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Exploring citizen infrastructure and environmental priorities in Mumbai, India

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ABSTRACT

Many cities worldwide seek to understand local policy priorities among their general populations. This study explores how differences in local conditions and among citizens within and across Mumbai, India shape local infrastructure (e.g. energy, water, transport) and environmental (e.g. managing pollution, climate-related extreme weather events) policy priorities for change that may or may not be aligned with local government action or global environmental sustainability concerns such as low-carbon development. In this rapidly urbanizing city, multiple issues compete for prominence, ranging from improved management of pollution and extreme weather to energy and other infrastructure services. To inform a broader perspective of policy priorities for urban development and risk mitigation, a survey was conducted among over 1200 citizens. The survey explored the state of local conditions, the challenges citizens face, and the ways in which differences in local conditions (socio-institutional, infrastructure, and health-related) demonstrate inequities and influence how citizens perceive risks and rank priorities for the future design and implementation of local planning, policy, and community-based efforts. With growing discussion and tensions surrounding the new urban sustainable development goal, announced by the UN in late September 2015, and a new global urban agenda document to be agreed upon at 'Habitat III', issues on whether sustainable urbanization priorities should be set at the international, national or local level remain controversial. As such, this study aims to first understand determinants of and variations in local priorities across one city, with implications discussed for local-to-global urban sustainability. Findings from survey results indicate the determinants and variation in conditions such as age, assets, levels of participation in residential action groups, the health outcome of chronic asthma, and the infrastructure service of piped water provision to homes are significant in shaping the top infrastructure and environmental policy priorities that include water supply and sanitation, air pollution, waste, and extreme heat.

1. Introduction

This study examines how differences in local conditions shape infrastructure development and environmental policy priorities within the Mumbai metropolitan area (estimated population of 21.5 million). While the differences in environmental priorities within one urban neighborhood have been explored in Beirut (El-Zein et al., 2006), and similar efforts have been made at national (Lo, 2010; Harrison and Kostka, 2014) and international levels including across cities (UN, 2015; ICMA, 2010; Aylett, 2014), few studies exist that unpacks how differences in local conditions shape infrastructure and environmental priorities, considering equity and citizen risk perceptions within and across a rapidly urbanizing Asian city.

Due to increasing interest in urban sustainability and shifting interests in the context of top-down versus community-based planning processes to achieve these goals, a number of surveys and studies have pointed to the importance of understanding local priorities and risk perception determinants, with such information providing an entry point to mapping and addressing key urban dynamics. Few studies have explained the determinants for policy priorities and how they may vary by citizen populations. Knowledge in this area may help to understand why certain sustainability issues related to infrastructure and environment rank higher in competing for prominence among the general population and for subpopulations by age, gender, religion, and/or urban services.

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For this study, over 1200 household surveys were conducted during December 2013 and February 2014 with local Indian institutional partners. Ten types of household priorities for change are identified and explored based on multiple local system conditions and inequities. While local urban systems are complex and any assessment of local conditions is far from all encompassing, we explore how three types of determinants or local conditions (socio-institutional, infrastructure and health outcomes) shape citizen priorities for managing multiple infrastructure and environmental risks. This case study demonstrates the importance of obtaining and utilizing new knowledge in two ways:

a) Creating opportunities for broad, integrative assessment of inequities and priorities (defined as prioritizing of urban infrastructure/environment issues by households).
b) Exploring implications of this information for planning and policy agenda setting efforts if cognizant of and recognizing urban citizen aspirations and diverse groups.

By using the case of Mumbai as a representative rapidly urbanizing megacity, initial methods are developed to create new knowledge on the questions: 'how and to what extent do differences in local conditions shape policy priorities?' and 'who (by social-institutional factors, infrastructure and health outcome conditions) cares about what priorities?' While we do not directly address aspects of informal and formal infrastructure conditions which are prevalent in cities across Latin America, Asia and Africa nor the various stakeholders behind the local urbanization processes, a study framework is discussed next (and in Fig. 1), illustrating the key elements and scope for exploring the survey results. The exploration of these questions are expected to help with improving initial understanding of the distinct and critical challenges and opportunities for citizens in one city based on recent trends and phenomena of rapid urbanization, motorization (Takeuchi et al., 2006), economic growth (Bhagat and Jones, 2013), tremendous demands for infrastructure that can improve health (WHO, 2014), global and local environmental change, environmental and weather-related health risks (Rosenzweig et al., 2011; Hallegatte et al., 2011; Maplecroft, 2014), and growing inequities (Sridhar and Kashyap, 2012) that may be exacerbated by climate impacts (de Sherbinin et al., 2007).

