

# BUILDING SMART CITIES IN INDIA

ALLAHABAD, AJMER,  
AND VISAKHAPATNAM

BROOKINGS



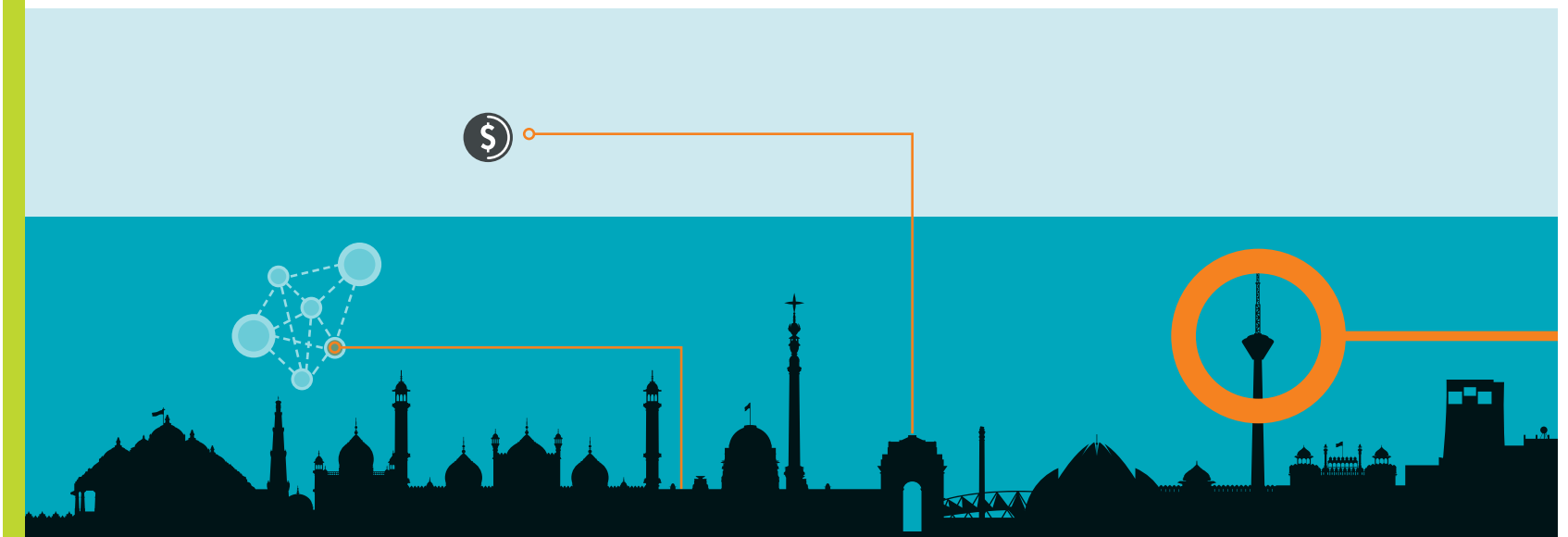
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ALLAHABAD, AJMER,  
AND VISAKHAPATNAM

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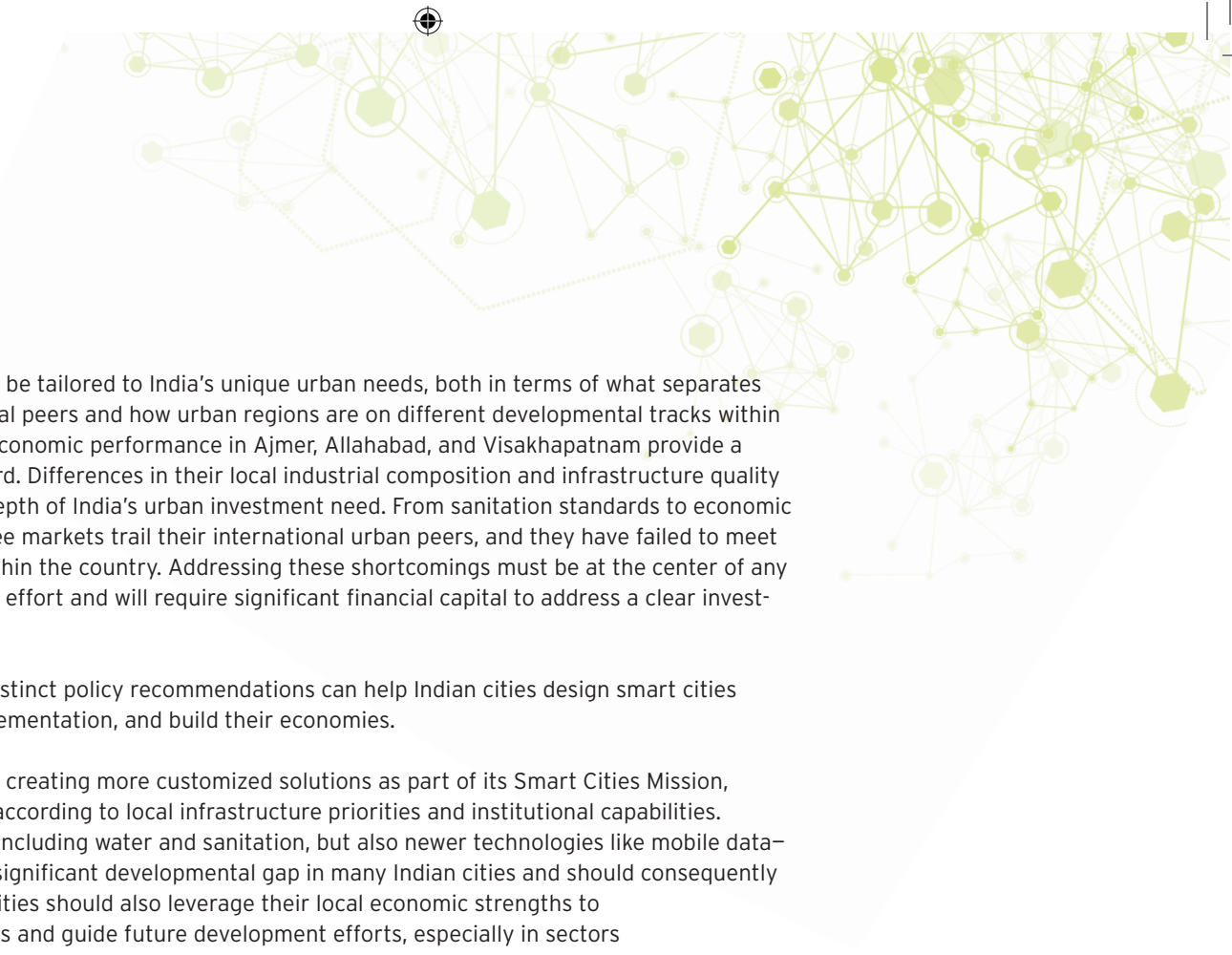
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## Executive Summary

**A**s India continues to experience rapid urban expansion, public and private leaders at a national, state, and local level are looking into ways to better manage larger populations and unlock greater economic potential. Launched under Prime Minister Narendra Modi in 2015, the “Smart Cities Mission” is an ambitious multiyear effort to boost economic development, technological innovation, and sustainable growth across 100 cities. Learning from previous national urbanization initiatives, the Smart Cities Mission promises to simultaneously improve the infrastructure and built environment in India’s expanding cities while offering a new path to urban fiscal health. If successful, Indian cities will position themselves as clean, modern, and competitive places for years to come.

Considering the early stages of the national initiative, this report comes at a critical time to inform and guide future strategies and collaborations. Using three cities—Ajmer, Allahabad, and Visakhapatnam—as examples, the report highlights governance challenges, infrastructure gaps, institutional arrangements, and financial tools that policymakers must consider to reach their local ambitions. Simply put, installing digital technologies alone will not deliver the results India hopes to achieve.

India’s growing tide of urbanization necessitates significant governance reforms to successfully manage such growth. Following a variety of reforms during the past few decades—including those included under prior national urbanization programs—many regions across India have assumed greater control over managing and financing their urban development. However, states and Urban Local Bodies (ULBs) can still vary widely in the amount of control they exercise in these matters and are continually exploring new ways to drive investments. The creation of new local units to manage urban infrastructure—called Special Purpose Vehicles (SPVs)—offers the potential to guide more comprehensive planning efforts, but their long-term role must be more clearly defined.



These reforms must then be tailored to India's unique urban needs, both in terms of what separates India from its international peers and how urban regions are on different developmental tracks within the country. The varied economic performance in Ajmer, Allahabad, and Visakhapatnam provide a useful gauge in this regard. Differences in their local industrial composition and infrastructure quality reveal the breadth and depth of India's urban investment need. From sanitation standards to economic diversification, these three markets trail their international urban peers, and they have failed to meet federal ministry goals within the country. Addressing these shortcomings must be at the center of any local Smart City planning effort and will require significant financial capital to address a clear investment gap.

Fortunately, a series of distinct policy recommendations can help Indian cities design smart cities plans, improve their implementation, and build their economies.

First, India must focus on creating more customized solutions as part of its Smart Cities Mission, which should be shaped according to local infrastructure priorities and institutional capabilities. Essential infrastructure—including water and sanitation, but also newer technologies like mobile data—poses perhaps the most significant developmental gap in many Indian cities and should consequently be a top priority. Indian cities should also leverage their local economic strengths to develop priority industries and guide future development efforts, especially in sectors that offer higher wages and pathways to more durable growth. Projects to address these challenges must then be aligned with institutional capabilities. Given existing governance and financial challenges, Indian cities must scale their project sizes in light of practical considerations on the ground.

Second, India must look to improve government capabilities at all levels to accelerate future urban development efforts. At the city level, for instance, ULBs must modernize their overall governance approach by further clarifying their functions and by shifting some of their responsibilities to SPVs or other administrative bodies, which may possess more specialized technical expertise and a more targeted mandate. For their part, SPVs must maintain public trust and accountability while pursuing improved financing and sustainable funding. Central and state governments must continue to further empower local leaders in the development of future policies, balancing when they should lead and where more independence—such as through revenue collection or stronger mayoral leadership—has the greatest impact.

Third, India must elevate the financial standing of its urban areas, making them more attractive destinations for future investment. Across all levels of government, particularly among different city agencies, India must ensure that dependable capital is available to meet economic goals in years to come. Increased private-sector engagement should be a paramount concern, which requires more active, coordinated leadership in project management, technical guidance, and risk mitigation. India should also actively investigate ways to boost activity within its municipal bond market, which can be a significant source of financial capital if it follows best practices in other leading markets such as the United States.

**“India must look to improve government capabilities at all levels to accelerate future urban development efforts.”**

# 1. Introduction

Following a sweeping victory in the 2014 general elections, the National Democratic Alliance (NDA) sought to recharge India's economy. Alongside Prime Minister Narendra Modi, the government not only brought a new positive outlook, but also ushered in many different reforms across multiple sectors of the economy. Among them, steps toward greater urbanization assumed central importance, with the government pledging more than INR 98,000 crore (\$14.7 billion) in support of these efforts over the next five years. A variety of programs emerged as a result, from AMRUT to HRIDYA, but the "Smart Cities Mission" proved perhaps the most captivating. It aimed to upgrade 100 Indian cities into world-class habitable places in the span of only a few short years.

In this study, we describe several of the fundamental pillars that define smart cities in India, using Ajmer, Allahabad, and Visakhapatnam (Vizag) as examples.

First, we establish additional context behind these efforts and provide a critical appraisal of previous government programs centered on urbanization, including the Jawaharlal Nehru National Urban Renewal Mission (JnNURM). We describe the central role of local governments in spearheading future changes across India, including the continued devolution of fiscal responsibility and authority. In particular, states and municipalities throughout India have varied widely in their implementation of the 74th Constitutional Amendment Act, which was designed to improve local governance. Across the public and private sectors, in turn, a wide range of institutional and financial factors must be weighed carefully when accelerating Smart City improvements in years to come.

With this background in mind, we then analyze the economic performance of Ajmer, Allahabad, and Visakhapatnam to better gauge how well they can incorporate such improvements. In particular, this study is motivated by the Modi-Obama joint declaration, under which the United States has extended its support for the Smart City development of these three cities. We examine the local industrial composition of these cities to identify specific engines of growth, which are crucial to successfully sustaining an economic comparative advantage and harnessing Smart City upgrades. In addition, we examine a variety of sociodemographic factors and infrastructure characteristics, from education and health to energy use and sanitation, relative to other global benchmarks.

Finally, in light of this economic context, we conduct an investment gap analysis to estimate the level of investment needed to improve existing infrastructure and meet Smart City standards. Although every Indian Smart City will become smart in its own unique way, we also explore similarities with global peers to provide guidance for future infrastructure improvements. Through a detailed cluster analysis, we have compiled a large sample of global cities for comparison.

Key implications and recommendations emerge from this analysis, providing guidance to government and other stakeholders. Ultimately, our extensive research reveals how governance changes at a city level represent a crucial step in delivering more comprehensive Smart City improvements, which naturally involve a number of factors beyond technological upgrades.



## 2. Governance Context

To better understand the context of India's "Smart Cities Mission," this section discusses the role of urbanization and governance at national, state, and local levels. It profiles recent patterns in growth, related government efforts, and various institutional arrangements that have contributed to the potential rise in Smart City improvements in urban areas like Ajmer, Allahabad, and Visakhapatnam, which will be described at greater length in later sections of this report.

### 2.1 INDIA'S URBAN CONTEXT

India is in the midst of an "urban revolution." According to the 2011 census of India, 31.2 percent of the total population—or 377 million people—lives in urban areas. When it comes to the rate of urbanization, India ranks far behind other emerging economies such as China (45 percent), Brazil (87 percent), and Mexico (78 percent), but is comparable to Burma (34 percent) and Guinea (35 percent). For the most part, over the last century India's population has resided in rural areas, but this rural-urban divide is shrinking quickly. As shown in Table 1, the share of India's urban population has risen steadily during the past few decades, jumping from 6.2 percent in 1951 to 31.2 percent in 2011, and it is expected to touch 40 percent by 2031.

Several different reasons help explain this structural shift, especially since 1947 with India's independence. The rise of a more diversified economy, combined with a growing reliance on heavy industry, is one major factor. Similarly important are the 1991 economic reforms, helping to spread greater market activity and investment across country.<sup>1</sup> With a focus on service industries, India has also experienced a notable transition from rural and semi-urban areas to urbanized growth centers. Better infrastructure facilities and economic opportunities are constantly attracting more people into urban areas. In the reverse, rural areas struggle with economic distress, agricultural stagnation, and limited infrastructure development. However, many areas are urbanizing in an unplanned manner, and a large number of unrecognized slum communities have developed around the peripheries of major towns and cities.

As highlighted in Table 1, the pace of urbanization—demonstrated by growth per decade—has slowed compared with the initial years after independence, yet the current trends of 30 percent growth are likely to continue for some time. For example, according to the Twelfth Five Year Plan, nearly 600 million people will reside in urban areas by 2031. Moreover, it is expected that more than 200 million people will live in urban areas in fewer than 20 years. Another measure—the "Index of Urban Population"—provides an even better sense of this trend. Since independence, India's urban population has sextupled, with the number of towns and urban agglomerations (similar in concept to metropolitan areas) almost doubling since 1951 alone. Notably, this growth in rural-urban migration is now much more widespread across the country, even though major metros such as Delhi, Mumbai, Chennai, and Kolkata were the primary centers of this activity in earlier decades. By comparison, a large number of "outgrowth areas" have recently emerged near existing cities, supporting additional migration from adjoining rural areas.

**TABLE 1. Urbanization Trends in India**

| Year | Total Population | Number of Towns and Urban Agglomerations | Urban Population | Decadal Growth (%) | Share of Urban Population to Total Population (%) | Index of Urban Population (Base 1951 = 100) |
|------|------------------|--|------------------|--------------------|---|---|
| 1951 | 36.11            | 2,843                                    | 6.24             | 41.4               | 17.3  | 100   |
| 1961 | 43.92            | 2,365                                    | 7.89             | 26.4               | 18  | 126   |
| 1971 | 54.81            | 2,590                                    | 10.91            | 38.2               | 19.9  | 175   |
| 1981 | 68.33            | 3,378                                    | 15.95            | 46.1               | 23.3  | 256   |
| 1991 | 84.63            | 3,768                                    | 21.76            | 36.4               | 25.7  | 349   |
| 2001 | 102.86           | 5,161                                    | 28.61            | 31.3               | 27.8  | 458   |
| 2011 | 125.21           | 7,935                                    | 37.71            | 31.8               | 31.16   | 601   |

Source: Census of India (1951: 2011).

Until very recently, however, policymakers and planners have not paid much attention to cities as “engines of growth,” which has led to a narrow vision for the future and severely constrained the systematic expansion and development of India’s urban spaces. Instead, the primary driver of these trends has been economic distress in rural areas.<sup>2</sup> Although the 1991 economic reforms have helped open the floodgates for investment, industry, and jobs in urban settings, a large portion of employment is still highly scattered and disorganized. As a result, an unending migration continues into established towns and cities, where individuals seek a better job market and living conditions. Meanwhile, the lack of coordinated planning and the laggard development of institutional capacity have made it difficult for urban areas to absorb this growth.

## 2.2 URBANIZATION INITIATIVES IN INDIA

Over time, India has adopted a piecemeal approach to enhance city life, including many individual programs sponsored by the central and state governments. Consequently, this approach did not provide a big enough push to fundamentally improve the condition of urban areas. The following sections provide additional context in this respect, discussing several key initiatives undertaken by successive governments in India—both to upgrade urban spaces and promote them as durable engines of growth.

### 2.2.1 JAWAHARLAL NEHRU NATIONAL URBAN RENEWAL MISSION

By many indications, India only recognized the need for a systematic upgrade of urban spaces about a decade ago. On December 3, 2005, then prime minister Dr. Manmohan Singh launched JnNURM, a massive initiative to improve the quality of life and local infrastructure in India’s cities within seven years.<sup>3</sup> With an estimated investment of \$20 billion, JnNURM aimed to create economically efficient, productive, equitable, and responsive cities, covering more than 67 mission cities across the country and spreading growth in multiple regions. However, many projects had not been completed within the seven years, resulting in a two-year extension lasting until March 31, 2014.

More forward-looking and reformist, this scheme marked a major departure from the prevailing piecemeal strategies and project-based approach across India’s cities. Collectively organized around four-submissions, JnNURM was highly ambitious and emphasized a wide range of priorities, includ-

ing water supply, sewers, solid waste management, stormwater drains, urban transport, water body preservation, upgrading slum areas, and basic services for the poor.<sup>4</sup> JnNURM mandated and created incentives for urban local bodies (ULBs) to undertake various reforms to gradually improve their civic service levels, with 23 reforms recommended, 13 of which were mandatory and 10 optional. Among the 13 mandatory reforms, ULBs were responsible for six and the rest were to be undertaken by their respective state governments. The aim of these reforms was to make local governments more financially sustainable and administratively efficient. Although, JnNURM was a Centrally Sponsored Scheme (CSS), with the share of central government grants ranging from 35 percent in larger cities to 90 percent in northeastern cities, it supported cost recovery through a variety of user charges and public-private partnerships.

### **BOX 1. Reforms under JnNURM**

#### **URBAN LOCAL BODIES REFORMS**

- 1 E-governance
- 2 Shifting to accrual-based double entry accounting
- 3 Implementing a property tax (85 percent coverage and 90 percent collection efficiency)
- 4 Adopting user charges (100 percent cost recovery of water supply and solid waste)
- 5 Earmarking funds for services to urban poor
- 6 Providing basic services to urban poor

#### **STATE REFORMS**

- 7 74th CAA (transfer 12th Schedule functions)
- 74th CAA (constitution of District Planning Committee)
- 74th CAA (constitution of Metropolitan Planning Committee)
- 8 Transfer-city planning function; transfer-water supply and sanitation
- 9 Reforming rent control
- 10 Rationalizing stamp duty to 5 percent
- 11 Repealing Urban Land Ceiling & Regulation Act (ULCRA)
- 12 Enacting community participation law
- 13 Enacting public disclosure law

#### **OPTIONAL REFORMS**

- 14 Introducing property title certification system in ULBs
- 15 Revising building bylaws—streamlining the approval process
- 16 Revising building bylaws to make rain water harvesting mandatory
- 17 Earmarking 25 percent of developed land in all housing projects for Economically Weaker Sections (EWS) and Lower-Income Groups (LIG)
- 18 Simplifying legal and procedural framework for converting agricultural land to nonagricultural purposes
- 19 Introduce computerized process of registration of land and property
- 20 Create bylaws on reuse of recycled water
- 21 Introduce administrative reforms
- 22 Introduce structural reforms
- 23 Encourage public-private participation

*Source: Ministry of Urban Development, Government of India*

Ajmer, Allahabad and Visakhapatnam were also included under JnNURM as mission cities and offer additional insights on how much progress has been achieved relative to national averages. In terms of the total number of reforms implemented, Visakhapatnam has performed quite well, with an overall 94 percent achievement rate, as shown in Table 2. This is followed by Allahabad (89 percent) and Ajmer (86 percent). The clear difference in ULB reforms between Ajmer and Visakhapatnam is still revealing, highlighting the variation in institutional capacity locally. The progress of state reforms also stands out in Andhra Pradesh compared with the other regions, further cementing Visakhapatnam's strategic position in future Smart City developments.

**TABLE 2. Reform status under JnNURM**

| Reforms               | Ajmer  | Allahabad | Visakhapatnam |
|-----------------------|--------|-----------|---------------|
| ULB reforms (6)       | 46/60  | 53.3/60   | 59.5/60       |
| State reforms (7)     | 65/70  | 63/70     | 67.5/70       |
| Optional reforms (10) | 87/100 | 88/100    | 90/100        |
| Total                 | 86%    | 89%       | 94%           |

Source: Brookings analysis of JnNURM appraisal report (cycle 4), Ministry of Urban Development, Government of India

Beyond policy reforms, mission cities also completed individual projects at different rates during JnNURM (Table 3). In total, JnNURM sanctioned 538 projects until April 29, 2014, with an investment outlay of INR 42,904 crore (\$6.4 billion).<sup>5</sup> However, of these, only 227 projects (42 percent) have been completed. At the state level, Maharashtra was sanctioned the maximum number of projects, while Bengaluru had the highest number of approved projects among cities. Nationally, completion rates were particularly slow for sewer and solid waste management projects at 30.9 percent and 28.6 percent, respectively. Although some cities such as Gujarat completed more than 70 percent of their total projects, Visakhapatnam's completion rate stood at 57 percent but only invested 18.5 percent of the total federal outlay. Ajmer, by comparison, spent a much higher share of its investment outlay (62.7 percent).

**TABLE 3. Project Status under JnNURM**

| Projects    | National Average | Ajmer      | Allahabad  | Visakhapatnam |
|-------------|------------------|------------|------------|---------------|
| Total       | 538 (42,904)     | 4 (505.64) | 4 (617.52) | 14 (1589.24)  |
| Completed   | 227              | 3 (316.91) | 4 (617.52) | 8 (293.19)    |
| In-progress | 311              | 1 (188.73) | 0 (0)      | 6 (1296.05)   |

Note: Figures in parenthesis show investment outlay in INR crore; these projects are only for Urban Infrastructure and Governance (UIG).

