

# Chapter 10

## Quality of Urban Life Index From Location-Based Social Networks Data: A Case Study in Belo Horizonte, Brazil

**Rodrigo Smarzaro**

*Federal University of Viçosa, Brazil*

**Tiago França Melo de Lima**

*Federal University of Ouro Preto, Brazil*

**Clodoveu Augusto Davis Jr.**

*Federal University of Minas Gerais, Brazil*

### ABSTRACT

*Several indicators are developed to support the decision-making processes in public policy for urban planning. Some of them seek to measure the quality of urban life. For example, the city of Belo Horizonte developed and uses an index called Quality of Urban Life Index, which identifies inequalities within the city, and therefore, those areas that need more investment. This index is calculated by measuring the availability of various kinds of services (e.g. education, infrastructure) and their accessibility (based on travel time and mobility data). For that, data from several government sources must be collected and used, which can delay updates of index values. In this chapter, the authors describe how data from Location-Based Social Networks (LBSN) can be used to calculate urban indicators, and hence, how they could be used as an alternative data source for estimating quality of urban life with faster results to support urban planning policies.*

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## INTRODUCTION

Since the last century, the world has experienced high rates of population migration from rural to urban areas. At the beginning of the 20th century, about 10% of the world population lived in urban areas. In 2007, urban population surpassed the number of people living in rural areas. In 2014, 53% of the world population were living in cities, and the predictions for 2050 indicate that urban population will reach 64% in developing countries and 86% in developed ones (The World Bank, 2015). In absolute numbers, urban population increases by 6 million people per month. It is as if a big city such as Washington (DC), Madrid or Belo Horizonte appeared every month in the world.

The fast urbanization process generates impacts on economy, health and environment, among others, and many challenges arise from them. For local governments, it is important to have indicators that summarize the evolution of citizens' quality of life, allowing the identification of regions that need further attention, assisting urban planning and supporting the allocation of resources to deal with current and future problems. Many metrics have been proposed over the years and there is no common agreement about how to define and measure quality of urban life. In 1990, the Human Development Index (HDI) was created by the United Nations Development Programme to show welfare status, aiming to be a more human-centered measure, instead of focusing only in economic issues. It is based on three dimensions: life expectancy, education and per capita income. HDI is used globally as an indicator for ranking countries, states and cities, but it fails to "reflect inequalities, poverty, human security, empowerment" (UNDP, 2015). The HDI uses the city, or municipality, as its smallest territorial unit.

Researchers and governments were stimulated by the creation and establishment of the HDI. Some of them started to propose and use their own indicators in order to measure urban quality of life in spatial units of different sizes, varying from country levels to metropolitan regions and municipalities. For instance, the Social Development Index (*Índice de Desenvolvimento Social* - IDS) was created in 1991 based on the HDI, but replacing per capita income with comfort and sanitation indicators (Rodrigues, 1991). The IDS is calculated for state-size geographic areas. The Living Conditions Index (*Índice de Condições de Vida* - ICV) is a city level index that was created to measure poverty and childhood conditions (Nahas, 2002). Several other efforts have been made to measure urban quality of life, with varying approaches and focusing on different aspects, including the evaluation of indexes (Badland et al., 2014; Blomquist, Berger, & Hoehn, 1988; Gavrilidis, Ciocănea, Niță, Onose, & Năstase, 2016; Hagerty et al., 2001; Helliwell, 2003; Marans, 2015; Pissourios, 2013; Rezvani & Mansourian, 2013; Roback, 1982; Rogerson, 1999; Węziak-Białowolska, 2016).

One problem with these indicators is that in general they attempt to summarize the complexity of cities into a single number. The local government uses these indexes to monitor city performance as a whole, but cannot use them to identify problems in specific regions of the city. To address this situation, Nahas, (2002) describes the idea of a quality of urban life index (*Índice de Qualidade de Vida Urbana* - IQVU), which is composed by ten dimensions: food supply, culture, education, sports, housing, urban infrastructure, environment, health, urban services and urban security. It is based on quantifying the spatial inequality of services that are available and accessible to population, and can be used to show areas that need increased public investment. The index was created and is used in Belo Horizonte (BH), a 2.5-million-people city that is the capital of the Brazilian state of Minas Gerais. IQVU is calculated for a geographic subdivision of the city, called Unit of Planning (UP), and is used to support urban planning. The first component in the calculation of the IQVU is a Local Availability Index (*Índice de Oferta Local* - IOL) that measures the availability of services inside an UP. The IOL is then adjusted by an accessibil-

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