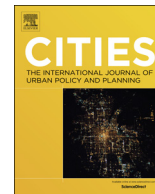




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Guest editorial/editorial

## Smart cities: A challenge to research and policy analysis

### Smart urban analytics and policy: editorial introduction

In the ‘century of the city’, with an increasing share of the world population living in urban agglomerations, cities have not only increased in number and size, but have also turned into complex and multi-faceted organisms. A modern city is no longer a simple settlement system with buildings, infrastructure and people, but displays non-linear evolutionary structures and trajectories as a result of an underlying complex force field comprising a multiplicity of (internal and external) actors and of (tangible and immaterial) constituents that altogether shape contemporaneous city life. Urbanity has become a “*modus vivendi*” of the 21st century, in which urban agglomerations are the geographic projections of an emerging new society characterized by connectivity, mobility and flexibility.

The complexity of ever growing cities in this world prompts serious policy concerns regarding environmental quality, energy use, transport accessibility, social cohesion, labour and housing markets, public amenities, safety, effective governance, local well-being, and so forth. To cope with all these challenges – and many more – in the harsh reality of urban policy and management, city authorities have over the years often resorted to sectoral responses, without sufficient regard of the interwovenness of a complex urban system and without carefully basing necessary urban decisions and adjustments on a solid and verified information base that maps out the multidimensional complexity of the urban area concerned. Consequently, urban policy tends to become fragmented and not supported by quantitative accountability and solid test principles.

To cope with these serious governance deficiencies in the ‘century of the city’, in the past decade the notion of a “smart city” has been introduced so as to reap the fruits of a modern knowledge-economy based on cognitive principles and to apply these effectively in an urban context. This concept of a smart city however, has in the meantime turned into a fashionable and vague buzzword, with the consequence that each city wishes to be called a smart city (or – even worse – calls itself a smart city). This concept stands, in general, nowadays often for a characteristic of urban governance driven by advanced knowledge, digital information and high-tech policy strategies serving the needs of citizens.

It should be noted however, that the current use of smart city notions reflects a hopeless confusion regarding means and ends. A smart city is *not* a goal in itself, but a strategic approach to significantly enhance the performance or quality of a city. This improvement strategy is based on cognitive principles in relation to a strong knowledge and information base for a future-oriented urban strategy comprising economic, social, environmental and technological parameters and

pathways. A smart city is only successful and meaningful if through the use of advanced knowledge, modern technology and up-to-date information systems its performance level is rising. In other words, a smart city presupposes an intelligent response to urgent challenges leading to a significant added value for the achievements of the city concerned.

A sine qua non for feasible and operational smart city initiatives and actions is the use of ‘smart city analytics’, which means the use of reliable, up-to-date and fit-for-purpose quantitative information and statistical data. In this way, a solid foundation can be laid for informed and testable policy strategies and actions, which can then be supported through the application of quantitative research tools in the form of e.g., multivariate statistics, econometric modelling, (micro-) simulation methods, scenario analysis, statistical benchmarking techniques, data mining, or multidimensional evaluation tools. This approach, starting from an unstructured policy orientation through the use of smart city analytics may pave the road towards focussed urban policy measures directed towards the achievement of performance and quality goals, as illustrated in Fig. 1.

This special issue of *CITIES* is devoted to Smart Urban Analytics and Policy, and aims to offer a new perspective for the world-wide interest in and reflection on smart cities, by highlighting the analytical basis (including inter alia integrated conceptual modelling, decision-tree and hierarchical modelling, discrete-choice estimation, count-data modelling, structural estimations modelling, and other research-driven and mainly quantitatively-oriented tools) for modern knowledge-driven (or preferably, innovative and intelligent) urban policy. Thus, in contrast to the multiplicity of anecdotal, descriptive, institutional, or planning studies on smart cities, it seeks to provide a solid methodological, conceptual and quantitative foundation for smart city studies. Consequently, the emphasis is not so much on technological advances for smart cities, but more on the relevance of advanced applied research for cities, including the social, economic and ecological dimensions. In this way, this special issue aims to offer a contemporaneous contribution to the achievement of smart policies (and smart or creative people) for smart cities. This special issue of *CITIES* is organized as follows:

The first paper *Smart City Implementation and Discourses: An Integrated Conceptual Model. The Case of Vienna*, by [Fernandez-Anez, Fernández-Güell, & Giffinger, 2018](#)), points out that stakeholder involvement in both urban projects and city policy strategy is key to developing a governance framework that allows an integrated and comprehensive understanding of current urban changes. This can only be done if Smart City strategies take the stakeholders' opinion into account and seek a compromise between their views and the implementation of the strategy. The main output of the paper is an

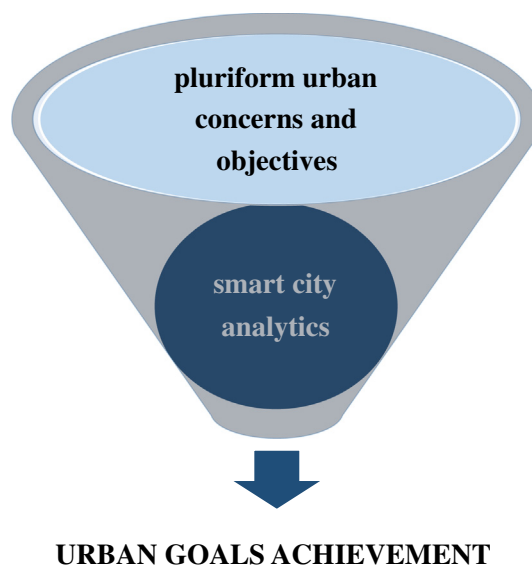


Fig. 1. The 'smart city analytics' filter.