Source: Brookings analysis of JnNURM data, Ministry of Urban Development, Government of India

With so many projects incomplete, it becomes clear that several cities struggled to forge effective plans and strategies during the JnNURM initiative. Even after a two-year extension, only 42 percent of the projects were completed at the national level, and many cities tended to complete only those smaller projects with smaller investment outlays. Thus, it is safe to assume that at least 58 percent of JnNURM's total investment (INR 24,884 crore) has not materialized into physical assets, signaling the need for a clearer, more concerted effort.

## 2.2.2 ATAL MISSION FOR REJUVENATION AND URBAN TRANSFORMATION

The newly elected central government, in turn, discontinued JnNURM in 2014 and launched a new urban investment program—the Atal Mission for Rejuvenation and Urban Transformation (AMRUT)—with a total investment outlay of INR 50,000 crore (\$7.5 billion). Although AMRUT has a similar overall purpose to JnNURM, it is distinct in its geographic coverage and implementation structure.

### BOX 2. Reforms under AMRUT

- 1 E-governance
- 2 Constituting and professionalizing municipal cadre
- 3 Augmenting double-entry accounting
- 4 Urban planning and city plans
- 5 Devolving funds and functions
- 6 Reviewing building bylaws
- 7 Setting up a financial intermediary at state level
- 8 Improving municipal taxes and fees
- 9 Improving levy and collection of user charges
- 10 Applying credit ratings
- 11 Using energy and water audits
- 12 Adopting the Swachh Bharat Abhiyan (clean India mission)

*Source: Ministry of Urban Development, Government of India*

For example, AMRUT aims to touch more than 500 cities across India compared with JnNURM's 67 mission cities. The central government also has limited its contribution to 33 percent of total project costs for cities with a population greater than 1 million, and 50 percent for cities with population less than 1 million. At the same time, to reduce project backlogs and improve implementation, AMRUT empowers state governments to sanction projects under their jurisdiction unlike the central government's case-by-case approach under JnNURM. The central government, however, permitted subnational governments to continue funding JnNURM projects where 50 percent or more of the work had already been completed.

Perhaps most significantly under AMRUT, ULBs are now primarily tasked with overseeing individual projects, have the involvement of third-party parastatal agencies, and are emphasizing the attraction of additional private investment to improve civic services and infrastructure. In particular, each ULB must prepare a Service Level Improvement Plan (SLIP), which forms the basis for larger State Annual Action Plans (SAAPs), which the central government then approves. Table 4 describes the total SAAPs approved for the three focus cities and their respective states.

**TABLE 4. Approved SAAP for Ajmer, Allahabad, and Visakhapatnam (fiscal year 2015-2016)**

|               | Ajmer | Allahabad | Visakhapatnam |
|---------------|-------|-----------|---------------|
| Approved SAAP | 120   | 269.94    | 114.57        |

Source: Ministry of Urban Development, Government of India

### 2.2.3 HRIDAY

Along with AMRUT, the newly elected central government also initiated the urban investment program, National Heritage City Development and Augmentation Yojana (HRIDAY) in January 2015. The aim of this scheme is to promote conservation across 12 “heritage cities” and launch more inclusive planning measures, with a total outlay of INR 500 crore (\$75 million) until March 2017.<sup>6</sup> India’s central government provides all funding under HRIDAY. Among the three focus cities, for instance, Ajmer is one of the heritage cities and received a INR 40.04 crore (\$6 million) to deploy heritage-sensitive infrastructure, upgrade historic city areas, augment heritage-based industries, and document its heritage asset inventory.

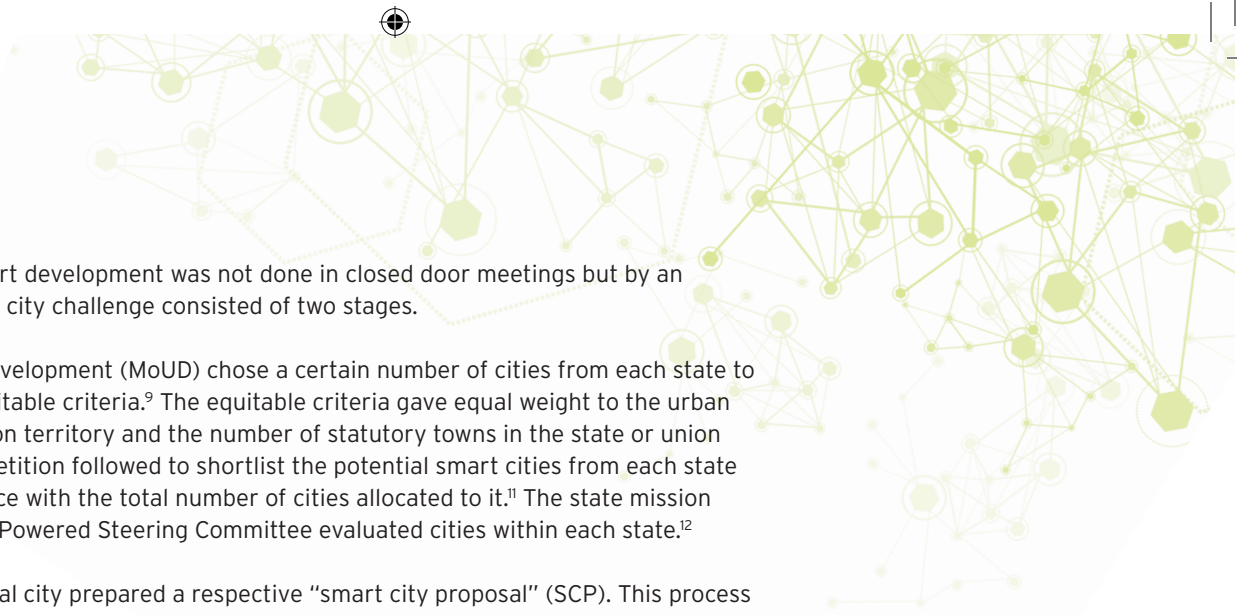
### 2.2.4 SMART CITIES

Among the various urbanization initiatives described above, India’s “Smart Cities Mission” garnered perhaps the most domestic and international attention. The objective of this initiative is to accelerate core infrastructure improvements in cities, provide a decent quality of life to citizens, offer a clean and sustainable environment, and readily apply “smart” solutions.<sup>7</sup> With an “area-based” development approach, this initiative differs markedly from previous efforts, which tended to follow a project-based development approach. In turn, a number of unique opportunities and challenges are likely to emerge in particular regions.

Indeed, the scope of India’s Smart Cities effort is quite ambitious. Its initial five-year window is from 2014-2015 to 2019-2020 with a total budget of INR 48,000 crore (\$7.2 billion). The central government, moreover, plans to invest INR 500 crore (\$75 million) per city during this period, and respective governments, ULBs, and private investors are expected to raise a matching amount. The initiative focuses on creating new business incentives, pushing state governments and ULBs to create a more business-friendly environment, and attract additional private capital for long-term infrastructure projects. Accordingly, 10 percent of the budget is reserved for incentive payments to respective state governments or union territories.

In addition, its major policy priorities are considerably broader than previous urbanization programs. Some of the key features include promoting mixed land uses, creating more inclusive affordable housing, preserving and developing open and walkable urban spaces, encouraging multipurpose transport facilities to promote “last mile” connectivity, simplifying governance activities, and applying “smart” solutions to infrastructure and services, among others.

Collectively, this initiative intends to create a more tailored urban development strategy—adopted by the respective city administration and reflective of current city conditions—rather than pursuing a one-size-fits-all solution. Broadly, it permits three different strategies for smart development in a subregion of the city, namely 1) retrofitting (the improvement of existing areas), 2) redevelopment (city renewal, including replacing existing built-up areas and the co-creation of new layout areas with improved infrastructure), and 3) green-field development (city extension to outgrowth areas). At the same time, cities must apply a selected smart solution as a pan-city initiative. The government feels that “since smart city is taking a compact area approach, it is necessary that all the city residents feel there is something in it for them also.”<sup>8</sup>



The selection of cities for smart development was not done in closed door meetings but by an impartial “city challenge.” The city challenge consisted of two stages.

First, the Ministry of Urban Development (MoUD) chose a certain number of cities from each state to be included using a set of equitable criteria.<sup>9</sup> The equitable criteria gave equal weight to the urban population of the state or union territory and the number of statutory towns in the state or union territory.<sup>10</sup> An intrastate competition followed to shortlist the potential smart cities from each state or union territory in accordance with the total number of cities allocated to it.<sup>11</sup> The state mission directors and state-level High Powered Steering Committee evaluated cities within each state.<sup>12</sup>

Under stage two, each potential city prepared a respective “smart city proposal” (SCP). This process was critical, as the SCP required an in-depth analysis of the strategy for Smart City development in individual cities. The proposals contained the chosen mode of development with various pan-city integration initiatives, deliberations with city residents, reflections on citywide aspirations, and a detailed plan of financing. A committee consisting of national and international experts, organizations, and institutions evaluated these proposals. Evaluation criteria were objective and based on a combination of city evaluation criteria (scoring 30 percent)<sup>13</sup> and proposal evaluation criteria (scoring 70 percent).<sup>14</sup> This comprehensive evaluation permitted a balanced selection of cities. The top 20 scoring cities were shortlisted as the winners of stage two and received the first round of funding.<sup>15</sup> Other cities not selected were advised to rework their proposals and submit improved versions for the second round of funding at the end of June 2016.

Another notable aspect of this initiative is that modernization plans will be implemented through Special Purpose Vehicles (SPVs) rather than ULBs as was previously done in past urbanization initiatives.<sup>16</sup> During both the short- and long-term, the advantages and disadvantages of SPVs must be weighed carefully, including possible structural shifts and the devolution of urban planning functions to a corporate entity versus a statutory body.

In short, SPVs are structured to have operational freedom to appraise, approve, finance, implement, manage, operate, monitor, and evaluate Smart City proposals. Each city is to incorporate an SPV as a limited company registered under the Companies Act of 2013, with 50/50 equity shares between the state government and ULB, with certain levels of private investment permitted. Furthermore, since grants provided by the central government to ULBs for Smart City development must be used upfront rather than being spread over time, the financial well-being of SPVs is key to accelerating these efforts, where steady streams of revenue must be maintained by state and local bodies through user charges, taxes, and surcharges, in addition to loans and debt from financial institutions. In the envisaged setting, SPVs are to be directed by a board of directors and run by a full-time CEO. The board of directors is to have representatives from central government, state government, ULBs, functional directors, additional directors (representative of other parastatal agencies), and independent directors, along with the CEO. The CEO may either be a bureaucrat or an independent expert, to be appointed for a term of three years. The various functions and responsibilities of ULBs are to be delegated to SPVs, allowing them to have functional autonomy and independence in decisionmaking.

## 2.3 GOVERNANCE OF SMART CITIES

India's recent urbanization initiatives illustrate how important it is to have a clear governance framework in pioneering future Smart City changes at a national, state, and local levels. The following subsections (2.3.1 through 2.3.3) will not only shed light on existing bottlenecks, but they will help define any key constraints that must be addressed if grand urbanization efforts such as the "Smart Cities Mission" are successful, including the peculiarities of Ajmer, Allahabad, and Visakhapatnam. Two subsections—namely "institutional structure" and "fiscal and financing structure"—help further elucidate these key governance challenges.

Put simply, sound governance and institutional structure are vital to the success of any reform agenda, especially in guiding future investments. For example, it is estimated that Indian cities will require capital investment of nearly INR 3.92 million crore (\$588 billion) from 2012 to 2031 to upgrade urban spaces in line with the ministry's prescribed standards.<sup>17</sup> At the same time, an additional INR 2 million crore (\$300 billion) will be needed for operation and maintenance costs, helping support future urban agglomeration and national productivity.<sup>18</sup> Although acquiring capital for this expansion is not anticipated to be a major stumbling block, political and organizational failures locally are expected to be more problematic. Locally, for instance, rampant corruption and administrative inefficiency are key bottlenecks that many less developed countries, including India, face.<sup>19</sup> Administrative failures locally not only lead to extra costs and delays for projects in the short run, but they can also deter private investment in the long run.

Up to this point, civic service delivery and local infrastructure upgrades in Indian cities have largely fallen under the oversight of public institutions, including most prominently the Municipal Corporations.<sup>20</sup> These bodies coordinate with various other agencies to deliver amenities and to develop the physical infrastructure for basic services such as water, sewer, solid waste management, stormwater drainage, and public lighting. Unfortunately, ULBs have not yet developed into autonomous institutions of self-governance with sufficient capability to cater to the needs of all populations.

Recently, however, a new trend in India is private-sector involvement in urban administration and financing, which may offer more effective alternatives to sole public governance and finance. Many private investors, for instance, have shown an appetite for delivering basic civic services, with the town of Gurgaon gaining widespread attention in this respect.<sup>21</sup> Although Gurgaon has emerged as a sprawling business town, other nearby towns like Faridabad have lagged behind, even though the latter was initially more industrialized and better positioned to support agglomeration. As a result of several private incentives—and circumventing traditional instruments of governance in favor of private developers—Gurgaon has achieved a higher growth trajectory.<sup>22</sup>

In many ways, Gurgaon's success story depends on how policymakers define the success of an urban area itself. For example, while Gurgaon has recorded impressive economic gains and attracted considerable investment, the town's ongoing growth has come to a halt. The lack of development in public infrastructure appears to represent a chief reason why the city has stopped expanding. Even though private firms are successfully delivering basic civic services in the city's concentrated enclaves, it can be difficult to coordinate their actions, and a mismatch in private costs and social gains from certain investments can occur, which limits the development of a broader, more dependable network of public infrastructure. In addition, although privately delivered services often outperform those from the government, both the public and private sectors share an immense number of challenges, resulting in the poor state of urban spaces across India and the desire for a more optimal mix of private incentives and government support.<sup>23</sup>



## 2.3.1 INSTITUTIONAL STRUCTURE

Although the municipal form of governance in India has existed since 1687, the degree of local autonomy and specific functions of cities have varied over time.<sup>24</sup> Several political dynamics, in particular, have helped define the path of municipal governance, including respective provincial governments.<sup>25</sup> In India, it was larger metropolitan cities such as Madras, Bombay, and Calcutta where the political and governance dynamics necessitated the formation of Municipal Corporations. But a very large portion of urban India remained without local governments until the second half of the 20th century.

In 1882, the Viceroy of India, Lord Ripon, led the resolution for the democratic form of municipal governance in India. This was a significant move not only for the effective transformation of cities and local politics but for larger political economy of the cities. In the coming decades, city politics became the major platform for educated youth, and many leaders of national prominence consequently emerged from the local bodies who were ultimately instrumental in bringing independence to India.<sup>26</sup> In another major structural reform, the Government of India Act 1935 brought local city government under the explicit purview of the provincial governments and laid down specific powers and responsibilities to them.<sup>27</sup> This was an important change for two reasons. First, it allowed for variations in municipal governance structures across the different provinces. Second, after India's independence, state governments led a restructuring of municipalities, which ultimately resulted in the variation that defines Indian cities today.

Crucially, then, the devolution of administrative and financial powers to municipalities came at the hands of state government. Many of the functions and responsibilities of municipalities overlapped with that of state government. Moreover, municipalities tended to depend on state governments to deliver basic services to their residents. This was disastrous for short- and long-term dynamics of city governance. In the short run, this practice led to interjurisdictional conflict across different levels of state agencies and resulted in the languishing of minimum basic services in many cities. This practice was even more disastrous in the long run, as it habituated the local authorities to be dependent on the higher form of government, leading to a complete collapse of both local political and bureaucratic leadership.

### 2.3.1.1 VERTICAL DEVOLUTION OF POWER AND RESPONSIBILITIES

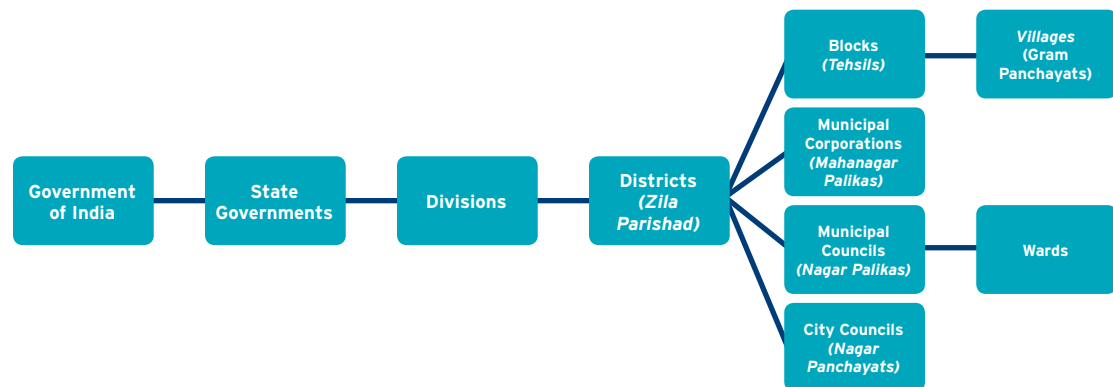
The sustained state of poor and ineffective basic services to the masses culminated in a political movement that demanded constitutional status for local city governments in India. This political upsurge led to the passage of the 73rd and 74th Constitutional Amendment Act (CAA) to the Indian Constitution in 1992, calling for a more effective administration of rural and urban affairs. Before this amendment passed, local governments were organized and managed by the discretionary executive orders of state governments on an *ultra vires* ("beyond the powers") basis. The "Statement of Object" of the 74th CAA clearly highlights the need of this intervention:

In many States local bodies have become weak and ineffective on account of a variety of reasons, including the failure to hold regular elections, prolonged supersessions and inadequate devolution of powers and functions. As a result, Urban Local Bodies are not able to perform effectively as vibrant democratic units of self-government.<sup>28</sup>

As a result, the 74th CAA provided constitutional status to local governments, which invalidated the discretionary control of their respective state governments. This legislative intervention brought local governments under judicial review—in other words, state governments were legally obliged to implement the new system of governance in its full spirit as delegated by the act. By 1994, most of the state legislatures had met this obligation by enacting necessary changes to their respective laws affecting municipal governance.

Among its changes, the 74th CAA permitted three types of ULBs: municipal corporations, municipalities, and city councils (which include Notified Area Committees and Town Area Committees). The functions and responsibilities of these three forms of government vary widely, including differences in their fiscal autonomy and the election and nomination of their members. Municipal corporations, for instance, tend to be the most autonomous. Subsequent legislation allowed for four other types of ULBs, including cantonment boards, port trusts, townships, and special purpose agencies. Figure 1 shows the existing structure of administrative governance in India.

**FIGURE 1. Administrative Structure of India following the 74th Constitutional Amendment Act**



As such, the 74th CAA attempted to resolve the long-standing interjurisdictional conflict between state governments and ULBs by establishing greater jurisdictional clarity in the following key areas:

- 1. Functions and responsibilities**—Through the Twelfth Schedule, the 74th CAA delineated 18 functions entrusted to ULBs. The intervention aimed to resolve interjurisdictional conflict and improve service delivery. Depending on their institutional capacity, each ULB varies in its functions. Box 3 lists all 18 functions, along with the inter ULB variation.<sup>29</sup>
- 2. Taxation power**—The Seventh Schedule lists all the taxes that can be levied by local bodies, which had been long a point of contestation. Specific sets of taxes for each ULB, however, are further defined by their respective state legislatures.
- 3. Arrangements for revenue sharing**—The 74th CAA calls for State Finance Commissions to recommend the basis of revenue sharing between states and municipalities.
- 4. Conduct of regular and fair elections**—State election commissions have the responsibility for fair and regular elections.
- 5. Adequate representation of weaker sections**—Article 243T makes provisions for reserving seats for the scheduled castes and tribes in every municipality.

### BOX 3. Twelfth Schedule Functions

- 1 Urban planning, including town planning
- 2 Regulation of land use and construction of buildings
- 3 Planning for economic and social development
- 4 Roads and bridges
- 5 Water supply for domestic, industrial, and commercial purposes
- 6 Public health, sanitation, conservancy, and solid waste management
- 7 Fire services
- 8 Urban forestry protection of the environment and promotion of ecological aspects
- 9 Safeguarding the interests of weaker sections of society, including the disabled
- 10 Slum improvement and upgrades
- 11 Urban poverty alleviation
- 12 Promoting urban amenities and facilities such as parks, gardens, playgrounds
- 13 Promoting cultural, educational, and aesthetic aspects
- 14 Burials and burial grounds, cremations grounds, and electric crematoriums
- 15 Cattle ponds, prevention of cruelty to animals
- 16 Vital statistics, including registration of births and deaths
- 17 Public amenities, including street lighting, parking lots, bus stops, and public conveniences
- 18 Regulation of slaughter houses and tanneries.

Source: 74th Amendment, Constitution of India

The 74th CAA also creates provisions for an approach to development for larger areas, forming District Planning Committees (DPCs) and Metropolitan Planning Committees (MPCs). The aim of DPCs and MPCs has been to promote growth and development beyond the narrow concept of city jurisdictions. This amendment made it compulsory for states to constitute DPCs, which are tasked with consolidating the plans prepared by urban and rural local bodies and preparing a Draft Development Plan (DDP) for the district as a whole.<sup>30</sup>

In preparing the DDP, DPCs consider matters of common interest among *panchayats* (*local self-government system*) and the municipalities, including spatial planning, sharing of water and natural resources, developing infrastructure, and conserving the environment. The act mandates that four-fifths of the members in DPCs be elected members of the district *panchayats* and municipalities. Similarly, two-thirds of MPCs are to be elected members of the municipalities and chairpersons of the *panchayats*. State legislatures have flexibility in the composition and functions of such committees and how the members are elected.

It is imperative to study the implementation status of 74th CAA 24 years hence, including what it means for future Smart City developments. As shown in Figure 2, progress varies on the 18 functions delegated under the Twelfth Schedule regarding the devolution of responsibilities, and governance across different Indian cities remains relatively uneven.

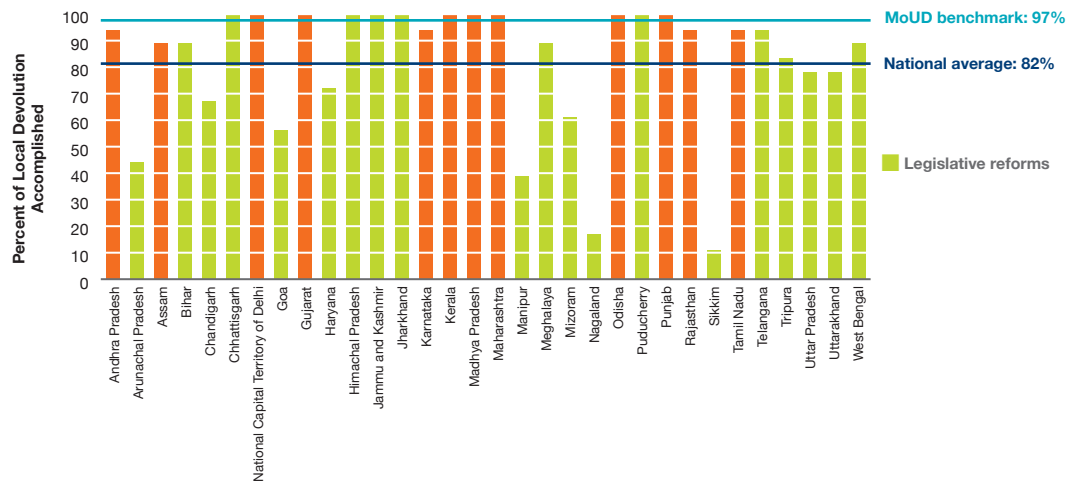
Ideally, legislative devolution would be complete by now. However, only about 82 percent of legislative functions have been devolved, when considering the amendments ULBs have made to their respective Municipal Acts across all the states and union territories. According to the data analyzed here, only

12 states have completely devolved all functions to their respective ULBs. In general, northeastern states have lagged behind, with Assam and Tripura being notable exceptions. Of particular note, the vertical orange bars in Figure 2 highlight states corresponding to the first 20 selected cities for Smart City development. For these select states, state have developed around 97 percent of functions, which clearly exceeds the national average and demonstrate a higher level of local autonomy.

