant producers of CO₂ emissions (Nordbo et al., 2012). As such, cities have become the simultaneous saviors and destroyers of human coexistence with the planet. As centers of innovation and culture (Athey et al., 2007; Vojnovic, 2014), cities are the means by which humans can live sustainable lifestyles, balancing environmental, economic and social priorities, taking advantage of economies of scale and their concomitant efficiencies (Dodman, 2009; Klopp & Petretta, 2017). As wielders of large demand footprints (Folke, Jansson, Larsson, & Costanza, 1997), cities are the means by which humans can live unsustainable lifestyles, ignorant of food, energy and waste processes (amongst others) with the potential to compromise a healthy, sustained and livable future.

Addressing the capacity and capability of cities to effectively deliver sustainability—and livability—has been the subject of much recent

academic and practitioner effort (Gough, 2015; Kitchin, Lauriault, & McArdle, 2015; Leach et al., 2016; Bell & Morse, 2008; Wong, 2006; Lynch & Mosbah, 2017). These efforts draw upon an increasing pool of methods for urban measurement and assessment such as, material flow analysis, indicators, scenarios, footprinting, life cycle assessment, multi-criteria analysis and computer modelling (Kitchin et al., 2015; Leach et al., 2015; Astleithner & Hamedinger, 2003; Mayer, 2008; Ness, Urbel-Piirsalu, Anderberg, & Olsson, 2007; Pires, Fidélis, & Ramos, 2014).

Despite the attention urban measurement and assessment has received and the sophistication of the available methods it is still not well understood how accurate (or not) the various methods are; their limitations in holistic city performance assessment; or, how they can be effectively used to better the design of the urban environment, city services and policies (Kitchin et al., 2015; Leach et al., 2016). In part this is because of definitional challenges, with neither sustainability nor livability having agreed definitions (Gough, 2015; Bell & Morse, 2008; Connelly, 2007; Kidd, 1992; Leach et al., 2016; Vojnovic, 2014; Tanguay, Rajaonson, Lefebvre, & Lanoie, 2010) and that our

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understanding of these concepts isn't fixed, but changes over time and contexts (Connelly, 2007; Portney, 2013; Astleithner & Hamedinger, 2003). It is also because our understanding of how cities operate and how they are best governed is incomplete (Vojnovic, 2014; Batty, 2012). In truth, there is no 'one' way a city behaves. For example, cities change along multiple temporal scales: centuries, decades, political cycles, yearly seasons, day to night, hour to hour. They also change along multiple geographic scales: city quarters, neighborhoods, streets and households. Urban measurement and assessment methods are one attempt at developing this understanding: they capture what is known about a city and assess its value (e.g., via benchmarking against the performance of other cities or extrapolating performance into the future).

Necessarily, urban measurement and assessment methods focus upon what is known. However, reflecting upon the unknowns and their impacts has the potential to deliver crucial insights into the assessment of city performance and governance. Many critiques of urban measurement and assessment methods exist (see for examples (Morse, 2004; Lyytimäki, Gudmundsson, & Sørensen, 2011; Lynch & Mosbah, 2017; Klopp & Petretta, 2017; Pinfield, 2007; Ghosh, 2006; Mori & Christodoulou, 2012; Mayer, 2008; Pires et al., 2014; Dawodu, Akinwolemiwa, & Cheshmehzangi, 2017)). What are less common are critiques that cover design as well as application and interpretation. Yet it is inevitably the case that in understanding the complete process of designing, applying and interpreting a method, a richer picture emerges of the (unavoidably) compromised view of the city afforded by the method. Such insights can be used to improve measurement and assessment methods, inform decision-making and influence governance practices.

Within this context, this paper describes the design, application and interpretation of UK City LIFE₁ (UK City Livable-sustainability Indicator Framework Edition 1) – a city performance measurement and assessment method that is designed for the comprehensive and holistic measurement of livable sustainability (the delivery of livability alongside sustainability (Gough, 2015)), to the city of Birmingham, UK, for the purpose of addressing the study's three primary research questions: (1) Is it possible, in practice, to holistically and at the city scale measure a UK city's livable sustainability? (2) What challenges and gaps arise and can these be overcome? and (3) How can the outcomes be interpreted to aid local authority decision-making in the UK?

