



## Research Article

# Open data for informal settlements: Toward a user's guide for urban managers and planners

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## Abstract

Informal settlements exist in a legally contested space and the quality of – and access to – information about them has been historically limited. The open data movement promises to address this gap by offering alternative sources for information and free or low cost analytical platforms. However, in order to use open data effectively, urban managers and planners need guidance to navigate these new data sources, software, and server platforms, as well as acquire the necessary skills. In this paper, we begin to address these issues by developing a framework that organizes the sprawling and rapidly evolving world of open urban data. Our framework includes three broad categories (1) inputs and resources, (2) activities and outputs, and (3) outcomes. We then identify and describe the key subcomponents under each, and list the prominent products and resources available to urban managers and planners. For example, under inputs and resources, we discuss open urban data sources such as Open Street Maps, cyberinfrastructure for web hosting, application deployment, and data processing, and open source software that can be used to analyze and visualize collected or derived data. We also identify the key resources available to planners for training and discuss the complementary opportunities presented by conventional datasets such as census and open urban data. Finally, using examples from ongoing activities in Mumbai, we show how open data resources can be useful for understanding urbanization and better integrating informal settlements into formal urban management and planning processes. We suggest that urban managers and planners working in informal settlements should take greater advantage of open data resources in order to both better address current challenges as well as for shaping a better future for the communities they serve.

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**Keywords:** Open data; Informal settlements; Slums; Planning support; Nongovernmental organizations

## 1. Introduction

Urban data is a term broadly applied to information characterizing the many facets of human settlements, including socio-economic and demographic makeup of its residents, infrastructure and environmental conditions, and historic trends in

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growth and change (Batty, 2008). High quality urban data for use as a fact base is an essential component of decision-making at large and small scales, and across a variety of sectors (White & Engelen, 2000, Klosterman, 1994). From an urban management perspective, data can be useful for identifying areas for infrastructure investments (Gramlich, 1994), pinpointing locations of environmental and public health hazards (Lawson et al., 1999), conserving biodiversity (Maddock & Du Plessis, 1999), and delivering basic as well as emergency services (Lee, 2007).

However, not all urban areas are created equal when it comes to the quality and availability of data for urban management. Detailed and standardized datasets are traditionally produced by public agencies, which often control its type, storage, and dissemination. In developing countries in particular, this data is often difficult to access for non-governmental agencies and researchers (Rambaldi, Kyem, McCall, & Weiner, 2006). The quality of – and access to – urban data is especially limited in areas of informal settlements (Zetter & De Souza, 2000), which exist in a legally contested space. As a result, agencies serving these areas often use ad-hoc datasets (Dagdeviren & Robertson, 2009) that can limit the perceived legitimacy of their analyses and findings. On the other hand, formal development plans and other instruments of the urban management agencies pay little attention to the needs of slums, either opting to relegate them to special purpose agencies in charge of “rehabilitation” or using the lack of data to justify their exclusion from formal planning processes and management efforts (Werlin, 1999). Indeed, many have attributed the lack of proactive planning for slums and the continuing challenges faced by public and non-profit sector planners to such attitudes (Werlin, 1999, Das & Takahashi 2009).

Open urban data or free, accessible, and user-generated information (Liu et al., 2015) has recently burst into the scene with the potential to address the gaps in the fact base revealed by relying solely on government-produced and other conventional authoritative datasets (Crooks et al., 2014). Their role in urban planning and management in particular has been touted by both the technology sector and academic researchers (Liu et al., 2015, Crooks et al., 2014). However, in order to realize the promise of open data, urban managers and planners need more detailed guidance on how to navigate a sprawling field of often unrepresentative and unstandardized datasets, varied software and server platforms, and gaps not readily addressed by existing open urban data resources. Navigating these issues is particularly challenging when organizations are operating with fewer resources and lower planning capacity (Donovan, 2012).

In this paper, we begin to address these issues by developing a framework to help urban managers and planners navigate the sprawling and rapidly evolving world of open urban data. Our framework is organized into three broad categories using the conventions of the logic model (Kellogg Foundation, 2004). These categories are: (1) *inputs and resources*, (2) *activities and outputs*, and (3) *outcomes*. We then identify and describe the key subcomponents under each, and list the prominent products and resources available to urban managers and planners. For example, under inputs and resources, we identify *open urban data* sources such as Open Street Maps, *cyberinfrastructure* or platforms for web hosting, application deployment, and data processing, and *open source* software that can be used to analyze and visualize collected or derived data. We also identify the key resources available to planners for training and discuss the complementary opportunities presented by open urban data and conventional datasets such as census. Finally, using examples from ongoing activities in Mumbai, we show how open urban data resources can be useful for understanding urbanization and better integrating informal settlements into formal urban management and planning processes. We suggest that urban managers and planners working in informal settlements should take greater advantage of open data resources in order to both better address current challenges as well as for shaping a better future for the communities they serve.

## 2. Motivation

We live in an increasingly urbanized world and this trend is expected to continue well into the future, but the locus of urban population growth has shifted from the developed economies of the Global North to developing nations of Asia and Africa (United Nations, 2014a). In many of the fastest growing cities, urban informality, understood as “a state of deregulation, one where the ownership, use, and purpose of land cannot be fixed and mapped according to any prescribed set of regulations or the law” (Roy 2009, p. 80) is an indisputable fact of life, but is often ignored by formal, state-sanctioned planning processes (Patwa, 2013; Pinto, 2015). An example can be seen in the map (see Fig. 1) taken from the Development Plan for Greater Mumbai 2014–2034 prepared by Municipal Corporation of Greater Mumbai, one of two planning agencies with jurisdiction over the city (Chakraborty, Wilson & Bin Kashem, 2015).

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