It is important to note, though, that the legislative devolution of different functions does not necessarily culminate in the actual transfer of functions. This fact is highlighted by few “Memorandum of Agreements” signed between the MoUD and respective state governments at the inception of the JnNURM. Even though the current status of these function transfers is not completely known across all ULBs, it is generally believed that the partial transfer of functions is common, with urban planning being the most severely restricted function. Still, the lack of progress in devolving greater responsibility to local governments continues to hinder the development of urban space. Table 5 describes the implementation status on conduct of elections and the constitution of DPCs and MPCs.

Areas with greater local autonomy, however, tend to have improved public service delivery, according to the ministry’s service level benchmark data for 2012. A clear correlation not only appears for ULBs in states that have devolved greater autonomy, but it also appears for different ULBs, such as Municipal Corporations and municipal boards, within the state. Technological upgrades are necessary to cater to the needs of urban India and this is plausible only through investments flowing to local city economies. But this phenomenon alone may not be enough to bring forth the required transformation for urban India. For it to be viable, let alone effective, these technological investments have to be complemented by indispensable governance reforms. The local autonomy of cities is the most crucial aspect of these reforms, and such autonomy must not be overlooked in the ongoing discussions of Smart City development.

**FIGURE 2. Legislated Devolution under the 74th Constitutional Amendment Act (Twelfth Schedule Functions), by States and Urban Territories covered under JnNURM**



Source: Brookings analysis of JnNURM reform appraisal report, cycle 4, and Memorandum of Agreements signed between state governments and the Ministry of Urban Development, Government of India.

\* Orange bars highlight the states corresponding to the first 20 selected cities for Smart City development.



**TABLE 5. Implementation Status of Municipal Elections and Planning Committees**

| State Elections  | District Planning Committee (DPC)     | Metropolitan Planning Committee (MPC)   |
|--|---------------------------------------|---|
| All the states have amended their acts to conduct local municipality elections regularly and fairly. | All the states have constituted DPCs. | Seven states have constituted and eight have not constituted MPCs, while MPC is not applicable to 15 states.<br><br>Andhra Pradesh and Uttar Pradesh have not constituted MPCs while Rajasthan has. |

Source: Brookings analysis of JnNURM appraisal report (cycle 4), Ministry of Urban Development, Government of India  
 Note: Information available as on January 2014  
 Information is for 29 states plus National Capital Territory of Delhi.

### 2.3.1.2 HORIZONTAL DISTRIBUTION OF POWER AND RESPONSIBILITIES

The 74th CAA provided a model to vertically distribute the power and responsibilities between state governments and ULBs. However, the specific structure of each local government is highly diversified, largely owing to the autonomy of state governments when catering to specific regional needs. State governments can define a singular format for all their respective ULBs or they can legislate different formats for different ULBs. Despite these variations, each state is to follow a prescribed overarching framework of governance. Here we examine the mechanisms of service delivery locally, providing lessons to consider for future Smart City improvements.

The 74th CAA helped established three kinds of municipalities: Municipal corporations for large urban areas, municipal councils for small urban areas, and *nagar panchayats*.<sup>31</sup> The three forms have varying institutional frameworks and fiscal capacities, and thus also have varying degrees of autonomy and functional responsibility. Municipal corporations, for example, are designed to deliver on each of 18 function noted in the Twelfth Schedule of the CAA, while municipal councils and *nagar panchayats* have a limited scope of responsibilities.

Indeed, the distribution of horizontal powers and responsibilities can get quite complicated within states, especially given the ever-growing presence of Special Purpose Agencies alongside existing Municipal Corporations. The role of Urban Development Authorities (UDAs), for instance, has gained prominence. They are a form of Special Purpose Agencies—supported by state governments—that perform specialized urban planning functions for specific regions. Generally, the jurisdiction of UDAs is far greater than that of municipal corporations, but the exact role, structure, and jurisdictional limits of these agencies are often determined by their respective state governments. This particular feature, in turn, presents advantages and disadvantages, allowing for larger spatial planning efforts but also leading to detrimental interagency jurisdictional conflict.<sup>32</sup>

Such intra-agency jurisdictional conflict is another major source of variation among ULBs. Intra-agency conflicts are heavily determined by the assigned powers and responsibilities of city mayors, elected councilors, and municipal commissioners, in addition to the specific nature of elections and terms of appointment. Together, these variations can affect the overall institutional and fiscal capacity of ULBs. Although most states and union territories generally conduct fair and regular elections for city council, the effective transfer of power can still vary across different municipalities, depending on the existing power structure between mayors and municipal commissioners.



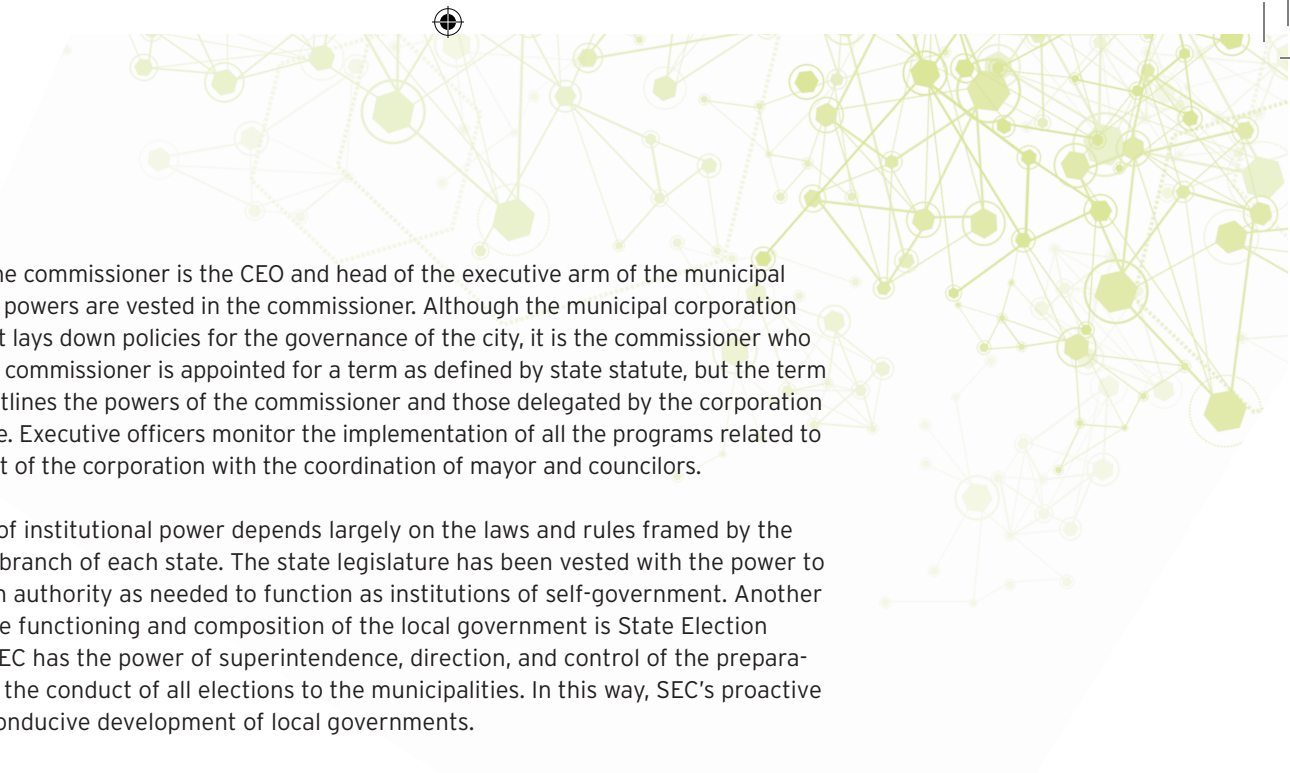
Mayors serve as the municipal heads in India and are usually chosen through indirect election among councilors themselves, as shown in Table 6. The number of councilors, moreover, can depend on the city's area and population, and they are generally elected from several wards for a term of five years. For example, Andhra Pradesh and Rajasthan have an indirect election of their mayors, while Uttar Pradesh follows a direct election. Similarly, Rajasthan and Himachal Pradesh have previously amended their regulations to make way for the direct election of mayors with five-year terms; however, both jurisdictions later revised those decisions due to the grossly ineffective city administration functioning. Municipal elections in Visakhapatnam have been due since 2013, delayed by ongoing court proceedings related to the merger of five nearby villages into Greater Visakhapatnam Municipal Corporation.

**TABLE 6. City Mayor Elections and Terms**

| State # | State            | Mode of Election | Term                |
|---------|------------------|------------------|---------------------|
| 1       | Assam            | Indirect         | One year            |
| 2       | Chandigarh       | Indirect         | One year            |
| 3       | Delhi            | Indirect         | One year            |
| 4       | Gujarat          | Indirect         | Two and a half year |
| 5       | Himachal Pradesh | Indirect         | Two and a half year |
| 6       | Karnataka        | Indirect         | One year            |
| 7       | Maharashtra      | Indirect         | Two and a half year |
| 8       | Kerala           | Indirect         | Five years          |
| 9       | Odisha           | Indirect         | Five Years          |
| 10      | Punjab           | Indirect         | Five years          |
| 11      | Sikkim           | Indirect         | Five years          |
| 12      | Goa              | Indirect         | Five years          |
| 13      | Haryana          | Indirect         | Five Years          |
| 14      | Uttarakhand      | Direct           | Five years          |
| 15      | West Bengal      | Indirect         | Five years          |
| 16      | Andhra Pradesh   | Indirect         | Five years          |
| 17      | Bihar            | Indirect         | Five years          |
| 18      | Chhattisgarh     | Direct           | Five years          |
| 19      | Jharkhand        | Direct           | Five years          |
| 20      | Madhya Pradesh   | Direct           | Five years          |
| 21      | Rajasthan        | Indirect         | Five years          |
| 22      | Tamil Nadu       | Direct           | Five years          |
| 23      | Uttar Pradesh    | Direct           | Five years          |

Source: Bhanu Joshi, "From 74th CAA to SMART cities" (New Delhi, Yojana, October 1, 2014), <http://yojana.gov.in/From-74-CAA-to-SMART-cities.asp>.

Municipalities function by committees, which consist of the mayor and other councilors. The most powerful is the Standing Committee, with its role of exercising executive, supervisory, financial, and personnel powers. It is composed of between seven and sixteen elected members within a system of proportional representation of councilors. The mayor, by comparison, lacks executive authority, largely owing to the British roots of the system. India instead largely follows a model that is also known as the Commissioner System, taking its name from the role of the city administrator who is generally a



state-appointed officer. The commissioner is the CEO and head of the executive arm of the municipal corporation. All executive powers are vested in the commissioner. Although the municipal corporation is the legislative body that lays down policies for the governance of the city, it is the commissioner who executes the policies. The commissioner is appointed for a term as defined by state statute, but the term can be altered. Statute outlines the powers of the commissioner and those delegated by the corporation or the standing committee. Executive officers monitor the implementation of all the programs related to planning and development of the corporation with the coordination of mayor and councilors.

The effective devolution of institutional power depends largely on the laws and rules framed by the legislative and executive branch of each state. The state legislature has been vested with the power to endow municipalities with authority as needed to function as institutions of self-government. Another institution that affects the functioning and composition of the local government is State Election Commission (SEC). The SEC has the power of superintendence, direction, and control of the preparation of electoral rolls and the conduct of all elections to the municipalities. In this way, SEC's proactive approach is vital to the conducive development of local governments.

## 2.3.2 FISCAL AND FINANCING STRUCTURE

In addition to these various institutional considerations, Smart City improvements in India also hinge on how finances are handled. In short, the fiscal devolution of power is essential for the effective devolution of institutional power.

Currently, many municipalities depend on grants from central and state governments, support from finance commissions, loans, and other sources of finances. The capacity of ULBs to generate their own revenue is meager. This phenomenon demands a detailed study of the fiscal and financing structure of ULBs. Several trends and core structural issues emerge concerning the financial well-being of municipalities, including Ajmer, Allahabad, and Visakhapatnam, which will influence their ability to accelerate Smart City developments.

### 2.3.2.1 EXISTING STRUCTURE OF FINANCING FOR LOCAL BODIES

The 74th CAA along with a structure for institutional devolution of power also prescribed a formal method for fiscal devolution of power to municipalities. It entrusted State Finance Commissions (SFCs) to make recommendations to the governor about the distribution of financial resources between the state and the municipalities. During a term of five years, SFCs review the financial position of *panchayats* and municipalities. State Finance Commissions make recommendations to the governor of the state on the following: 1) the net proceeds of the taxes, duties, tolls, and fees levied by the state, 2) which taxes, duties, tolls, and fees may be assigned to the municipalities, and 3) the grants-in-aid to the municipalities from the state's Consolidated Fund. The commission is also empowered to recommend other matters referred by the governor in the interests of sound municipal finance. Apart from SFC, the Central Finance Commission (CFC) may also suggest the measures needed to augment the Consolidated Fund of a state to supplement the resources on the basis of the recommendations made by the Finance Commission of the state.

Through Article 243X, the Constitution of India empowers state legislatures to delegate taxation powers to municipalities by enacting the required law, so that they may:

- "a) Authorize a municipality to levy, collect, and appropriate such taxes, duties, tolls, and fees in accordance with such procedure and subject to such limits;
- b) Assign to a municipality such taxes, duties, tolls, and fees levied and collected by the state government for such purposes and subject to such conditions and limits;

- c) Provide for making such grants-in-aid to the municipalities from the Consolidated Fund of the state; and
- d) Provide for constitution of such funds for crediting all money received, respectively, by or on behalf of the municipalities and also for the withdrawal of such moneys there from.”<sup>33</sup>

The state governments are given the flexibility to decide on matters that they want to pass on to the ULBs. Based on the analysis of Municipal Acts at the state level, Box 4 presents a list of various taxes that fall under municipalities’ power. However, different municipalities may have different taxes under their domain. Similarly, Box 5 provides a detailed list of various sources of nontax revenue for municipalities.

**BOX 4. Tax Sources in Indian Cities from Municipal Acts**

- 1 Property tax
- 2 Profession tax
- 3 Sanitation/ conservancy tax
- 4 Scavenging tax
- 5 Latrine tax
- 6 Drainage tax
- 7 Education tax
- 8 Entry/terminal tax
- 9 Taxes on vehicles
- 10 Advertisement tax
- 11 Entertainment tax
- 12 Pilgrim tax
- 13 Environment tax/land revenue
- 14 Betterment/development tax
- 15 Passengers and goods tax
- 16 Timber tax
- 17 Tax/toll on animals
- 18 Cable operator tax
- 19 Toll/tax on bridges/vehicles
- 20 Octroi (local taxes on goods entering the city)

Source: 74th Amendment, Constitution of India

**BOX 5. Nontax Sources or Use Charges in Indian Cities from Municipal Acts**

- 1 Sanitation/ conservancy charge
- 2 Water charges
- 3 Surcharge on sales tax
- 4 Birth/death registration fees
- 5 Betterment fees
- 6 Mutation fees
- 7 Dangerous and Offensive Trade license fees
- 8 Slaughterhouse fees
- 9 Market fee
- 10 Fee for fire services
- 11 Fees on dogs
- 12 Fees for registration of animals
- 13 Parking fees
- 14 Fee for building application
- 15 Duty on transfer of immovable property
- 16 Penalty for late tax payment
- 17 Stamp duty
- 18 Rent from municipal properties
- 19 Receipts from fines
- 20 Receipts from interest

Source: 74th Amendment, Constitution of India



Likewise, many municipalities currently face stark financial realities, which can influence their level of service delivery and their symbiotic relationship with the central and state governments. For example, municipal revenue forms a minimal portion of total GDP. According to the Twelfth Finance Commission, this ratio stood at around 0.70 percent, but has slightly improved to 0.94 percent as per the Thirteenth Finance Commission.<sup>34</sup> The municipal tax to GDP ratio is also a meager 0.5 percent, whereas the ratio of total tax to GDP stands at around 18 percent. Put another way, India does generate a significant amount of tax revenue, but almost none of it is from direct local taxes.

Table 7 below presents the status of municipal revenue in India for 2007-2008. The share of “own revenue”—which includes transfers and grants-in-aid from the central and state governments—constitutes approximately 53 percent of total revenue. A comparison from the Twelfth Finance Commission report reveals that this is down from 63 percent, highlighting how over time, municipalities are depending more on other sources of revenue besides their own.

**TABLE 7. Status of Municipal Revenue in India**

|                                    | INR (in crore) | (Relative share (percentage)) |
|------------------------------------|----------------|-------------------------------|
| <b>Total</b>                       | <b>44,429</b>  | <b>100</b>                    |
| <b>Own Revenue</b>                 | <b>23,522</b>  | <b>53</b>                     |
| Exclusive taxes                    | 15,278         | 34.4                          |
| Revenue shared taxes               | 0              | 0                             |
| Non-tax revenue                    | 8,244          | 18.6                          |
| <b>Other revenue</b>               | <b>20,907</b>  | <b>47</b>                     |
| Transfer from SFC                  | 9,171          | 20.6                          |
| Grants in Aid (State Governments)  | 5,676          | 12.8                          |
| Transfer from CFC                  | 869            | 2                             |
| Grants in Aid (Central Government) | 2,373          | 5.3                           |
| Other                              | 2,818          | 6.3                           |

Source: High Powered Expert Committee. “Report on Indian Urban Infrastructure and Services” (New Delhi: Government of India, Ministry of Urban Development, 2011, p. 153).

Note: Data are sourced from Thirteenth Finance Commission report for 2007-2008

With this broader context in mind, Table 8 below describes the varying municipal finance status of Ajmer, Allahabad, and Visakhapatnam. Allahabad, for instance, is most the dependent on grants-in-aid—which makes up 68 percent of its total revenue—followed by Ajmer and Visakhapatnam, at 29 percent and 24 percent, respectively. Tax revenue, in contrast, makes a very minor contribution to Ajmer’s total revenue, while the tax revenue in both Allahabad and Visakhapatnam contribute approximately one-quarter of their revenue. Further, although tax revenue represents only a minor share of aggregate municipal finances, property taxes contribute approximately 90 percent of the tax revenue for each of the three cities.

**TABLE 8. Status of Municipal Finances of Ajmer, Allahabad and Visakhapatnam**

| Variable        | Ajmer | Allahabad | Visakhapatnam |
|-----------------|-------|-----------|---------------|
| Tax revenue     | 3%    | 26%       | 25%           |
| Non-tax revenue | 68%   | 6%        | 51%           |
| Grants          | 29%   | 68%       | 24%           |
| Property Tax*   | 84%   | 93%       | 88%           |

Source: City Development Plans for Allahabad and Visakhapatnam, State Finance Commission report 2013.<sup>35</sup>

Note: All figures are percent of total revenue.

\* As a percentage of total tax revenue; calculations are on average in Visakhapatnam (2007-08 to 2010-11) and Allahabad (2008-09 to 2011-12)

Despite these varying levels of municipal finances, the central government continues to emphasize the importance of enabling local bodies to raise capital from the market more directly. The ability to do so, however, is possible only if and when the local bodies are financially well off enough to generate returns and meet their obligations to creditors.

For example, Table 9 shows the credit ratings for Ajmer, Allahabad, and Visakhapatnam. Fitch, the credit rating agency, has assigned Ajmer a rating of BBB-(good). BBB ratings indicate that expectations of default risk are currently low and the capacity for payment of financial commitments is considered adequate, but adverse business or economic conditions are more likely to impair this capacity. CARE Ratings assigned B+ and A rating to Allahabad and Visakhapatnam, respectively. Although Allahabad has a high risk of default for the timely servicing of its financial obligations, Visakhapatnam is adequately safe in servicing its financial obligations. The ratings show that Allahabad has not been performing as well financially as Ajmer and Visakhapatnam. This impedes the capability of Allahabad to rely on the market for raising capital.

**TABLE 9. Credit Ratings**

| Ajmer        | Allahabad | Visakhapatnam |
|--------------|-----------|---------------|
| BBB- (FITCH) | B+ (CARE) | A (CARE)      |

Source: Brookings analysis of JnNURM data, Ministry of Urban Development, Government of India (status as of November 2012)

### 2.3.2.2 INDIAN MUNICIPAL BOND MARKET AND LESSONS FROM THE U.S. MARKET

Although ULBs had long depended on grant aid and subsidies from the state and central governments to meet their funding needs, the passage of the 74th Constitutional Amendment improved the institutional capacity of ULBs and opened their routes to raise independent revenue. Although the ULBs primarily rely on devolved funding from central and state governments, plus directly sourced taxes and fees, the 74th amendment also allows ULBs to access capital market and borrow by issuing municipal bonds. However, India's current municipal bond market is relatively shallow owing to constraints on both supply and demand. In this case, ULBs's poor credit ratings bar them from issuing bonds, and conservative Indian investors tend to limit investment in the municipal bond market.

In January 2015, The Securities Exchange and Board of India (SEBI) announced regulations for "Issue and Listing of Debt Securities by Municipality" to deepen the municipal bonds market in India.<sup>36</sup> To ensure local Indian governments leverage this opportunity to improve access to capital, it is vital to consider the structure of India's current municipal bond markets, its shortcomings, and how the more robust U.S. bond market can inform recommendations.

The Bangalore Municipal Corporation was the first in India to issue a municipal bond in 1997. It raised INR 1.25 billion with a state guarantee backing the issuance. The Ahmedabad Municipal Corporation issued the first municipal bonds in India without state government guarantee in January 1998, raising INR 1 billion. Since then, the debt market for municipal bonds has grown relatively slowly. Table 10 below shows the amount raised by ULBs with municipal bonds.

Following in the steps of Ahmedabad Municipal Corporation, other cities have shown interest in accessing the capital markets. Municipalities such as Nashik, Nagpur, Ludhiana, and Madurai have issued municipal bonds without state government guarantee, but the market growth has fallen short of expectations.<sup>37</sup> The Greater Visakhapatnam Municipal Corporation (GVMC) issued the last round of municipal bonds in 2010. In most cases, ULBs use municipal bonds to fund water supply infrastructure, sewer schemes, and road projects. ULBs or public utilities have primarily relied on tax or tax-free bonds and pooled-finance bonds for issuing municipal securities.

**TABLE 10. Amount Raised by ULBs with Municipal Bonds**

| Type of Bond Issuance | Amount Raised (in INR million) |
|-----------------------|--------------------------------|
| Taxable bonds         | 4,450                          |
| Tax free bonds        | 6,495                          |
| Pooled finance        | 2,586                          |
| <b>Total</b>          | <b>13,531</b>                  |

Source: National Institute of Urban Affairs (NIUA); C. Vaidya and H. Vaidya, "Market-based Financing of Urban Infrastructure in India." In Building from the Bottom, edited by S. Kochar and M. Ramchandran (New Delhi: Academic Foundation, 2010).