The study triangulates information from three strands of analysis, described in the subsequent sections of this paper: a review of the sustainability and livability measurement and assessment literature (Section 2), a critical assessment of the design and application of UK City LIFE₁ to the city of Birmingham, UK (Section 3) and a critical reflection upon the interpretation of UK City LIFE₁, taken with UK local authorities, urban design decisionmakers and urban professionals (Section 4). Section 5 discusses the outcomes and sets out the conclusions of the study.

This research was conducted as part of the development of the Livable Cities' decision-making method, a decision-support tool designed to assist urban design professionals in thinking holistically, complexly and long-term when making interventions in an urban environment, which can range from the delivery of city services to urban regeneration to policy formulation. The work forms part of the Livable Cities Program Grant.

2. A review of the sustainability and livability measurement and assessment literature

Current city performance measurement and assessment methods are many and vary in criteria, measurement methodology, robustness, transparency and applicability to specific urban contexts, with no single method dominating (Kitchin et al., 2015; Leach et al., 2016). This presents a challenge to policymakers and others wishing to use these methods to inform policy (Mayer, 2008).

City performance data for urban design decision-making and policymaking are almost universally expressed in the form of indicators (Kitchin et al., 2015). As such, this paper will focus upon indicator-based city performance measurement and assessment methods. Indicators provide information about the object of the data or are used as a representation of an associated factor (Business Dictionary, 2016; Oxford Dictionaries, 2016). For example, GDP (gross domestic product) and employment rate are both indicators of economic performance. Used wisely, indicators can effectively measure city performance (Bell & Morse, 2008; Kitchin et al., 2015) whilst guarding against the tendency for them to compromise creativity (Leach et al., 2015).

This section describes the principles, challenges and gaps for the design, application and interpretation of indicator-based urban sustainability and livability performance measurement and assessment suggested by the literature. An exploratory literature survey was undertaken to collect and analyze written sources that contributed to understanding the principles, challenges and gaps. Literature from 1992 to 2017 were considered to coincide with the Rio Earth Summit and the establishment of Agenda 21 (the local implementation strategy for global sustainability and climate change mitigation), which gave rise to a proliferation of sustainability- and livability-focused measurement and assessment methods (Kitchin et al., 2015).

2.1. Designing urban measurement and assessment methods: a review of the literature

The criteria for designing successful indicator-based measurement and assessment methods are diverse and contested (Mayer, 2008). Inevitably, indicator choice is, at some stage in the process, based upon arbitrary decisions (Niemeijer & de Groot, 2008). This said, there are principles that should be followed where possible and these are described here.

Consideration should be given to how interpretation is influenced by the conceptualization and measurement of the performance criteria (Marans & Stimson, 2011). In order for performance data to be useful, a determination of what constitutes 'good' performance must be made. Who does this, and how, materially influences the conclusions drawn (Kitchin et al., 2015; Mackenzie, 2008). As such, the transparency of this information is crucial for policymaking (Kitchin et al., 2015).

Performance measurement should be accompanied by a performance assessment framework that allows for the accurate and clear interpretation of the data (Mayer, 2008). The framework should have a clearly defined area of focus (e.g., livable sustainability), be designed for the context in which the measurements are to be taken (e.g., cities in the UK), evidence a clear causal chain, make explicit interdependencies and extend across disciplinary and professional siloes (e.g., architecture, engineering, planning and governance) (Leach et al., 2016).

Selecting or designing a performance assessment framework and indicators useful for policymaking requires careful consideration. Any given framework should be holistic with minimal overlap, be simple (without compromising any underlying complexity), include subjective and objective perspectives as well as quantitative and qualitative data, be usefully organized and be relevant to decision-making (Leach et al., 2016). The individual indicators should be simple, elegant, effective, sensitive to change, measurable and verifiable (preferably in a standardized way), conceptually sound, understandable, unambiguous, objective (value-free) and draw upon data that either exist or are relatively easy to obtain (Leach et al., 2016; Kitchin et al., 2015).

Perhaps most importantly, however, is designing a city performance measurement and assessment method that is fit for purpose. This requires a clear understanding of the intended use of the outcomes and the best-fit mechanism for achieving this. Parris and Kates (2003) identify four purposes for sustainability assessments: (1) decision making and management, (2) advocacy, (3) participation and consensus building and (4) research and analysis. Kitchin et al. (2015) identify two broad mechanisms for achieving these purposes: (1)

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