integrated conceptual model of a smart city. The methodology of its creation combines project analysis with surveys and interviews with different groups of key stakeholders (governments, private companies, universities and research centres, and civil society) through text analysis. The conceptual model is developed through discussions with different European stakeholders and is applied to the case of the Vienna Smart City strategy. The model has been structured to allow it to be connected with various current assessment methodologies that use a similar structure of dimensions or clusters (Giffinger et al., 2007; Monzon, 2015). Systematisation and connection to statistical data will allow the development of comparative case studies of cities with a smart city strategy.

The second paper on *Functionality between the Size and Indicators of Smart Cities: A Research Challenge with Policy Implications*, by Borsekova, Koróny, Vaňová, and Vitálišová (2018), focusses on the concept of a smart city and its specific components in relation to size of the city. As cities vary considerably in size, it is important to ask whether the size influences the value of selected indicators of smart cities. This paper may be considered as one of the first applied modelling studies dedicated to the relation between size of the city and smart city indicators. Besides interesting classification results, several research results overturn common assumptions about smart cities. Both the results and the methodology used may form an inspiration for the larger future research task, to enhance the theory and practice of smart cities.

The third paper, *Creative and STEM Employees and Firm-level Innovation*, by Brunow, Birkeneder, and Rodriguez-Pose (2018), examines the link between innovation and the endowments of creative and STEM – Science, Technology, Engineering and Mathematics – workers at the level of the firm and at the city-/regional-level in Germany. The results highlight that firms that employ creative and STEM workers are more innovative than those that do not. This work represents a first step towards investigating the link between creative and STEM employment and innovation in Germany. Despite the limitations linked to the data, the results provide some indicative policy implications for cities and regions in Germany. STEM workers are likely to also energise innovation capacities well beyond the main cities and also in more intermediate and smaller cities. This makes the case of using public resources to attract STEM workers more justifiable, as they have a greater capacity to make German cities and towns smarter.

The fourth paper, *Services that Add Value in the City: The Rise of the Modern Economy in Brazil*, written by Barufi (2018) aims to investigate the spatial distribution of service firms that add value and compare it with the location of service firms that reduce cost. The main results

show that despite the strong linkages with manufacturing, service firms do not necessarily pursue locations close to places that concentrate industrial employment, and they actually avoid to locate in neighbouring areas of those which concentrate manufacturing activities. Higher population density, diversity and other measures of economic spatial concentration are much more relevant to determine the location of these firms. Service firms that add value to manufacturing activities are also more prone to provide new solutions for smart cities. In this sense, understanding their location decision can provide insights for the rise of smart cities.

The fifth paper, *Smarter Cities in a Post-socialist Country: Example of Poland*, by Sikora-Fernandez (2018), aims to identify the potential to transform Polish cities into smart cities. Smart urban solutions, despite having been present for several years in Western Europe, are treated as a novelty in many cities of the post-communist bloc, including Poland. The lack of orderly, correlated smart initiatives seems to be an immediate solution to urban problems rather than a long-term development strategy centred on the tangible benefits that advanced technologies bring to cities. Opportunities for building urban smartness are provided by the provisions for smart development in a long and medium-term development strategy at the national level. These include the construction of automated traffic control systems, intelligent transport systems, improved communication with public administration, and increased efficiency in energy projects.

The sixth paper on *A Spatial Interaction Model with Land Use and Land Value*, by Silveira and Dantin (2018), presents the formulation, calibration and validation of a Spatial Interaction Urban Model with Land Use and Land Value and the application made for Terceira Island simulated land uses and land values for climate change scenarios. Results show a considerable decrease in pasture area that supports the economic base of the island, a diminution in the number of habitants and a decrease of the property value of around 524 million euros. The exercise shows the potential of the model to assess the impact of economic, technological, regulatory and environmental shocks in cities and surrounding areas.

The last paper *The Smart City as a Common Place for Tourists and Residents: A Structural Analysis of the Determinants of Urban Attractiveness*, by Romão, Kourtiti, Neuts, & Nijkamp, 2018 presents a structural modelling analysis of the performance determinants of urban attractiveness, in terms of resident population and international tourism demand, in 40 global cities. The results of a latent growth curve model confirm the existence of different impacts of urban functions on the visitors' and residents' attractiveness. Cultural dynamics appears to

be a major determinant for attracting new residents and supporting a strong international tourism industry. From an economic perspective, purely economic strength (in terms of absolute growth) appears to enhance city attractiveness for residents, while the dynamics observed in research and development activities influences the quality of employment instead of being a direct driver of population growth. While the social aspects of sustainability (framed under the concept of liveability) and the urban environment typically exert higher impacts on urban attractiveness, accessibility appears mostly very relevant for visitors. The analysis presented in the paper suggests an uneasy balance between liveability, environment, and population and visitor volume and growth.

It goes without saying that smart cities do not come about automatically, but need a careful coordination of many efforts of stakeholders in the city so as to ensure a better achievement of policy goals. To this end, a solid analytical approach that is able to handle a wealth of heterogeneous and often big data is necessary for a balanced urban development in the context of smart policy and governance.

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