Table 11 provides a detailed account of taxable municipal bonds. The table shows the nature of placement, guarantee, annual rate of interest, and escrow account type (linked cash flow for repayment). Nearly all the funds were privately placed except for Ahmedabad (1998), which was publically offered.

**TABLE 11. Status of Taxable Municipal Bonds India**

| City                 | Amount (in INR million) | Placement          | Guarantee        | Annual Interest | Escrow                                   | Purpose                             |
|----------------------|-------------------------|--------------------|------------------|-----------------|--|-------------------------------------|
| Bangalore (1997)     | 1,250                   | Private            | State Government | 13%             | State government grants and property tax | City Roads/Street Drains            |
| Ahmedabad (1998)     | 1,000                   | Public and Private | No               | 14%             | Octroi from 10 octroi collection points  | Water Supply and Sanitation Project |
| Ludhiana (1999)      | 100                     | Private            | No               | 13.5% to 14%    | Water and sewer taxes and charges        | Water Supply and Sanitation Project |
| Nagpur (2001)        | 500                     | Private            | No               | 13%             | Property tax and water charges           | Water Supply Project                |
| Nashik (1999)        | 1,000                   | Private            | No               | 14.75%          | Octroi from four collection points       | Water Supply and Sanitation Project |
| Indore (2000)        | 100                     | Private            | State Government | 13.00%          | Grants/property tax                      | Improvement of City Roads           |
| Madurai (2001)       | 300                     | Private            | No               | 12.25%          | Toll tax collection                      | City Road Project                   |
| Visakhapatnam (2004) | 200                     | Private            | No               | 7.75%           | Property tax                             |                                     |
| <b>TOTAL</b>         | <b>4,450</b>            |                    |                  |                 |  |                                     |

Source: National Institute of Urban Affairs (NIUA); C. Vaidya and H. Vaidya, "Market-based Financing of Urban Infrastructure in India." In Building from the Bottom, edited by S. Kochar and M. Ramchandran (New Delhi: Academic Foundation, 2010).

In 2000, the central government permitted a tax exemption on bonds issued by ULBs to incentivize demand.<sup>38</sup> The guidelines eventually published by MoUD in February 2001 capped the interest rate at a maximum of 8 percent per year to be eligible for tax free status. This rule has been a major hurdle in the expansion of tax-free municipal bonds, as there is inadequate return given the associated risk of investing in local government projects. Table 12 lists the municipal corporations that have issued tax-free bonds to date and the associated projects and amount raised.

**TABLE 12. Status of Tax-Free Municipal Bonds India**

| ULB  | Year | Project   | Amount (INR million) |
|--|------|---|----------------------|
| Ahmedabad Municipal C                                  | 2002 | Water supply and sewerage   | 1,000                |
| Nashik Municipal Corporation                           | 2002 | Underground sewerage and storm waterstormwater drainage                 | 500                  |
| Hyderabad Municipal Corporation                        | 2003 | Road construction and widening  | 825                  |
| Hyderabad Metropolitan Water Supply and Sewerage Board | 2003 | Drinking water  | 500                  |
| Chennai Metropolitan Water Supply and Sewerage Board   | 2003 | Water supply augmentation   | 420                  |
| Ahmedabad Municipal Corporation                        | 2004 | Water supply, storm waterstormwater drainage, road, bridges and flyover | 580                  |
| Visakhapatnam Municipal Corporation                    | 2004 | Water supply  | 500                  |
| Chennai Metropolitan Water Supply and Sewerage Board   | 2005 | Water supply  | 500                  |
| Chennai Municipal Corporation                          | 2005 | Roads   | 458                  |
| Ahmedabad Municipal Corporation                        | 2005 | Roads and wWater supply   | 1,000                |
| Nagpur Metropolitan Water Supply and Sewerage Board    | 2007 | Water supply and sewerage   | 212                  |
| <b>Total</b>   |      |   | <b>6,495</b>         |

Source: National Institute of Urban Affairs (NIUA); Vaidya, C. and Vaidya, H. (2010), "MarketBased Financing of Urban Infrastructure in India" in Kochar, S. and Ramchandran, M. (Ed.), *Building from the Bottom*, Academic Foundation, New Delhi, India.

On behest of Ministry of Urban Development and Ministry of Finance, the World Bank conducted a study on the regulation of municipal borrowing in India. Published in 2011, the report made a series of recommendations to push municipal borrowing toward its full potential.<sup>39</sup> The authors believed that SEBI should publish disclosure guidelines for publicly issued municipal bonds in line with the Ministry of Finance's tax-free standards. They also believed that India should better incorporate current international best practices. Such practices could include following Electronic Municipal Market Access as in the United States, where the U.S. Securities and Exchange Commission has no specific disclosure requirements but relies instead on the voluntary industry standards. Following the 2011 publication, MoUD created a committee to assess the implementation of the recommendations of the World Bank report. Some of their findings and suggestions are in Appendix A.

Indian investors traditionally prefer fixed deposits, small saving schemes, or gold. Because investors can track the progress of local projects and estimate their projected returns from the project's status and cash flow, bonds issued by municipalities with good financial track records are a promising alternative investment opportunity.<sup>40</sup> Civic engagement through municipal bonds is also possible; socially active, religious, or philanthropic entities can fund specific local projects related to schools, hospitals, and community centers.

Municipal bonds may also be an attractive option for private placements with large investors such as provident funds, pension funds and insurance companies. The issuance of tax-free bonds by municipalities may attract high net worth individuals and institutional investors. However, the cap of 8 percent interest for tax-free status reduces the attraction for investors. As a response, SEBI suggested removing the rate cap and linking it to a benchmark market rate.<sup>41</sup>

However, these reforms are just a start. If the ambition is to dramatically expand India's municipal bond market, the United States offers many lessons. The United States has the most advanced municipal bond market in the world. In theory, municipal financing can thrive in any country with a federalist system of governance, including Germany, Australia, and India. As India's cities consider more flexible and reliable ways to pay for Smart City improvements, municipal bonds can serve as a valuable model to consider strengthening in years to come.

Municipal bonds in the United States typically fall into two categories: general obligation bonds (GO bonds) or revenue bonds, the former of which can be issued by either state or local governments. To better understand whether the same forms of financing are viable in Indian markets, this section summarizes the specific sources of credit support under each bond category and explores additional factors to consider for expanded implementation.

General obligation bonds are backed by the full faith and credit of the issuing U.S. authority; while states typically use sales taxes and income taxes as sources of revenue, localities tend to use property taxes and similar types of support. Massachusetts and California are among the larger states that have issued GO bonds to support a variety of projects, and the New York City and the Los Angeles School District represent some of the more notable local leaders in this space. Internationally, global sovereign bonds and sub-sovereign bonds share many similarities with state and local GO bonds.

India's ability to replicate this GO bond model—and ultimately drive new investment—hinges on several additional considerations. For example, India could follow the U.S. lead, where it is crucial to consider: (1) the capacity of states to pay debt, including the robustness of their tax base; (2) the willingness of states to pay debt, based on a track record of repayment; and (3) the financial obligations states are already trying to fulfill, such as pension payments and other post-employment benefit liabilities. Monitoring the performance of local GO bonds also requires careful attention, including: (1) their exposure to state and county transfer payments; (2) recent economic trends; and (3) the levels of local taxation compared with neighboring jurisdictions.

In addition to GO bonds, India should also examine the potential of revenue bonds, which are generally backed by income generated from a given project or entity, such as bridge tolls and water fees. In the United States, a wide range of regional bodies has issued revenue bonds, including the San Francisco Bay Bridge Authority and the Bay Area Toll Authority. Internationally, corporate utility bonds display many similarities. As with U.S. GO bonds, several factors must be weighed carefully, namely, the stability of cash flow streams, and the flexibility to raise fees and tolls as needed.

In short, national, state, and local leaders in India will need to conduct more extensive analysis of these and other financial tools to support Smart City efforts, but the model for GO bonds and revenue bonds holds significant potential.

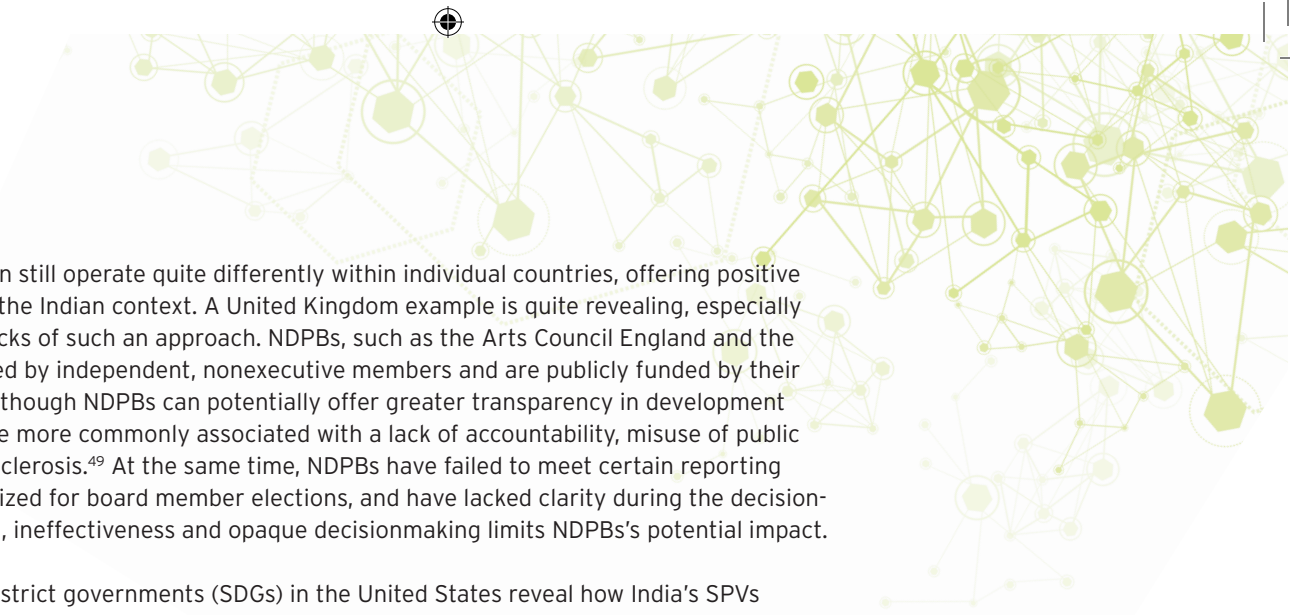
### 2.3.3 SPECIAL PURPOSE VEHICLES—THE WAY FORWARD

As part of India's "Smart Cities Mission," the central government announced the use of limited public companies called special purpose vehicles (SPV) to direct, finance, and manage urban infrastructure plans locally.<sup>42</sup> Structured similarly to independent government entities in many developed democracies—including the United Kingdom, United States, Australia, and France—India's SPVs promise to accelerate project development, attract private capital, and perform a range of other public services.<sup>43</sup> Given the structural similarities, these international examples provide important lessons for how India's Smart City SPVs can best meet their project delivery objectives and improve economic opportunity.<sup>44</sup>

First, it is important to consider how the Smart City SPVs differ from traditional Indian governmental frameworks. The SPVs are structured to operate with greater flexibility and autonomy than are traditional government bodies, with states and ULBs sharing equity stakes and working collaboratively to develop local projects.<sup>45</sup> Each SPV is led by a board of directors, consisting of representatives from central, state, and local governments as well as independent directors. Each SPV can draw funding from a number of different sources—including loans, taxes, grants from state and federal sources, and other user charges—and its independence is intended to reduce political risk concerning lost revenue, a critical consideration for attracting private capital in the Indian marketplace. In theory, this design should enable SPVs to adhere closely to federal Smart City guidelines on the timely execution of different projects.

Several other countries have established similar, independent entities to better target infrastructure investment, which offer additional precedent for India to consider.<sup>46</sup> Quasi-autonomous nongovernmental organizations (quangos), special purpose governments (SPGs), nondepartmental public bodies (NDPBs), and government sponsored entities (GSEs) are designed to meet the demand for specialized government services by completing projects with greater regulatory and financial independence.<sup>47</sup> They also have the ability to design, finance, and manage multiple projects within a clearly defined geographic area, ranging from the entire country to a specific city district. This is a major distinction from traditional Indian SPVs, which tend to focus on delivering one specific project in one specific place. Their geographic breadth also enables these independent units to foster multijurisdictional collaboration, typically by offering all jurisdictions board membership of some kind.

**“SPV leadership must establish transparency policies and abide by them, particularly when electing board members and monitoring the progress of projects.”**



However, these bodies can still operate quite differently within individual countries, offering positive and negative lessons for the Indian context. A United Kingdom example is quite revealing, especially in identifying the drawbacks of such an approach. NDPBs, such as the Arts Council England and the British Council, are headed by independent, nonexecutive members and are publicly funded by their sponsor department.<sup>48</sup> Although NDPBs can potentially offer greater transparency in development efforts, they have become more commonly associated with a lack of accountability, misuse of public funds, and bureaucratic sclerosis.<sup>49</sup> At the same time, NDPBs have failed to meet certain reporting requirements, been criticized for board member elections, and have lacked clarity during the decision-making process.<sup>50</sup> Overall, ineffectiveness and opaque decisionmaking limits NDPBs's potential impact.

By comparison, special district governments (SDGs) in the United States reveal how India's SPVs could lead to a number of benefits. Distinct from local general-purpose governments, SDGs can more efficiently serve a variety of purposes—from sewage treatment to fire protection—and are often created, governed, and empowered by local voters.<sup>51</sup> Because SDGs have independent tax and corporate powers, they are able to sign contracts, issue bonds, impose taxes, and collect user charges without a time-consuming review process. In many cases, SDGs can also physically deliver projects faster than general-purpose governments.<sup>52</sup> Their financial and governance independence mean funding flows do not touch other government coffers, allowing SDG management to focus on meeting their objectives on the basis of independent financial health. SDGs also have clear mandates for public accountability, which they deliver through transparent business practices and by designating board positions to relevant jurisdictions (often including local mayors, county executives, and state representatives). Although some research shows that SDGs spend significantly more per capita for services than general purpose governments—and may even overpay for labor and materials—they alleviate pressure on debt-burdened localities and spread risk for future projects.<sup>53</sup>

These examples provide invaluable lessons for all public parties involved in Smart City SPVs. First, SPV leadership must establish transparency policies and abide by them, particularly when electing board members and monitoring the progress of projects. Second, because SPVs currently include representatives from all three tiers of government, they must establish formal systems for sharing responsibility for successful and undelivered outcomes.<sup>54</sup> It is simply too easy to imagine an unsuccessful Smart City plan devolving into a finger-pointing exercise among board members. Third, although independent entities are at times difficult to dissolve, adopting “sunset” legislation under which entities expire after a fixed term—especially if specific outcomes are not achieved—will eliminate long-term unnecessary costs and create incentives to achieve immediate impact.<sup>55</sup> Lastly, some combination of federal, state, and local governments must establish long-term controls on revenue flows related to Smart City projects under SPV supervision. The American SDG framework is an important lesson, as independent financial governance generates marketplace confidence in the entities' long-term fiscal solvency and reduces project risk. Ensuring revenue will flow irrespective of an SPV's existence or potential interference from other government entities is a paramount concern in not only attracting initial capital but maintaining the physical investments constructed under Smart City plans.



## 3. Local Economy

This section highlights the key economic distinctions among Ajmer, Allahabad, and Visakhapatnam, illustrating the potential areas in which Smart City improvements could be targeted for future action. In addition to examining the structure and level of economic activity in these three cities, the section also looks into several sociodemographic characteristics and indicators of civic service performance.

### 3.1 ECONOMIC OVERVIEW

Although regional economies have often been viewed as dimensionless entities floating in space, their unique spatial distributions and geographical peculiarities play a critical role defining their needs—industrial, technological, or otherwise.<sup>56</sup> A variety of social, political, and geographical factors help differentiate each and every city over time. Understanding the root causes behind these distinctions and the subsequent effects on local economies is crucial to charting a more productive and innovative future for regions.

Although it can be difficult to establish a precise economic definition of cities, many have attempted to better articulate their foundational role in market activity. Commonly seen as essential physical entities in this respect—known as “built cities”—cities have more recently been associated as spaces for mass consumption (or “consumption cities”) and employment (or “employment cities”).<sup>57</sup> As populations increasingly diversify their patterns of consumption beyond agricultural products and toward other types of commodities, urban areas are experiencing more robust industrial and employment growth. For example, by 2010, cities accounted for more than 80 percent of world GDP.<sup>58</sup> Likewise, India’s urban sector accounted for more than 52 percent of the country’s GDP by 2005, up from 38 percent in 1971. This ratio, moreover, is likely to continue to rise to nearly 75 percent by 2021.<sup>59</sup>

The three focus cities in this study are economically distinct in a variety of ways. Ajmer is a city in the middle of the western state of Rajasthan. Historically, given its central geographic location, it has often been involved in trade and other commercial activities, but it has also served as an educational hub and center for tourism.<sup>60</sup> Allahabad, on the other hand, is one of the largest and most populated districts of the state of Uttar Pradesh. This city is situated at the confluence of the two most important rivers of north India and commands a high heritage value. Finally, Visakhapatnam is a major port in the southeast, representing the largest and most populated city in the state of Andhra Pradesh. It also serves as the financial capital of the state and has the tenth largest Gross Domestic District Product (GDDP) in India.



**MAP 1. Three Indian Focus Cities**



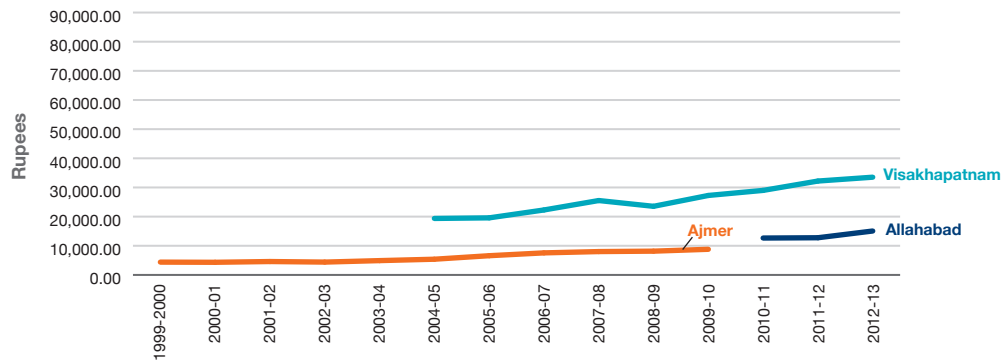
Source: Brookings Institution

## 3.2 ECONOMIC DATA

Economic characteristics for all three cities expose their relative strengths, weaknesses, and potential areas for improvement. This section discusses the variation in the GDP, per capita income (PCI), and employment ratios in the three cities. The three cities are economically diverse to a significant degree, at least relative to their current stage of development. Any future policy interventions, as such, should take this variation into account to support future engines of growth.

Visakhapatnam not only boasts the highest GDP, but it is also growing faster than Ajmer and Allahabad (Figure 3). In 2012-2013, the GDP of Allahabad was less than half that of Visakhapatnam, while future estimates for Ajmer put its output at less than one-third that of Visakhapatnam. At the same time, as Figure 4 shows, per capita income (and standard of living) can vary widely across the three cities. In 2012-2013, the PCI of Visakhapatnam was INR 76,320 (\$1,445), considerably higher than the INR 39,856 (\$598) and INR 24,372 (\$366) of Ajmer and Allahabad, respectively. As a result, having higher levels of economic output does not always result in higher standards of living, as evidenced by the sizable poor population in Allahabad relative to Ajmer and other cities.

**FIGURE 3. Gross Domestic District Product at Constant Prices**



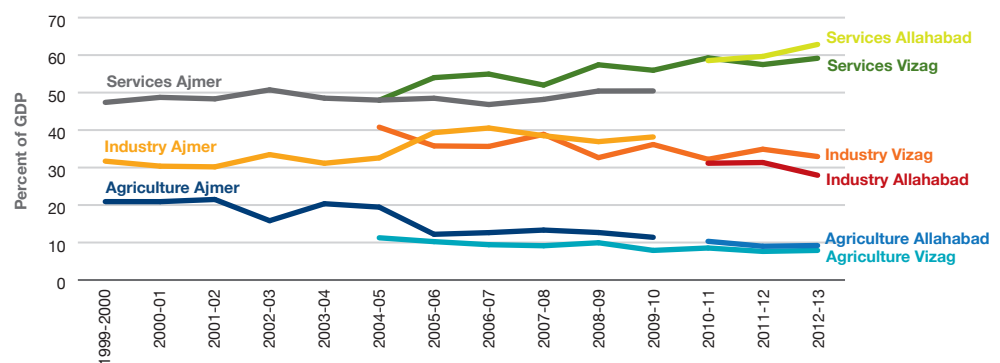
**FIGURE 4. Per Capita Gross Domestic District Product at Constant Prices**



Source: Brookings analysis of Directorate of Statistics and Economics data (Rajasthan, Uttar Pradesh, and Andhra Pradesh)  
 Note: The GDDP figures for Ajmer are extrapolated for 2011-2012 and 2012-2013.

The industrial composition of each city is also crucial to potential economic development strategies, as shown in Figure 5. Agriculture,<sup>61</sup> industry,<sup>62</sup> and services<sup>63</sup> and total output reveal distinct sectoral patterns in each city. For example, although the service sector accounts for a higher share of output in all three cities than both agriculture and industry, Ajmer's industry sector, in particular, has shown more robust growth than Allahabad and Visakhapatnam.

**FIGURE 5. Sectoral Contribution to Gross District Domestic Product (GDDP)**



Source: Brookings analysis of Directorate of Statistics and Economics data (Rajasthan, Uttar Pradesh and Andhra Pradesh)

Indeed, during the past decade, Ajmer's industrial sector has grown by 6.5 percentage points, rising from 31.7 percent to 38.2 percent as a share of the city's total economy. Future projections, moreover, expect it to account for nearly 40.3 percent of its economy. By comparison, this same sector has declined by 7.8 percentage points in Visakhapatnam and 3.2 percentage points in Allahabad. As such, manufacturing will likely remain a more crucial area of economic focus in Ajmer than in the two other cities.

The service sector, meanwhile, continues to play a more prominent role in Allahabad and Visakhapatnam, accounting for 62.8 percent and 59.2 percent of their local GDDPs, respectively, in 2012-2013. Allahabad has been able to benefit from this shift to services despite seeing a decline in industrial output. At the same time, the pace of expansion is most remarkable in Visakhapatnam, where it has risen by nearly 11.2 percentage points during the period. Although Ajmer's service sector is still quite robust—making up 51.4 percent of its economy—its growth has been relatively more stagnant in recent years.

Notably, agriculture's economic importance remains considerably lower in all three cities and is continuing to fall. In 2012-2013, Visakhapatnam had the lowest share (7.9 percent), with Allahabad (9.2 percent) and Ajmer (9.5 percent) slightly higher. Still, the decline of agriculture in Ajmer has been especially rapid, falling by nearly 11.4 percentage points in the past decade alone.