The organization of the rest of this paper is as follows. First, we describe the rationale for study area selection. We use a review of the literature to then develop a conceptual framework that links differences in local conditions and policy priorities. We then develop methods to apply the framework, explore survey results, and discuss key findings on local conditions as they relate to infrastructure and environmental priorities.

2. Study area rationale

Mumbai was selected as a case study for three reasons: it is one of the five most populous metropolitan areas in the world; it is one of the most densely populated cities globally; and its' pathways for urban development pose a series of sustainable urbanization challenges and opportunities that are similar to other rapidly growing Asian cities. These are described in detail below.

- Population: The Mumbai Metropolitan region's population has ballooned from 7.3 million in 1975, 16.4 million in 2001, to 22.6 million in 2014. The projected addition of 4 million new inhabitants by 2025 (est. 26.6 million) is the equivalent of the entire population of Los Angeles, California moving to Mumbai in the next 10 years (UN, 2014).
- Population Density: Mumbai is among the five largest megacities in the world and is projected to maintain one of the highest population densities in the world at 20,692 persons per square kilometer for the city as a whole. Population density is currently twice as high as New York city (Thirani, 2012).
- Mumbai as a Laboratory for Sustainable Urbanization Challenges/Opportunities: While India is experiencing the fastest urbanization in the world (2.8% annually) and is now the second fastest-growing economy after China, the country's cities including Mumbai continue to face overcrowding, poor infrastructure conditions and high levels of slums and exposures to air pollution, flooding, and heat waves. Mumbai contributes 40% of the State GDP, 5% of national GDP, and generates 40% of India's foreign trade (Bhagat and Jones, 2013), yet recent estimates suggest slum populations within Greater Mumbai Municipal Corporation's boundary accounts for more than half of its citizens and more than one-seventh (15.2%) of the total slum population in India (Gupta et al., 2009). This situation has resulted in urban inequities that have persisted and are particularly apparent during or after natural hazards or when analyzing city health data. For example, heavy rains in Mumbai in 2000 killed seventy persons (De et al., 2005) and the July 2005 cyclone resulted in 94 centimeters of rain in 24 h with over 1000 deaths in Mumbai, mostly in slum settlements (de Sherbinin et al., 2007). In terms of health, a study of eight cities in India found Mumbai to have the highest proportion of stunted children (45%) indicating high levels of malnutrition or undernourishment; and for women in Mumbai, at least one in five are underweight and 667 per 100,000 suffer from medically treated tuberculosis (a number that is even higher in slums versus non-slum areas) (Gupta et al., 2009).

With these challenges in mind, opportunities exist for alternative urban development pathways that address and

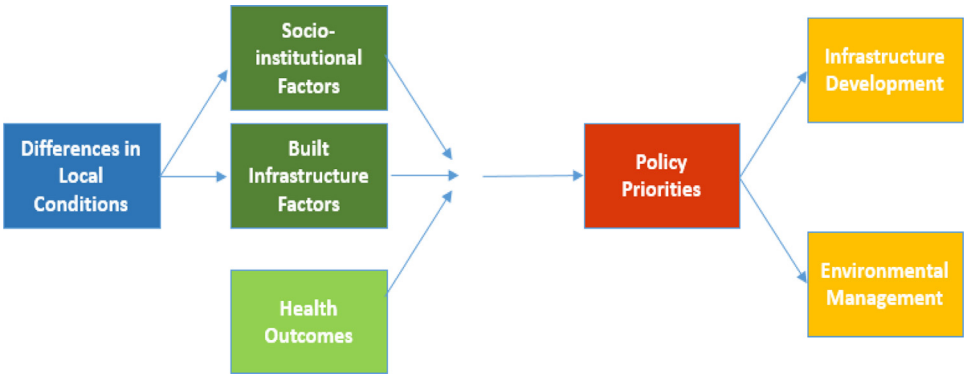

Fig. 1. Framework for Exploring Differences in Local Conditions and Priorities.