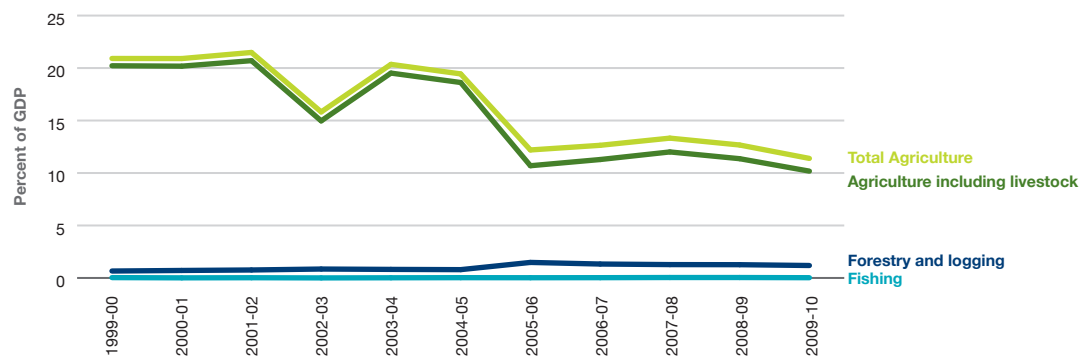
To further understand the unique contributions these sectors make in each city, Figures 6 through 14 provide a deeper subsectorial analysis, offering public and private leaders greater insight into their economic composition.

Figure 6, Figure 7, and Figure 8 reveal, for example, that agriculture, including livestock, has remained the most dominant subsector, even as the sector as a whole experienced a decline in importance. The other two subsectors, forestry and fishery, have made much smaller contributions, consistently accounting for less than 2 percent of each city's GDDP.

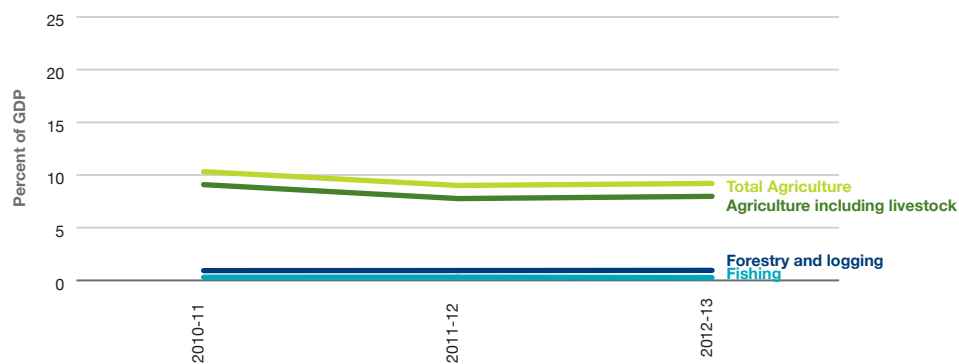
The industrial sector, in contrast, has greater variety—and strength—across all three cities. As shown in Figure 9, Figure 10, and Figure 11, “registered manufacturing” is perhaps the most notable subsector, but with several nuances within each city, including a rise in “construction.” In Visakhapatnam, for instance, registered manufacturing continues to dominate the industry sector, but construction has been the prime driver of growth, with Compound Annual Growth Rate (CAGR) of 8.4 percent. In Ajmer, the opposite has occurred; registered manufacturing has surged in importance during the second half of the last decade, with a CAGR of 11.2 percent, while construction has declined slightly. Allahabad, meanwhile, appears to rely on both subsectors fairly evenly, seeing few major structural shifts.<sup>64</sup>

Within the service sector, all three cities depend on “trade, hotels, and restaurants” and “real estate, ownership of dwellings” as two major subsectors, highlighted in Figure 12, Figure 13, and Figure 14. In Visakhapatnam, these two subsectors remain the most dominant. However, the “communications” subsector is picking up momentum, with a 22.9 percent CAGR. Ajmer follows a similar pattern, with the communications subsector registering the highest CAGR of 12.9 percent, followed by “trade hotel and restaurants” and “real estate, ownership of dwellings,” with 8.9 percent and 8.8 percent CAGR, respectively. Although Allahabad tends to rely more on the “public administration” sector, the limited number of observations makes it difficult to trace any discernable patterns over time.

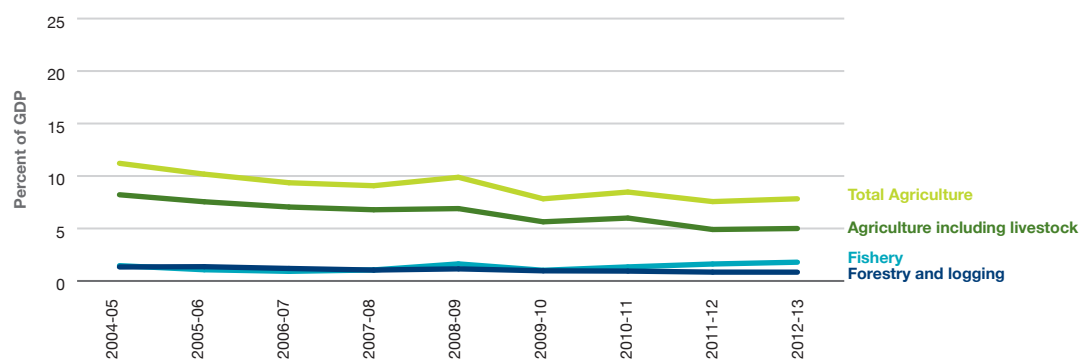
**FIGURE 6. Subsectoral Composition of GDDP (agriculture sector) | Ajmer**



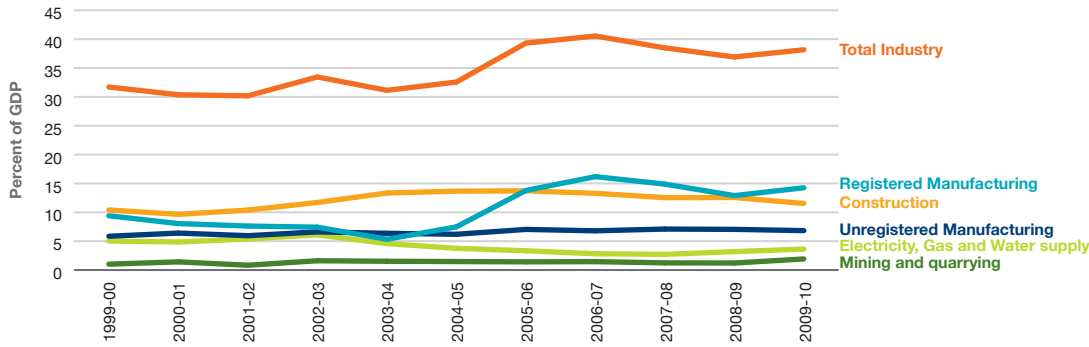
**FIGURE 7. Subsectoral Composition of GDDP (agriculture sector) | Allahabad**



**FIGURE 8. Subsectoral Composition of GDDP (agriculture sector) | Visakhapatnam**

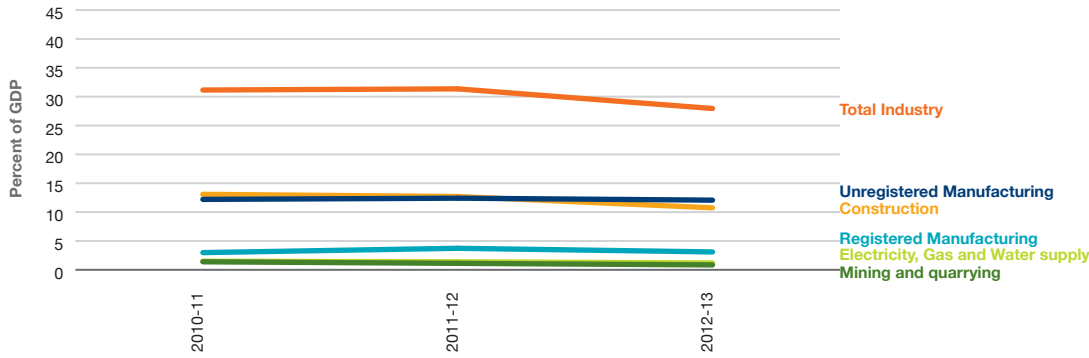


**FIGURE 9. Subsectoral Composition of GDDP (industry sector) | Ajmer**

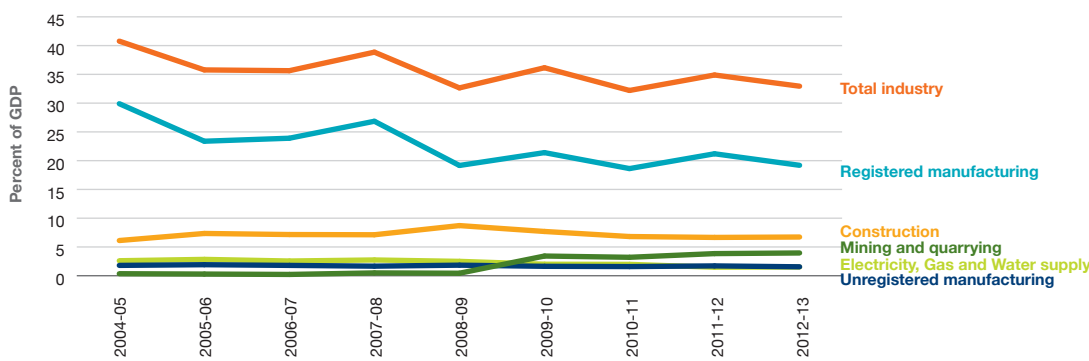


(Note: Source for Figures 6 - 14 is Brookings analysis of Directorate of Statistics and Economics data (Rajasthan, Uttar Pradesh and Andhra Pradesh) and authors' calculations)

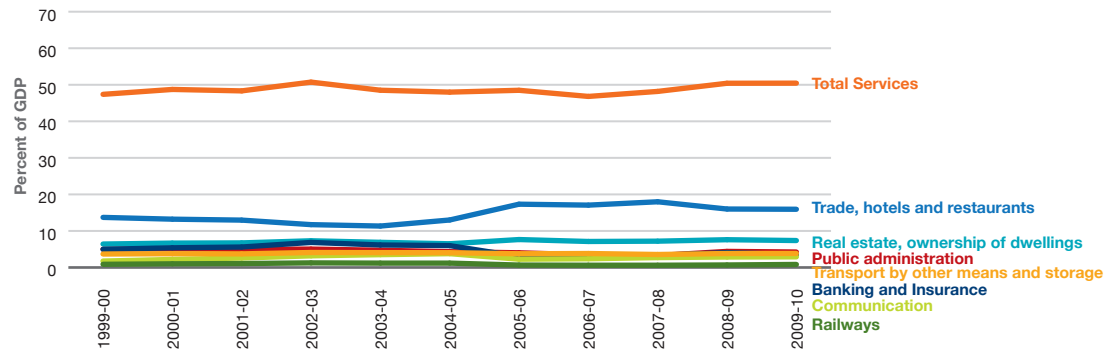
**FIGURE 10. Subsectoral Composition of GDDP (industry sector) | Allahabad**



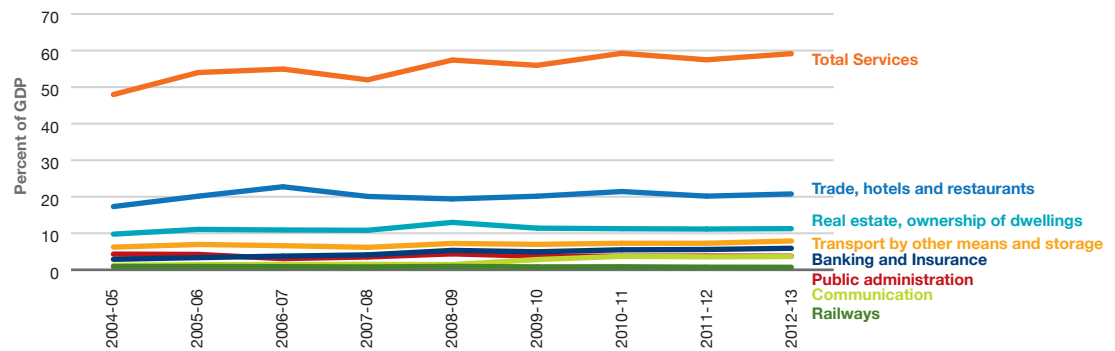
**FIGURE 11. Subsectoral Composition of GDDP (industry sector) | Visakhapatnam**



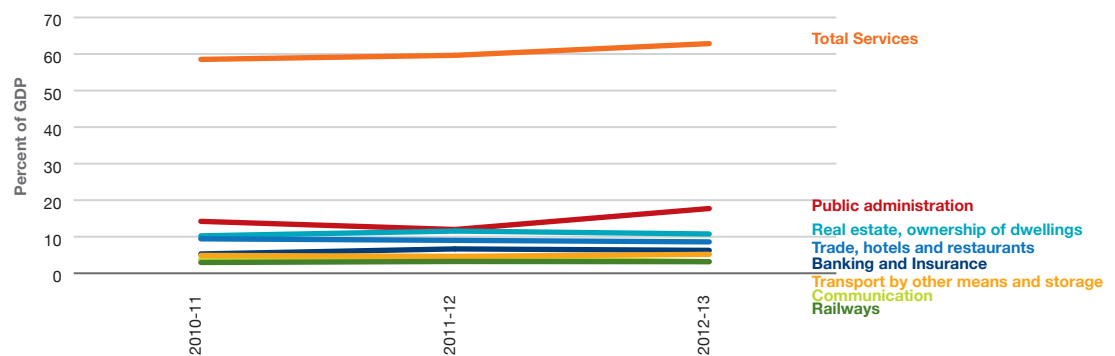
**FIGURE 12. Subsectoral Composition of GDP (services sector) | Ajmer**



**FIGURE 13. Subsectoral Composition of GDP (services sector) | Visakhapatnam**



**FIGURE 14. Subsectoral Composition of GDP (services sector) | Allahabad**

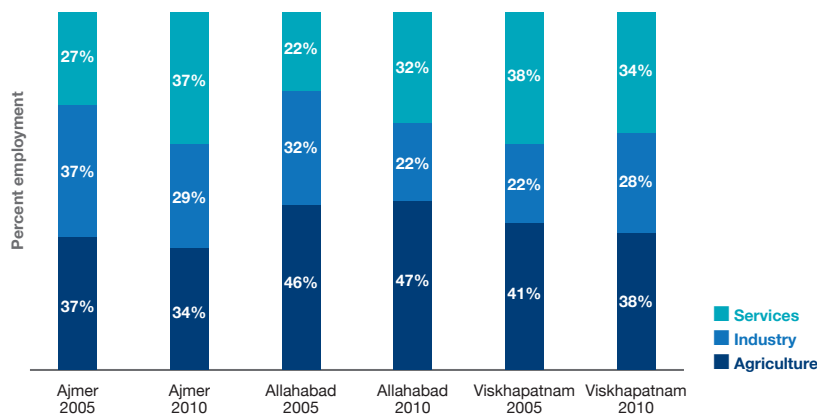


In addition to considering the economic output in each sector, it is also crucial to examine related employment totals. The National Sample Survey Organization (NSSO) (2005-2010) sheds light on the industries in each city that may benefit the most from future growth and investment. Figure 15 shows the distribution of employment across the major sectors in Ajmer, Allahabad, and Visakhapatnam.

Notably, all three cities displayed a clear focus on agriculture in 2005, at least relative to other economic sectors. For example, more than 46.1 percent of Allahabad's employment was concentrated in this one sector, followed by Visakhapatnam (41.3 percent) and Ajmer (36.7 percent). Employment in the industrial sector was also somewhat pronounced in Ajmer (37 percent) and Allahabad (32 percent), while Visakhapatnam concentrated more in services (37.2 percent).

During the following half-decade, however, several shifts occurred as each city tended to diversify its employment base. Although Allahabad saw its share of agricultural workers tick up by 0.8 percentage points, Ajmer and Visakhapatnam saw declines of nearly 3 percentage points each. Industrial employment, on the other hand, rose by 6 percentage points in Visakhapatnam, but fell by 6.3 percentage points in Ajmer and 10.4 percentage points in Allahabad. Service-sector employment, in particular, thrived in Ajmer and Allahabad, expanding by nearly 10 percentage points during the same span.

**FIGURE 15. District level sector-wise employment**



Source: Brookings analysis of National Sample Survey Organization (NSSO) 2005 and 2010 data

In this way, each city displays specific patterns in their levels of economic activity, including varying impacts on output and employment. Given the variation in their economic base, it is crucial to understand the uniqueness of these three cities, particularly when it comes to the type of industries that will ultimately represent their cornerstone in the “Smart Cities Mission.” This initiative is expected to deliver jobs and attract new investment through several important global partnerships, but it must do so by responding to the unique challenges and growth opportunities within India's cities. In particular, Indian cities must be highly attuned to the concentration of employment in agriculture relative to the sector's output—and how that may be restricting potential incomes. Continuing to transition workers to higher-output industries should provide sizable benefits for household incomes.

Indeed, development strategies and technological solutions must be individually tailored to each market. Visakhapatnam has, by far, the largest economy—more than twice the size of Allahabad's and three times that of Ajmer—and trade and transport are key drivers. Allahabad, by comparison, has a clear specialization in “unregistered manufacturing,” which is driven by small-scale enterprises. Agriculture has traditionally been the largest industry in Ajmer and has remained relatively stable, but trade and real estate appear to be growing in importance.

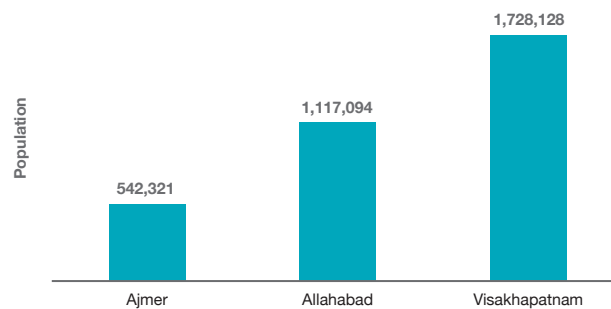
Smart Cities require sharp self-awareness: each Indian Smart City should develop or update a strategic plan for growth, one that has clear goals for basic service improvement, job growth and productivity, economic inclusion, and sustainability and resilience. The technological deployments under the Smart City rubric should then aim to deliver on those goals.

### 3.3 SOCIAL AND DEMOGRAPHIC DATA

This section investigates social and demographic variations across the three cities, revealing distinct patterns in the population to be served by potential Smart City improvements.

As Figure 16 shows, the sheer size of each city should be a central consideration. For example, the population of Ajmer city stood at 542,321 in 2011, roughly one-half and one-third that of Allahabad and Visakhapatnam, respectively.<sup>65</sup> By creating more customized solutions in light of specific population concerns, public and private leaders can help deliver basic services and other complementary infrastructure to support more efficient economic activity.

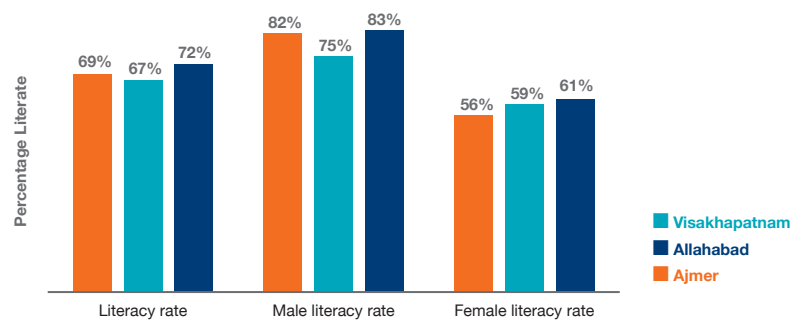
**FIGURE 16. City Population**



Source: Brookings analysis of Census of India 2011 data

Of course, even while facing concerns related to their geographic extent and population size, these cities must also consider a range of other physical and demographic factors. The literacy rate, for instance, is an important determinant of prosperity, as it affects regional workforce capabilities and industrial patterns of development. As Figure 17 illustrates, the overall literacy rates of Ajmer, Allahabad, and Visakhapatnam was very similar, with the national average of 74 percent in 2011, exceeding their respective state averages of 67.1 percent, 67.7 percent, and 67.7 percent. All three cities also have above-average gender-specific literacy rates. However, equitable outcomes can still vary, with Allahabad, in particular reporting a narrower gender literacy gap.

**FIGURE 17. Literacy Rate**

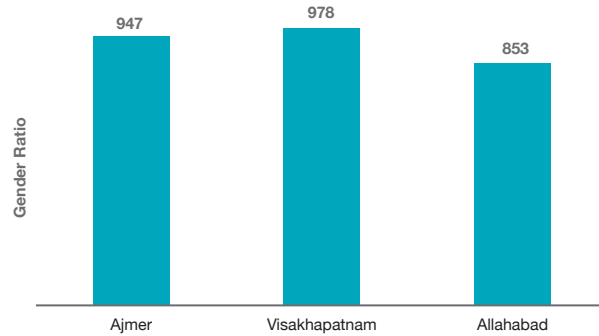


Source: Brookings analysis of Census of India 2011 data

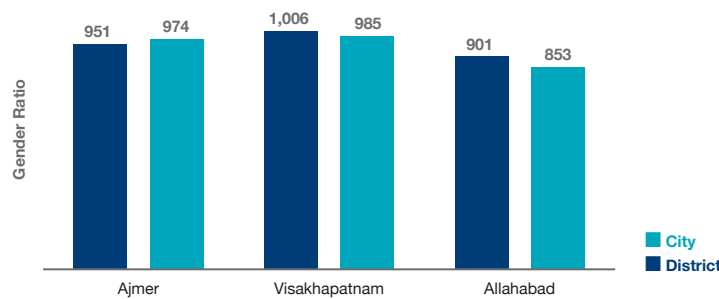


Similarly, Figures 18 and 19 highlight the gender ratio (that is, the number of females per 1,000 males) at the city and district levels, respectively. In 2011, Visakhapatnam had the most even gender ratio, at 978, followed by Ajmer at 947 and Allahabad at 853. Nonetheless, a district comparison reveals that Visakhapatnam's gender ratio fell by 21 points between 2001 and 2011, while Ajmer and Allahabad made gains of nearly 20 points each during the same time. Still, Allahabad's district ratio departs significantly from its city ratio (48 points), which points to a sizable difference within the same region.

**FIGURE 18. City level gender ratio: United States, 2014**



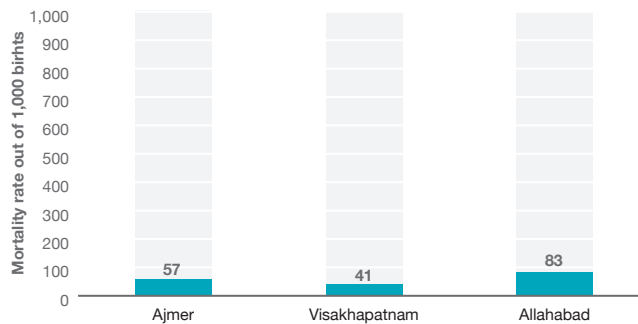
**FIGURE 19. District Level Gender Ratio: United States, 2014**



Source: Brookings analysis of Census of India 2011 data

Health conditions are another area of concern that must be weighed carefully in each city. At the district level, the infant mortality rate (IMR) is a useful indicator, as displayed in Figure 20. Allahabad has an IMR of 83, much higher than Visakhapatnam (57) and Ajmer (41).

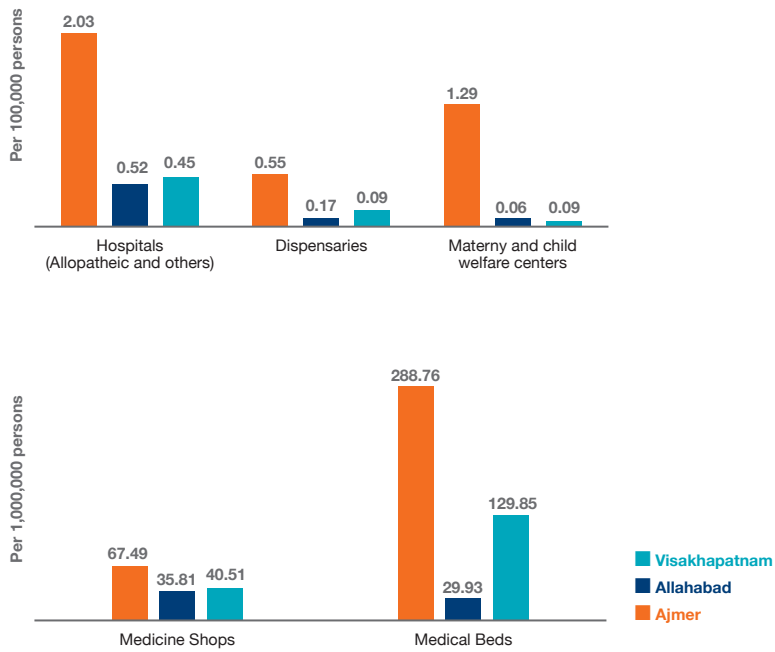
**FIGURE 20. Infant Mortality Rate: (District)**



Source: Brookings analysis of Census of India 2011 data

The state of each city's education and health infrastructure is similarly important to examine, which the District Census Handbook 2011 describes in great depth. For example, Figure 21 highlights the availability of particular health facilities, such as hospitals, for the population. It shows that Ajmer consistently outperforms Allahabad and Visakhapatnam on this indicator. Allahabad, meanwhile, frequently lags behind in each category, from medical beds to medicine shops to dispensaries, perhaps in part explaining its higher infant mortality rate. Although Visakhapatnam contains more health facilities overall given its large population, it tends to rank lower on a per capita basis in many categories.

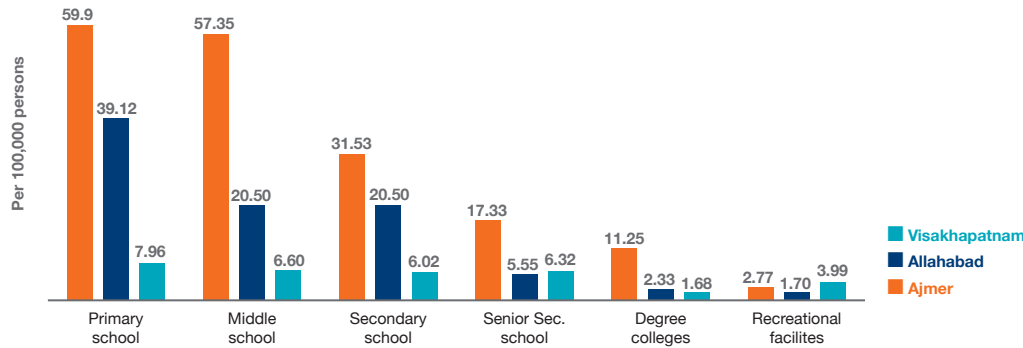
**FIGURE 21. Health Infrastructure at a city level**



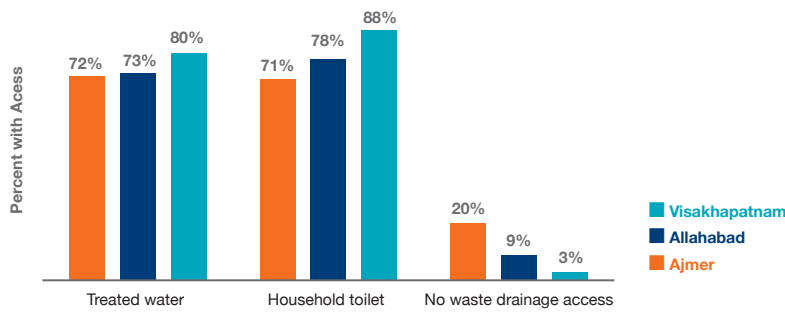
Source: Brookings analysis of District Census Handbook 2011 data

A similar analysis for educational amenities in Figure 22 reveals that Ajmer is once again a front-runner. Ajmer boasts a higher concentration of primary and secondary schools and colleges, in line with its generally higher literacy rates. Visakhapatnam, interestingly, tends to have a higher share of recreational facilities by comparison. Collectively, such variation helps explain the foundational infrastructure already in place—or lacking—in these cities as they accelerate various improvements over time.

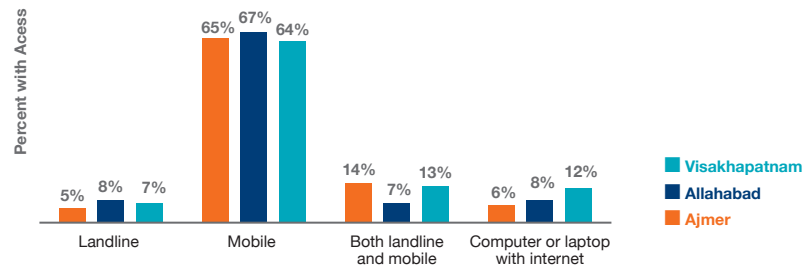
**FIGURE 22. Education Infrastructure at City Level**



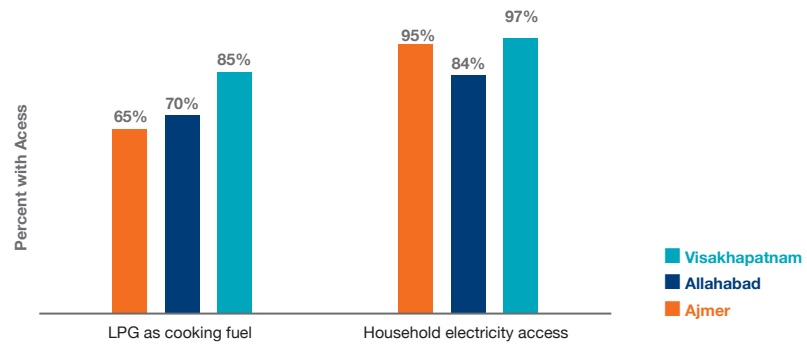
**FIGURE 23. Sanitation**



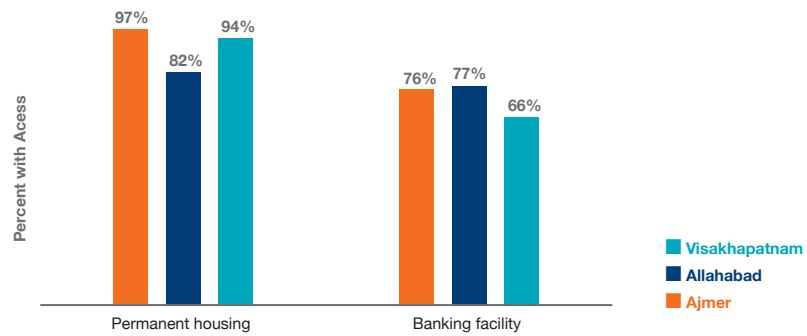
**FIGURE 24. Connectivity**



**FIGURE 25. Energy Uses**



**FIGURE 26. Housing and Banking**



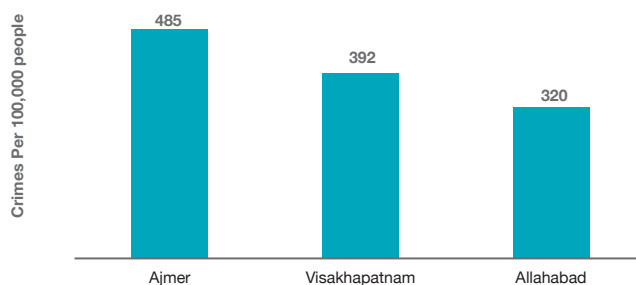
Figures 22-26: Source: District Census Handbook 2011

At the same time, local government public services are important as a baseline against which to measure economic agglomeration. The availability of these services, as described below, does not always establish a clear winner or loser, but it does shed light on how much progress each city has made toward greater modernization, including the likely role different policies and programs have played in regions. Visakhapatnam, by and large, appears to have made the most progress across several indicators, but it still faces a number of challenges.

Sanitation and telecommunications infrastructure—the latter of which provides essential digital connectivity—are two such public services. In sanitation (Figure 23), Visakhapatnam has more widespread access to treated water, in-house toilets, and wastewater drainage, according to the District Census Handbook. In contrast, Ajmer struggles to provide these basic services despite having a smaller population—possibly indicating its more limited administrative capacity. With regard to connectivity (Figure 24), Allahabad outperforms both Ajmer and Visakhapatnam, with 7.6 percent and 67.5 percent of its households having landline and mobile connections, respectively. In terms of internet access, however, Visakhapatnam leads with 11.9 percent of its households, followed by Allahabad and Ajmer with 8.3 percent and 6.0 percent of their households, respectively.


Other services, including energy use (Figure 25) and housing and banking (Figure 26), offer additional insights into the degree of urbanization in each city. Visakhapatnam tends to have the most widespread access to energy, whether using LPG as a cooking fuel (84.9 percent) or the share of households with electricity (97.3 percent).<sup>66</sup> The stability offered by permanent housing and banking institutions, likewise, represents another area of consideration for these cities. Ajmer has the highest percentage (97.2 percent) of permanent housing, followed by Visakhapatnam (93.5 percent) and Allahabad (81.6 percent). In terms of banking, though, Allahabad has the highest share, with 76.9 percent of its households covered by a formal banking system; Visakhapatnam has the lowest coverage rate (65.7 percent).

**FIGURE 27. Crime Rate (2013)**



Source: Brookings analysis of National Crime Record Bureau 2013 data

In much the same way, crime (Figure 27) can inhibit future economic expansion, which each city faces to a varying extent. According to the National Crime Record Bureau, Ajmer had the highest level of reported Indian Penal Code crimes per capita in 2013, with 484.9 crimes for every 100,000 people. Visakhapatnam (391.6) and Allahabad (320.0) had considerably lower rates; however, the level of bias in reporting crimes could have played a role in these results. Allahabad, for instance, often experiences crimes that receive extensive media coverage, and yet it ranks as a safer city in the crime bureau data.<sup>67</sup>



Collectively, across all of these various social and demographic factors, the three cities display a number of strengths and weaknesses, which will require targeted development strategies. For example, Visakhapatnam has performed well in terms of its toilet access, electricity coverage, infant mortality rate, and its education and health infrastructure. Ajmer has often done well in terms of its literacy rate and education and health infrastructure. On average, Allahabad has lagged behind on most of the indicators, with the potential exception of its mobile access and banking facilities, where technological solutions may be better suited.

Nonetheless, the overall performance in these three cities often significantly lags international standards. Policy interventions, in turn, will likely need to play a bigger role in driving change, even in markets with fewer apparent obstacles to overcome. Visakhapatnam, for instance, has an enormous population and expansive infrastructure base—potentially allowing for greater economies of scale—but any resulting agglomeration will depend on the institutional dynamics of the city, such as the efficiency of its local government, the rule of law, and its specific trade and industrial policies. Across all three cities, the lack of reliable electricity or a computer with internet access severely limits the potential to implement digital solutions, ranging from fairly basic digital governance to future-looking Internet of Things (IoT) products.

At the same time, these lagging indicators represent impressive opportunities for public or private market interventions. Using new digital infrastructure to upgrade sanitation services, schools, and hospitals has the potential to dramatically impact these regional economies. If done well, these upgrades can create a virtuous cycle in which households leverage improved services to achieve greater economic outcomes, which in turn increases their demand for even more infrastructure services. India's economic challenges are clear—but so are the market opportunities.

“At the same time, these lagging indicators represent impressive opportunities for public or private market interventions.”

## 3.4 MUNICIPAL SERVICE STANDARD DATA

Indeed, the delivery of basic services is of paramount concern in these markets, and where public and private leaders will likely need to focus the bulk of their attention in years to come. This section explores the condition of basic service delivery in the three cities vis-à-vis their respective state averages, national averages, and the benchmark service indicators prescribed by the MoUD. In 2007, MoUD set up a standard benchmark for 28 municipal service indicators to systematically study the status of service delivery across ULBs. Table 13 presents the current status of service delivery—across the 28 prescribed indicators—for Ajmer, Allahabad and Visakhapatnam. The service level indicators are prescribed broadly for 4 service areas, namely: Water Supply, Sewerage, Solid Waste Management, and Storm Water Drainage.

**TABLE 13. MoUD Service Benchmark Indicators**


| Indicator  | Benchmark                    | Indicator                                    | Benchmark |
|--|------------------------------|--|-----------|
| Coverage of water supply connections                   | 100%                         | Coverage of toilets                          | 100%      |
| Per capita supply of water                             | 135 Liter per capita per day | Coverage of sewer network services           | 100%      |
| Extent of metering of water connections                | 100%                         | Collection efficiency of sewer network       | 100%      |
| Extent of nonrevenue water                             | 20%                          | Adequacy of sewer treatment capacity         | 100%      |
| Continuity of water supply                             | 24 hours                     | Quality of sewer treatment                   | 100%      |
| Efficiency in redressing complaints                    | 80%                          | Extent of reuse and recycling of waste water | 20%       |
| Quality of water supplied                              | 100%                         | Extent of cost recovery in sewer services    | 100%      |
| Cost recovery in water supply services                 | 100%                         | Efficiency in redressing customer complaints | 80%       |
| Efficiency in collecting water supply charges          | 90%                          | Efficiency in collecting sewer charges       | 90%       |
| Household coverage of SWM services                     | 100%                         | Extent of cost recovery in SWM services      | 100%      |
| Efficiency in collecting municipal solid waste         | 100%                         | Efficiency in redressing customer complaints | 80%       |
| Extent of segregation of municipal solid waste         | 100%                         | Efficiency in collecting SWM user charges    | 90%       |
| Extent of municipal solid waste recovered              | 80%                          | Coverage of stormwater drainage network      | 100%      |
| Extent of scientific disposal of municipal solid waste | 100%                         | Incidence of water logging / flooding        | 0         |

Source: Ministry of Urban Development, Government of India

### 3.4.1 WATER SUPPLY

The availability of clean, reliable water is of utmost importance for cities to operate economically and otherwise. Based on MoUD assessments, the quality of water service is measured across nine different indicators, which offer precise detail for each city. In many categories, Indian cities are performing better than the national average, but additional progress is clearly needed.

According to the first indicator—the coverage of water supply connections—all three cities have performed better than their respective state averages and the national average (50 percent). However, they still face a clear deficit with respect to the MoUD benchmark of 100 percent coverage. As Figure 28 shows, Ajmer and Allahabad both fall short in this regard, with around 75 percent coverage, while Visakhapatnam ranks considerably higher (92 percent).



A similar story unfolds for per capita supply of water (Figure 29), where the MoUD benchmark is 135 litre per capita per day (LPCD). Allahabad is the closest to achieving this standard (at 133 LPCD), while the other cities are farther behind, especially Ajmer (80 LPCD). Nonetheless, these cities once again consistently perform better than their respective state averages and the national average.

Having a continuous supply of water is another indicator to closely monitor in each city, particularly for reliability (Figure 30).<sup>68</sup> The MoUD has prescribed 24 hours of continuous water supply, but most of India falls far short of achieving this standard, with a national average of only three hours. Allahabad (10 hours) has been an outlier in this regard, while also exceeding its respective state average (6.3 hours). However, both Ajmer (one hour) and Visakhapatnam (one hour) face enormous struggles by comparison.

Beyond quantity, though, the quality of water is also critical in gauging service delivery (Figure 31). The MoUD benchmark is 100 percent. Although India as a whole only provides an alarming 73 percent of quality coverage, the three focus cities have performed much better than the national average and their respective state averages. Visakhapatnam stands out, having achieved the 100 percent standard and providing a quality water supply to its residents.

In addition to tracking the physical nature of India's water supply, public and private leaders are also well advised to monitor the financial performance of these services, which are central to the administrative well-being of each city. In terms of cost recovery (Figure 32), for instance, the MoUD has established a 100 percent standard—where all water supply costs are to be covered—but India struggles on this front, with a national average of only 40 percent. Bucking this national trend, however, Visakhapatnam and Allahabad have performed fairly well, covering more than 90 percent of their water supply costs.

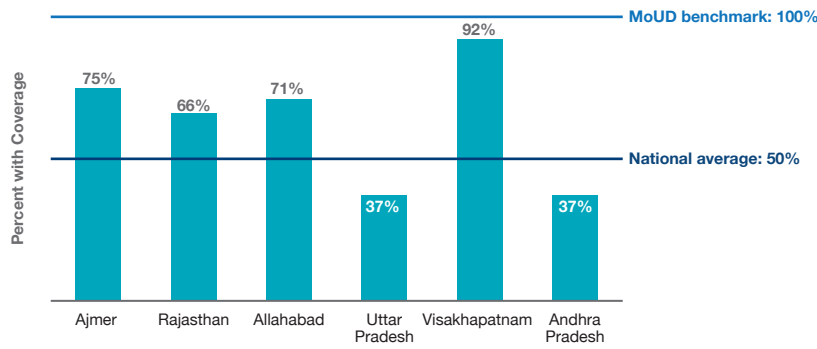
Efficiency in collecting water supply charges (Figure 33) is an important parameter to judge and analyze the deficit of cost recovery. In this aspect, the MoUD aims for collection efficiencies of 90 percent. Visakhapatnam is the closest with 84 percent collection efficiency, followed by Ajmer (80 percent) and Allahabad (65 percent). Despite once again not hitting the MoUD standards, the three cities have performed on par with or better than their respective state averages.

Finally, cities are also looking into innovative technological solutions—the metering of their water connections—to improve collection efficiency (Figure 34). Although the MoUD has called for a benchmark of 100 percent achievement, India as a whole (13 percent), along with most states and cities, has not come close to reaching this benchmark. The situation is particularly dire in Allahabad, which has achieved only 1 percent of the net metering target; all the ULBs in Uttar Pradesh, likewise, have struggled mightily as well. Still, Visakhapatnam (40 percent) has performed better than the national average and its state average of 3 percent, and Ajmer (20 percent) and Rajasthan (38 percent) show positive signs toward implementation.

Nonrevenue water—or water that has been produced but is either lost during transmission or there is no charge for use—is another way to assess the quality of water networks and service delivery. In this case, Visakhapatnam loses around one-third of its water to “nonrevenue,” worse than Ajmer (25 percent) and Allahabad (30 percent) (Figure 35). Visakhapatnam's larger land area complicates its ability to make high-quality water connections to all properties. In terms of redressing complaints, Allahabad outperformed the other two cities, with more than 90 percent (Figure 36) and is the only city to reach the MoUD benchmark.

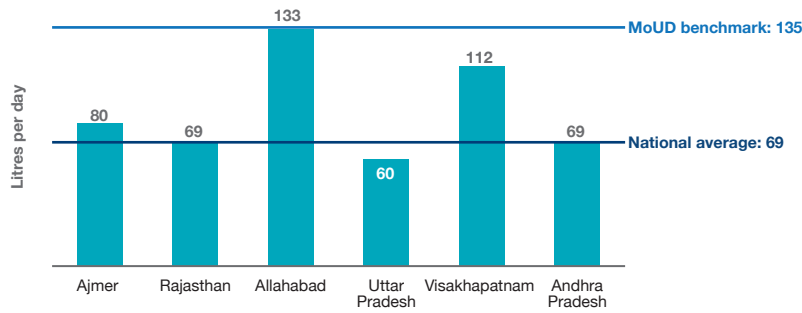


**FIGURE 28. Coverage of Water Supply Connections**

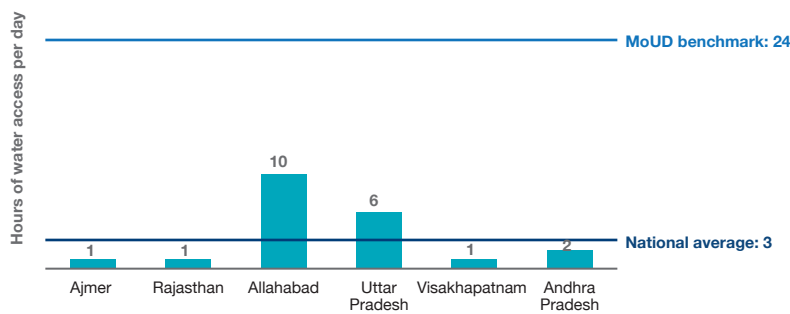


Figures 28-36: Source: Brookings analysis of Ministry of Urban Development, Service Level Benchmark Handbook 2012 data  
 Note: Data indicate service status of 2011.

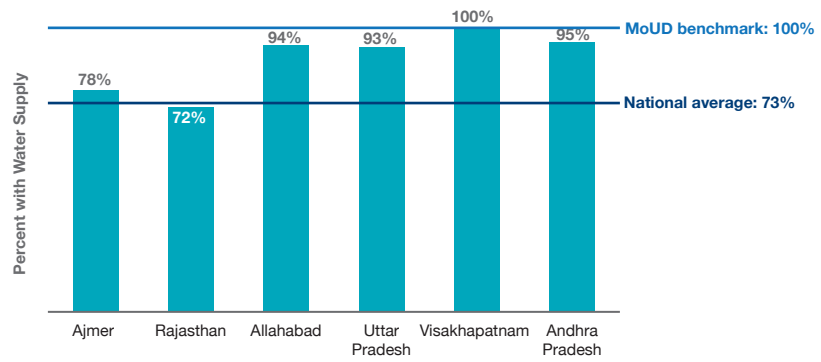
**FIGURE 29. Per Capita Supply of Water (LPCD)**



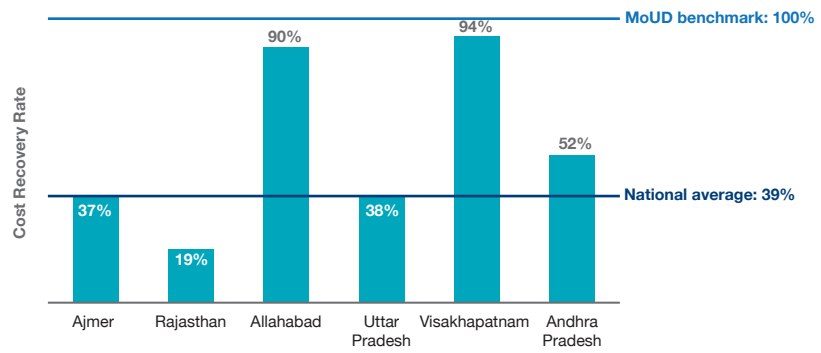
**FIGURE 30. Continuity of Water Supply**



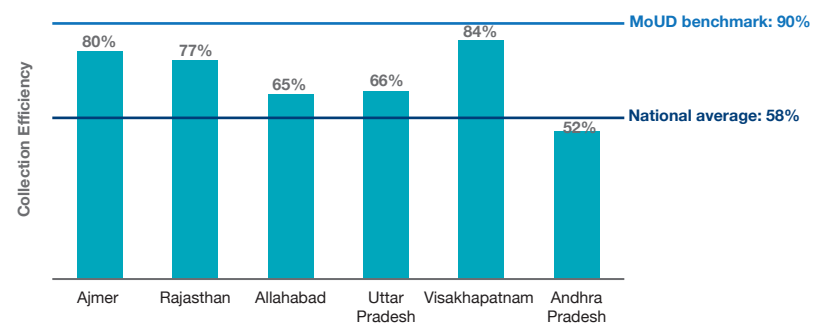
**FIGURE 31. Quality of Water Supplied**



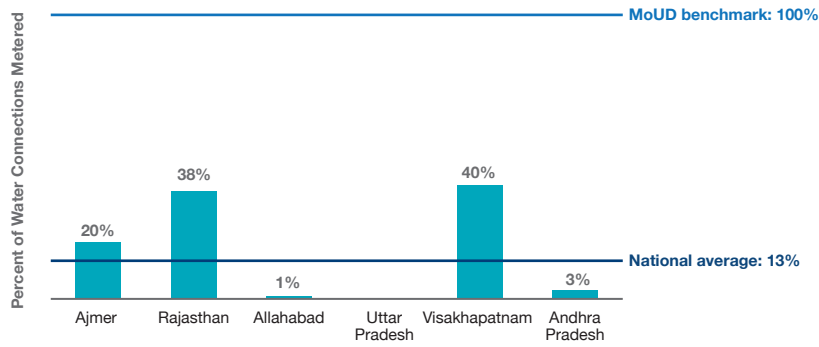
**FIGURE 32. Cost Recovery in Water Supply Services**



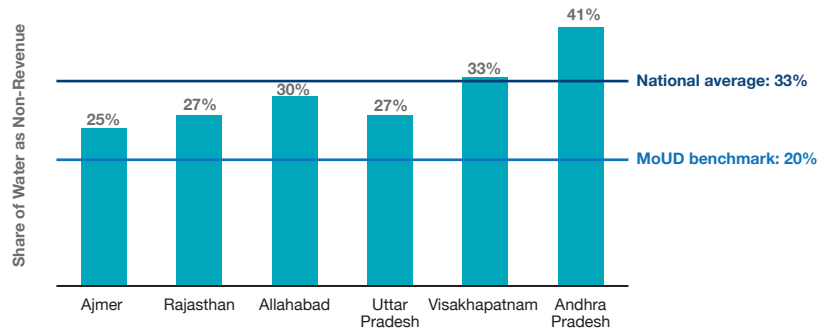
**FIGURE 33. Efficiency in Collecting Water Supply Charges**



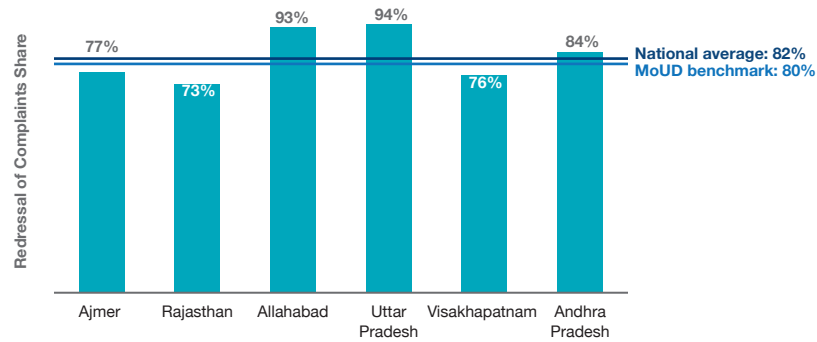
**FIGURE 34. Extent of Metered Water Connections**



**FIGURE 35. Extent of Nonrevenue Water**



**FIGURE 36. Efficiency in Redressal of Complaints**



### 3.4.2 SEWERAGE AND WASTE MANAGEMENT

Having reliable sanitation is crucial to supporting clean, productive urban environments, which civic authorities have traditionally operated and maintained. Although the private sector has recently played a bigger role in managing these systems, the government still remains at the forefront of overseeing sanitation, especially given its history of developing such infrastructure across India.

Among the various measures used to evaluate sanitation, the availability of toilets within households (Figure 37) is particularly important. The MoUD benchmark is 100 percent provision of toilets in the home. Although results have improved over time, none of the three focus cities has achieved this milestone. Visakhapatnam (98 percent) is the closest to reaching this goal, followed by Ajmer (75 percent) and Allahabad (62 percent). Still, all three cities perform better than the national average of 70 percent and their respective state averages.

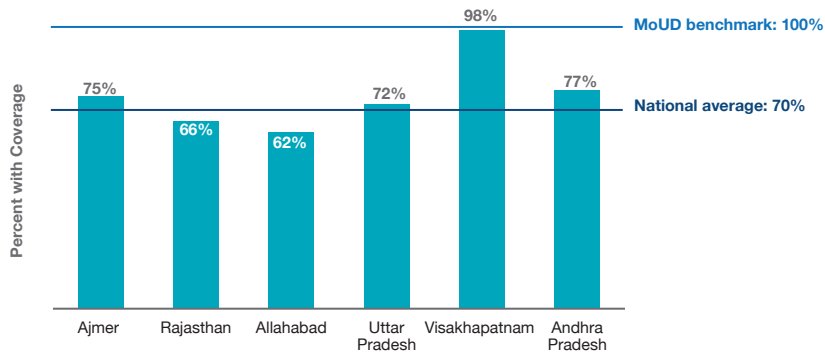
The presence of an efficient sewer system is also critical to creating reliable sanitation infrastructure (Figure 38). The MoUD calls for 100 percent sewer system coverage, but India once again struggles to comply (12 percent nationally). Allahabad (27 percent) and Visakhapatnam (27 percent) have poor coverage as well. However, Ajmer (80 percent) performs quite well by comparison.

To address these shortfalls in sanitation, water reuse and recycling is an important intervention for Indian cities to consider, which face an ever-growing demand for water. Overall, the MoUD specifies a threshold limit of 20 percent for water reuse and recycling (Figure 39), but many regions have struggled to achieve this standard. The national average, for instance, stands at only 4 percent, while Visakhapatnam (3 percent) and Ajmer (1 percent) do not fare much better. Likewise, data on the adequacy of sewer treatment facilities (Figure 40) show shortfalls across many cities, albeit by a smaller extent. For example, Visakhapatnam leads with 80 percent coverage, which falls below the MoUD 100 percent benchmark. Allahabad (59 percent) and Ajmer (25 percent), meanwhile, face even more significant hurdles. Regarding the quality of sewer treatment (Figure 41), more progress is clearly needed in many cities.

Indicators that measure the financial efficiency of service delivery are also key elements to consider. In terms of the cost recovery for sewer facilities (Figure 42), the national average (5 percent) is abysmally low relative to the MoUD benchmark (100 percent). Yet, a few cities tend to perform quite well, in particular Allahabad (97 percent). Some cities also perform reasonably well against the 90 percent MoUD target for collecting sewer charges (Figure 43). Ajmer (80 percent) leads in this respect, followed by Allahabad (65 percent) and Visakhapatnam (28 percent). Finally, in efficiently redressing complaints (Figure 44), Allahabad and Visakhapatnam seem to have achieved the MoUD target of 80 percent, with Ajmer (78 percent) close behind.

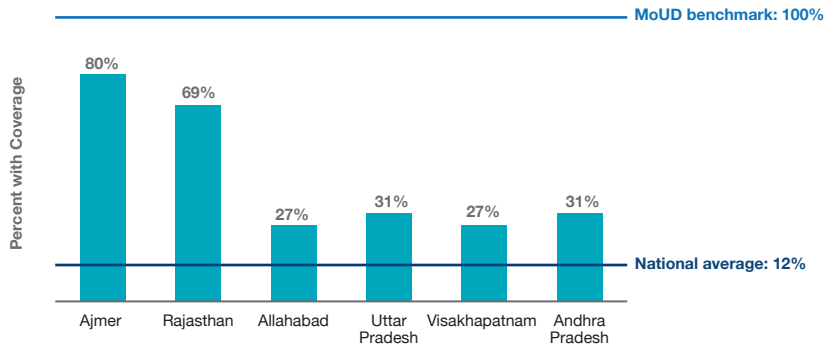
“Having reliable sanitation is crucial to supporting clean, productive urban environments, which civic authorities have traditionally operated and maintained.”

**FIGURE 37. Coverage of Toilets**

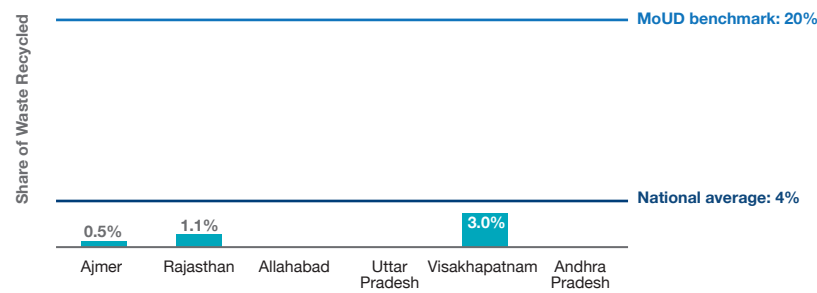


(Figures 37-44: Source: Brookings analysis of Ministry of Urban Development, Service Level Benchmark Handbook 2012 data)

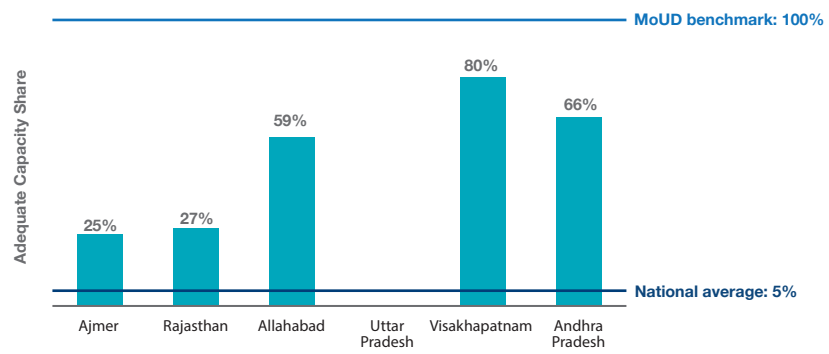
**FIGURE 38. Coverage of Sewer Network Services**



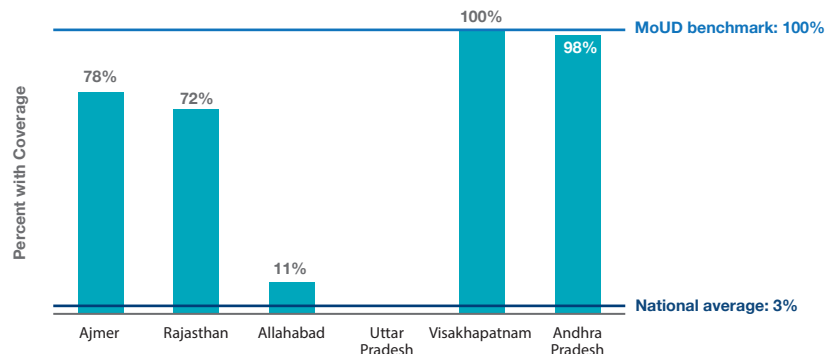
**FIGURE 39. Extent of Reuse and Recycling of Wastewater**



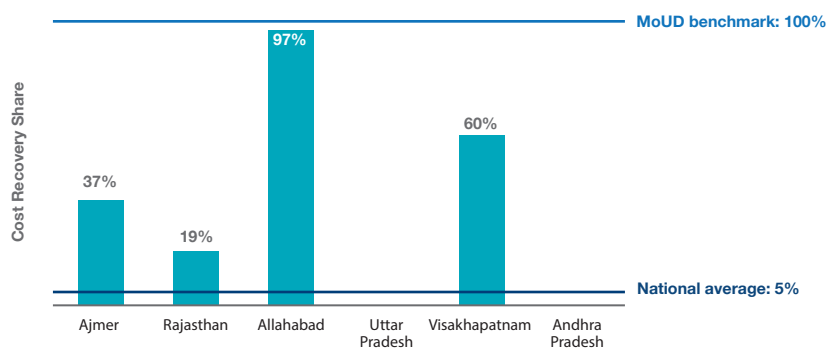
**FIGURE 40. Adequacy of Sewer Treatment Capacity**



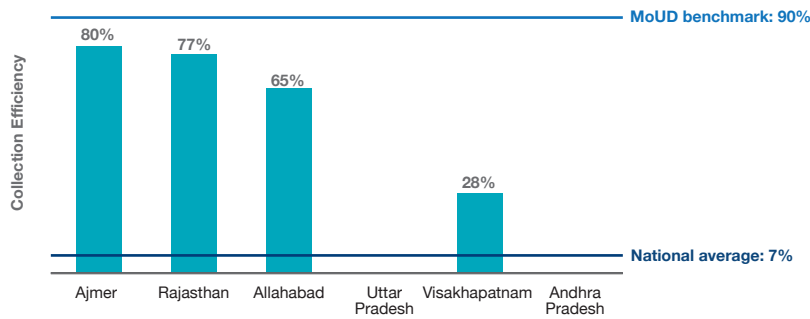
**FIGURE 41. Quality of Sewer Treatment**



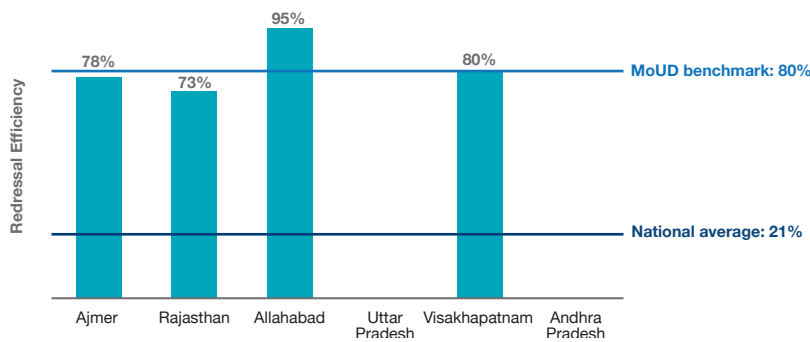
**FIGURE 42 Extent of cost recovery in sewerage**



**FIGURE 43. Efficiency in Collecting Sewer Charges**



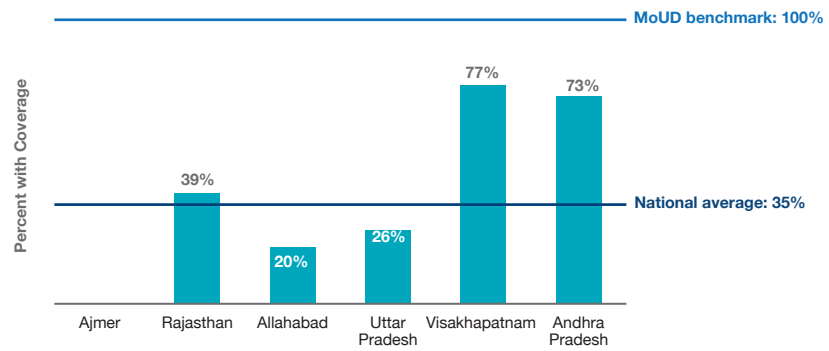
**FIGURE 44. Efficiency in redressal of customer complaints**



Solid waste management (SWM) has been a pertinent problem for Indian cities. The amount of solid waste that is produced daily goes beyond the institutional capacity of local governments to collect and dispose of efficiently, as revealed by several indicators below.<sup>69</sup>

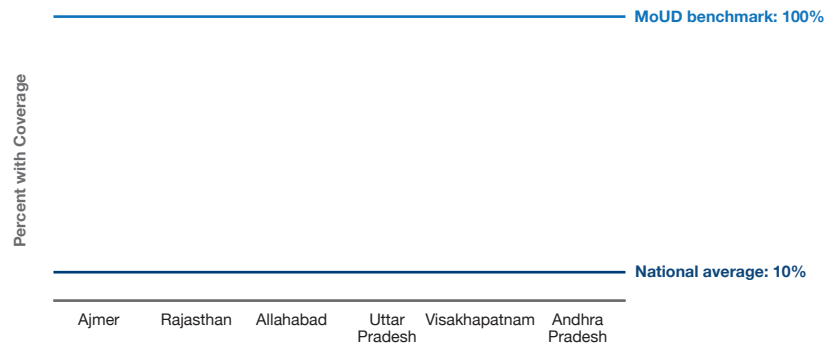
For example, the MoUD has benchmarked the collection of household SWM at 100 percent (Figure 45), but the national average stands only at 35 percent, revealing the gravity of this infrastructure shortcoming. Visakhapatnam had a 77 percent coverage rate by comparison, but Rajasthan (39 percent)—the state that contains Ajmer—and Allahabad (20 percent) fared considerably worse.<sup>70</sup> The scientific disposal of waste in India is also very low (Figure 46), where the national average (10 percent) is far below the MoUD benchmark (100 percent); city and state data, moreover, are missing in this category. Fewer concerns, however, appear in the collection of municipal waste (Figure 47), where Visakhapatnam has achieved a 91 percent success rate, while Ajmer (74 percent) and Allahabad (71 percent) also do fairly well.

**FIGURE 45. Household Coverage of SWM Services**

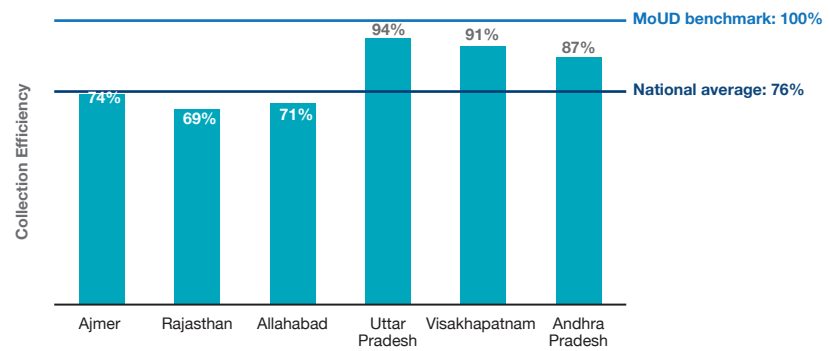


**FIGURE 46. Extent of Scientific Disposal of Municipal Solid Waste**

Data for individual cities and states are not available for this measure



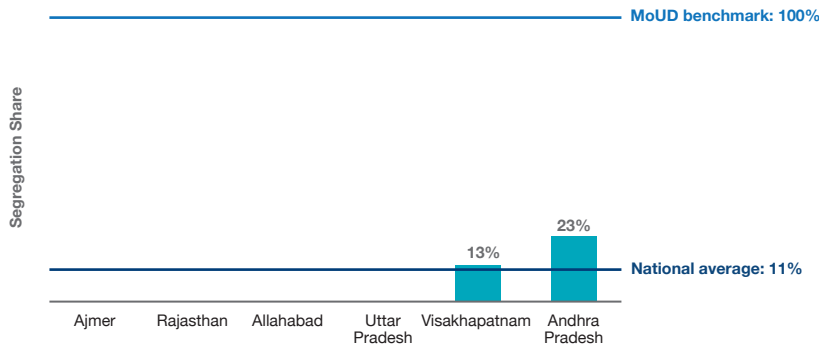
**FIGURE 47. Efficiency in Collecting Municipal Solid Waste**



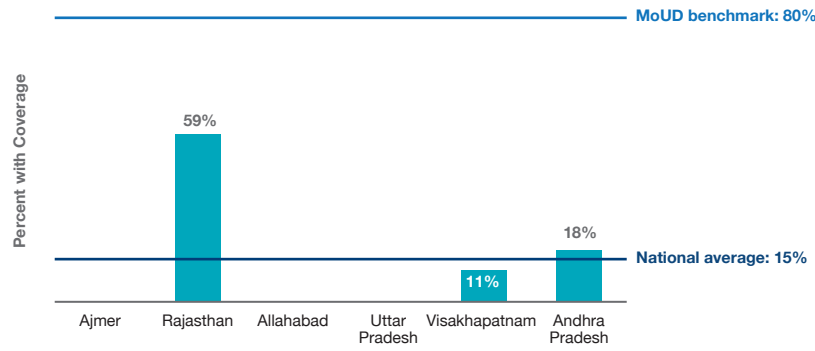


**FIGURE 48. Extent of Segregation of Municipal Solid Waste**

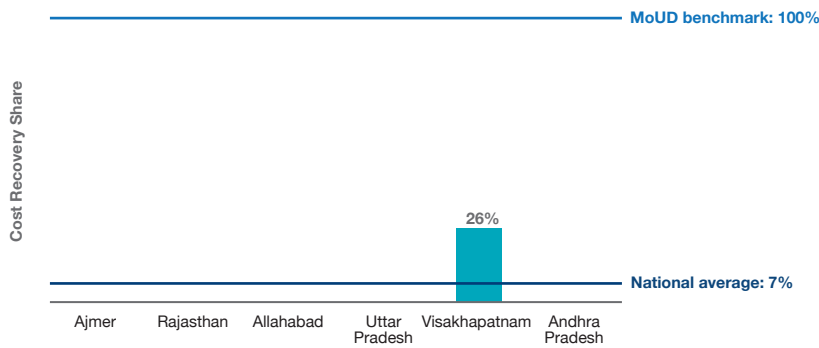
(Figures 45-52: Source: Brookings analysis of Ministry of Urban Development, Service Level Benchmark Handbook 2012 data)



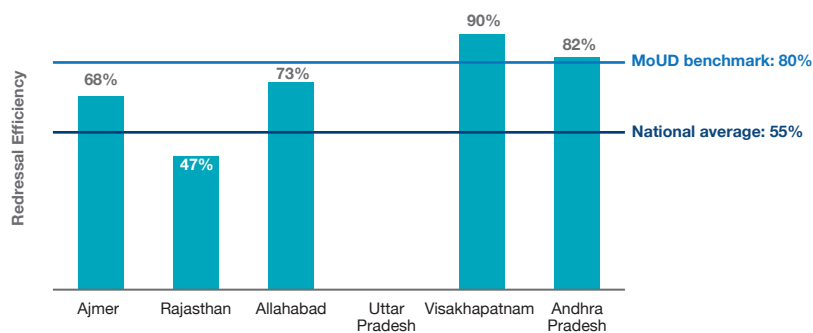
**FIGURE 49 Extent of Municipal Solid Waste Recovered**



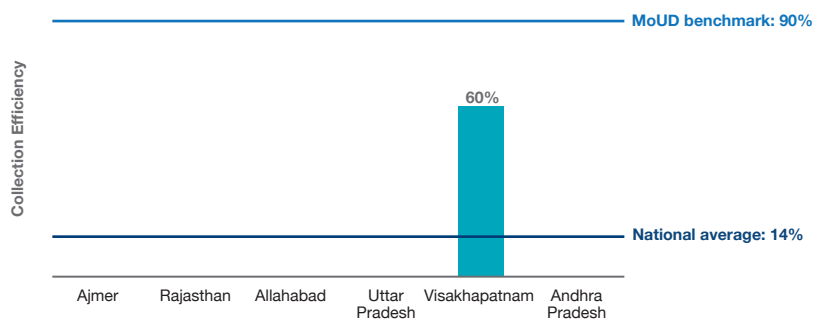
**FIGURE 50. Extent of Cost Recovery in SWM Services**



**FIGURE 51 Efficiency in Redressal of Customer Complaints**

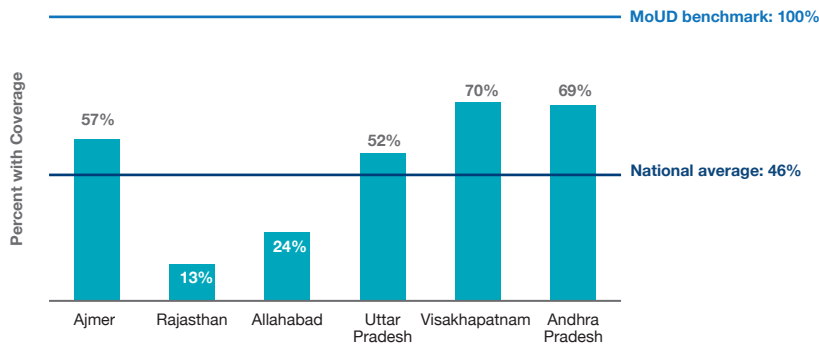


**FIGURE 52 Efficiency in Collection of SWM Related User Related Charges**

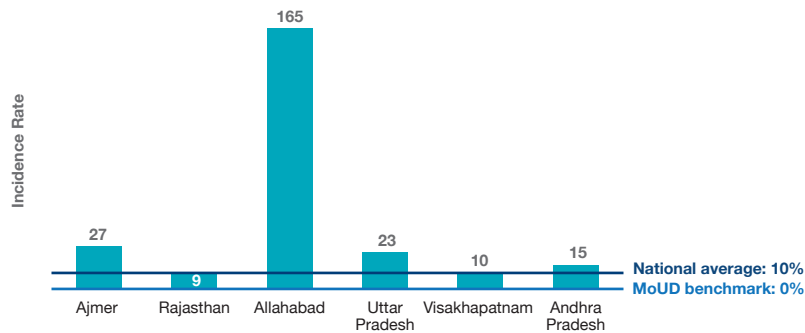


Road congestion is a difficult but common situation during rainy seasons across many cities. Storm-water drainage systems is important to easing traffic movement. Although, MoUD maintains a benchmark of 100 percent coverage, Visakhapatnam has the best record, with 70 percent coverage, which is much higher than the national average of 46 percent and slightly better than its state average of 69 percent. The performance of Allahabad has been particularly disappointing. It is worse than the national and its state average. Another way of looking at this problem is to measure the incidence of waterlogging and flooding. This should be expected to be inversely proportional to the stormwater drainage network. Quite expectedly, Allahabad had highest incidence of waterlogging (165 times), where MoUD expects zero waterlogging. In such cases, the roads will not only be jammed but will also demand higher maintenance costs. On the other hand, Visakhapatnam witnessed the fewest waterlogging cases, at only 10 such incidences.

**FIGURE 53. Coverage of Stormwater Drainage Network**



**FIGURE 54. Incidence of Waterlogging / Flooding**



Source: Brookings analysis of Ministry of Urban Development, Service Level Benchmark Handbook 2012 data

Across all the different variables, few services meet the MoUD benchmarks, and an analysis of national averages is even more appalling, pointing to the poor state of municipal services throughout India. Among the three focus cities, Visakhapatnam has performed slightly better on most indicators, but still remains woefully unprepared to accelerate growth in future years or match its international urban peers.<sup>71</sup> These infrastructure challenges are significant and will continue to be a barrier to broad-based economic opportunity.

## 4. Investment gap analysis

The last section highlighted the gaping difference between the service standards as envisioned by MoUD in its service level benchmark (SLB) indicators and the condition of the three cities. This section builds on that analysis to calculate the investment gap for each of the three cities—the amount needed to meet the benchmarks in four core services: water supply, sewer, solid waste management, and stormwater drainage. Together, these investments are crucial for delivering a modern infrastructure system emblematic of a Smart City.

Investment gaps are determined for the time period 2011 to 2020. The methodology used to determine the investment needs is based on the estimates generated by High Powered Expert Committee for Estimating the Investment Requirements for Urban Infrastructure Services (HPEC). We assessed the current per capita state of coverage across all four services and determined the effective per capita shortage as per MoUD benchmarks in 2020 by projecting the population trends. We then multiplied the determined level of effective per capita shortage by per capita cost estimates as determined by the HPEC to calculate the investment requirements for the next five years. The HPEC estimates different per capita costs for each of the four services, and the cost is further divided into two sub-components: “investment cost” and “operations and maintenance costs.”

Based on population size, Ajmer is Type 1-C (pop. 100,000 to 1 million) while Allahabad and Visakhapatnam are Type 1-B (pop. 1–5 million). Table 14 lists the estimates of the per capita investment cost (PCIC)<sup>72</sup> and per capita operations and maintenance (PCOM)<sup>73</sup> costs for each of the four services for Type 1-B and Type 1-C cities. As the table shows, both PCIC and PCOM estimates vary for the Type 1-B and Type 1-C cities. These estimates are determined based on assumptions outlined in Appendix B.

**TABLE 14. Per Capita Investment and Operations and Maintenance Cost Estimates**

| Service                | City Type | PCIC (INR*) | PCOM (INR*) |
|------------------------|-----------|-------------|-------------|
| Water Supply           | Type 1-B  | 4,161       | 613         |
|                        | Type 1-C  | 5,259       | 491         |
| Sewerage               | Type 1-B  | 3,841       | 373         |
|                        | Type 1-C  | 3,411       | 290         |
| Solid Waste Management | Type 1-B  | 393         | 189         |
|                        | Type 1-C  | 410         | 135         |
| Storm Water Drains     | Type 1-B  | 4,140       | 62          |
|                        | Type 1-C  | 5,175       | 78          |

Note: INR is cost in Indian rupee at 2009-2010 prices.

Source: High Empowered Expert Committee Report on Indian Urban Infrastructure and Services

Next, using these estimates and determining the effective service standard gaps for each of the four services, we estimate the investment gaps between 2011 and 2020. Table 15 presents a brief analysis of the investment gaps.

**TABLE 15. Estimates of Investment Requirement for Targeted Coverage**

| Service                | PCIC  | PCOM | Percentage of households covered (2011) | Percentage of households covered (2020) | Population not covered* | Total capital expenditure required (in INR core)** |
|------------------------|-------|------|---|---|-------------------------|--|
| <b>Ajmer</b>           |       |      |   |   |                         |  |
| Water Supply           | 5,259 | 491  | 75                                      | 75                                      | 198,978                 | 114.41   |
| Sewerage               | 3,411 | 290  | 80                                      | 80                                      | 171,862                 | 63.61  |
| Solid Waste Management | 410   | 135  | 39                                      | 39                                      | 394,213                 | 21.48  |
| Storm Water Drains     | 5,175 | 78   | 57                                      | 57                                      | 296,595                 | 155.80   |
| Total investment gap   |       |      |   |   |                         | 355.30   |
| <b>Allahabad</b>       |       |      |   |   |                         |  |
| Water Supply           | 4,161 | 613  | 613                                     | 71                                      | 511,285                 | 244.09   |
| Sewerage               | 3,841 | 373  | 373                                     | 27                                      | 1,025,375               | 432.09   |
| Solid Waste Management | 393   | 189  | 189                                     | 20                                      | 1,107,162               | 64.44  |
| Storm Water Drains     | 4,140 | 62   | 62                                      | 27                                      | 1,025,375               | 430.86   |
| Total investment gap   |       |      |   |   |                         | 1,171.48   |
| <b>Visakhapatnam</b>   |       |      |   |   |                         |  |
| Water Supply           | 4,161 | 613  | 613                                     | 92                                      | 1,275,358               | 608.86   |
| Sewerage               | 3,841 | 373  | 373                                     | 27                                      | 2,398,642               | 1,010.79   |
| Solid Waste Management | 393   | 189  | 189                                     | 77                                      | 1,534,578               | 89.31  |
| Storm Water Drains     | 4,140 | 62   | 62                                      | 70                                      | 1,655,547               | 695.66   |
| Total investment gap   |       |      |   |   |                         | 2,404.62   |

Source: Authors' estimates.

NOTE: INR is Indian rupee in 2011 figures

\*Population not covered equals population not within the ambit of service delivery by 2011 plus the additionally added population by 2020.

\*\*Total capital expenditure required equals population not covered times sum of PCIC and PCOM.

The required investments in Ajmer, Allahabad, and Visakhapatnam are INR 355 crore (\$53.2 million), INR 1,171 crore (\$175.7 million), and INR 2,404 crore (\$360.6 million), respectively, from 2011 to 2020. This investment would provide the suggested universal coverage. Even though Visakhapatnam has performed best among the three cities, it still requires the largest amount of additional investment to provide universal coverage, based on two key factors. First, it has the larger current population and expects the largest aggregate increases over the period. Second, Visakhapatnam's sewage network is relatively poor. The requirements for Allahabad and Ajmer are more evenly distributed across all the service parameters.

Although all three cities likely have made significant improvements to these infrastructure systems since 2011—most notably due to supportive federal programs such as JnNURM, AMRUT, HRIDAY—the aggregate investment needs over the period are stark evidence of the capital needs in these places. Future analysis should use a later start date to capture more recent investment and a broader pool of cities to test for significant differences across place. This would enable a finer analysis of investment gaps.

## 5. International Comparison of Smart Cities

Compiling rankings, publishing lists, and creating other regional comparisons have often attracted attention in the Smart City space. Although these assessments offer some value to public, private, and civic leaders—including insights into the deployment of new technologies across different global regions—it is arguably more useful to objectively benchmark metropolitan economies and their infrastructure systems against one another. By doing so, cities do not simply chase exciting demonstrations, but instead identify the most relevant best practices and adopt innovative approaches, especially when considering peers with comparable economic needs.

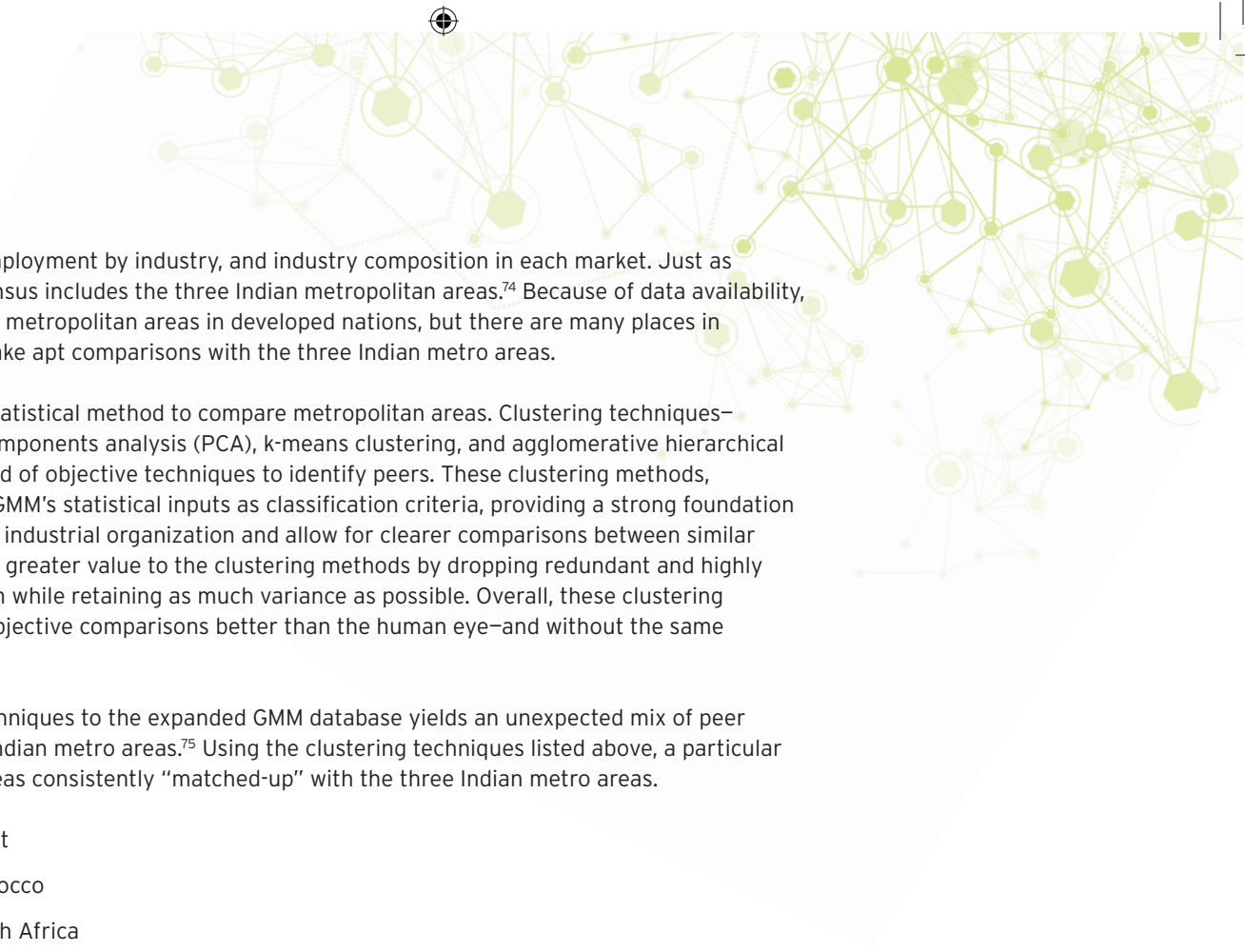
Using clustering techniques to compare the economic characteristics of Ajmer, Allahabad, and Visakhapatnam against 300 other metropolitan areas globally, our analysis reveals clear developmental challenges for these three Indian cities. In particular, we analyzed nine peer metro areas in greater depth, representing a range of global regions: Alexandria, Egypt; Casablanca, Morocco; Cape Town and Durban, South Africa; Medellín, Colombia; Fortaleza, Recife, and Salvador, Brazil; and Shantou, China. Across every relevant indicator—from personal wealth, to access to electricity, to overall literacy—the Indian cities either match or trail their global peers. Smart City investments, however, could help build stronger infrastructure assets, achieve gains in efficiency, and lead to greater economic opportunity.

### 5.1 CLUSTER ANALYSIS

Because governments, industries, and researchers approach the Smart City concept in a variety of ways, regions should look toward one another to develop more consistent and comprehensive strategies. Given the cutting-edge nature of digital technologies and the difficulty in designing policy frameworks in response, regions can often find it challenging to articulate and implement Smart City objectives without considering other relevant examples. Transferring technologies and learning from shared experiences, though, can help regions gauge performance, procure the best services for their particular needs, and ultimately reduce their investment risk.

However, identifying peers with similar needs is not always straightforward. Many leaders naturally gravitate to some of the largest projects and most innovative deployments of digital technology infrastructure, such as Rio de Janeiro's command center or Barcelona's citywide initiatives. This view may overlook economic realities that should motivate technology investments. Instead, cities should first compare themselves to markets with similar demographic and economic traits, relying on two critical inputs.

The first input is a globally representative database of metropolitan areas. Fortunately, the Brookings Institution already maintains a world-class database of global markets, produced in support of the Global Metro Monitor (GMM) series. This collection of 300 metro areas—representing every continent—



includes population, employment by industry, and industry composition in each market. Just as critically, the Indian Census includes the three Indian metropolitan areas.<sup>74</sup> Because of data availability, the GMM includes more metropolitan areas in developed nations, but there are many places in emerging nations to make apt comparisons with the three Indian metro areas.

The second input is a statistical method to compare metropolitan areas. Clustering techniques—specifically principal components analysis (PCA), k-means clustering, and agglomerative hierarchical clustering—offer the kind of objective techniques to identify peers. These clustering methods, moreover, can use the GMM’s statistical inputs as classification criteria, providing a strong foundation to assess an economy’s industrial organization and allow for clearer comparisons between similar regions. PCA adds even greater value to the clustering methods by dropping redundant and highly interrelated information while retaining as much variance as possible. Overall, these clustering techniques can make objective comparisons better than the human eye—and without the same subjective biases.

Applying clustering techniques to the expanded GMM database yields an unexpected mix of peer markets for the three Indian metro areas.<sup>75</sup> Using the clustering techniques listed above, a particular group of nine metro areas consistently “matched-up” with the three Indian metro areas.

- Alexandria, Egypt
- Casablanca, Morocco
- Cape Town, South Africa
- Durban, South Africa
- Fortaleza, Brazil
- Medellín, Colombia
- Recife, Brazil
- Salvador, Brazil
- Shantou, China

These nine markets form the preferred cohort for Smart City comparative analysis and present some clear distinctions from other markets. First, all nine are more moderately populated (2-5 million people) than other global metros. Second, as measured by GDP per capita, all nine markets are extremely poor relative to other GMM metro areas. This measure of individual wealth is a critical indicator of a metro area’s developmental stage and marks a clear reason to eschew comparisons with areas typically cited as model Smart Cities, such as Amsterdam and Chicago. Finally, the list provides geographic breadth: the nine metro areas represent six different countries across three different continents.

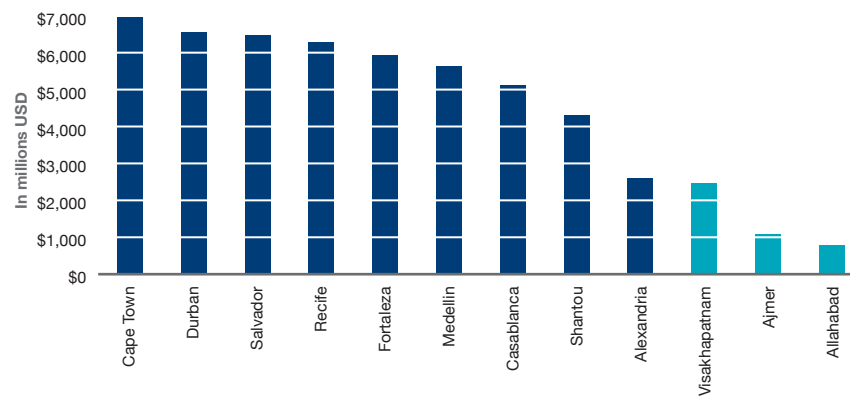
Also notably, the six other Indian metro areas within the GMM database did not cluster with the three focus Indian markets.<sup>76</sup> This is likely due to a combination of factors: the GMM Indian metro areas house considerably larger populations, have larger tradable and local service industries, and are less reliant on utility industries than the three new metro areas. Although the natural inclination may be to look at cultural and national peers, this exercise underscores the importance of looking beyond national borders for apt comparisons. This same global comparative approach should apply to every Indian city participating in the Smart Cities program.

## 5.2 INDUSTRIAL COMPARISON

Although the three Indian metro areas consistently showed statistical similarities with the same nine GMM markets, their economies are markedly less developed than their international peers. This section uses standardized data from the GMM to make metropolitan comparisons.

Even among these relatively poor metro areas, the Indian metro areas stand out. The GDP per capita in Ajmer and Allahabad is easily the lowest, hovering near \$1,000 (Figure 55). Meanwhile, Visakhapatnam only begins to approach the average wealth in Alexandria, which itself is the poorest of the peer metro areas. Excluding the Egyptian coastal metro area, every other peer metro exceeds \$4,000 in GDP per capita. Considering that the entire country of India has a GDP per capita of \$1,582 (compared with a global average of more than \$13,000), these three Indian metro areas face a serious wealth gap in boosting economic opportunity.<sup>77</sup>

**FIGURE 55. Metro GDP per Capita**



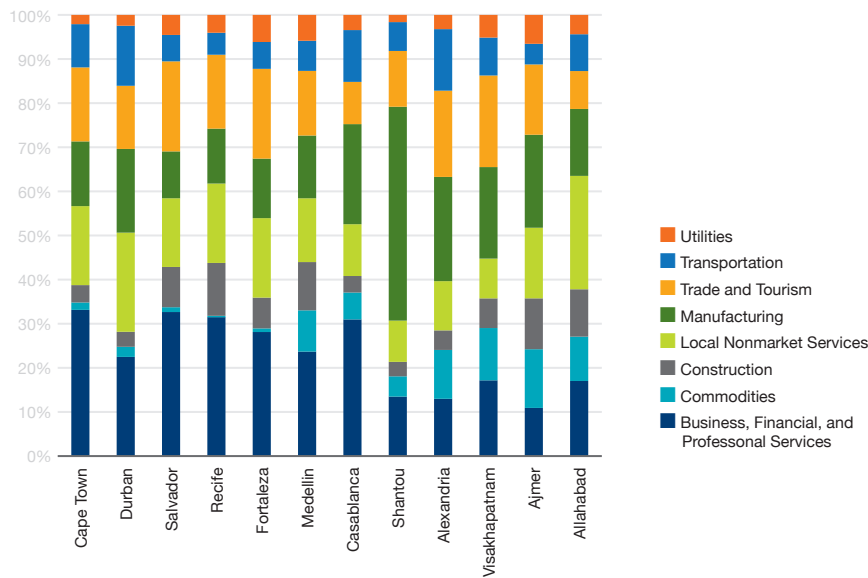
Source: Brookings analysis of Oxford Economic and Indian federal data

The Indian metro areas' industrial composition helps to explain this wealth discrepancy. Compared with their peers, the Ajmer, Allahabad, and Visakhapatnam have the smallest share of output from tradable services, which include business, financial, professional, trade, and tourism services. Given that these industries tend to pay higher wages and bring new skills and investment into regions, they unlock additional value as represented by multiplier effects.<sup>78</sup> The only exceptions are Alexandria and Shantou, which are manufacturing-driven markets unlike any other in this cohort.

Instead, as shown in Figure 56, commodity-focused industries are an outsized share of their GDP in the three Indian metro areas. Although regions specializing in the physical production of goods experienced a faster recovery from the recent global recession, markets like Houston and Perth tend to house more advanced industries and boast higher-value manufacturing than markets in India.<sup>79</sup> India's metro areas, for instance, had a GDP per worker of only \$2,000 or less in these industries, signaling the lower-valued processes typically involved in their commodity production. In turn, as these three Indian markets continue to derive a large share of their GDP from manufacturing, they will need to explore ways to increase the value of these industries over time.



**FIGURE 56. Metro GDP Share by Industry**



Source: Brookings analysis of Oxford Economic and Indian federal data

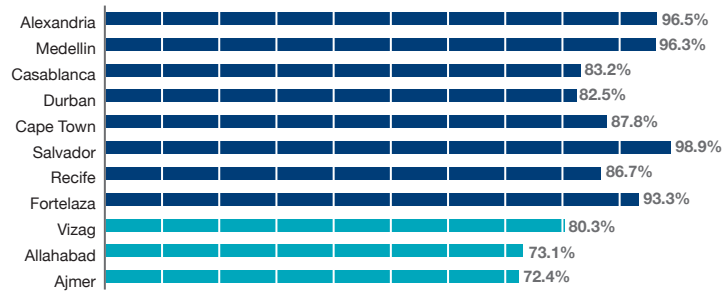
## 5.3 DEVELOPMENTAL COMPARISON

Smart City projects use digital technologies to improve infrastructure performance, ideally in the pursuit of broader economic objectives. Here, too, the three Indian cities must to play catch-up in essentially every respect. At the same time, these developmental gaps point to the greatest return on investment for Smart City deployments.

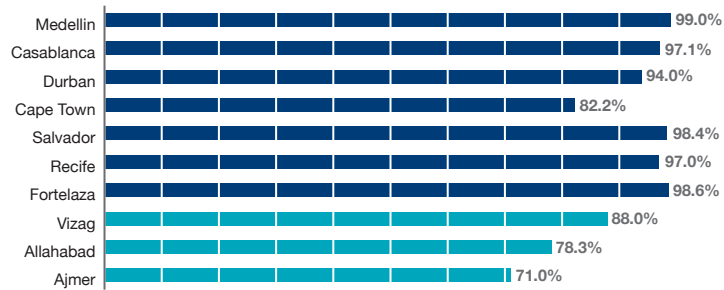
This portion of the analysis extends beyond GMM, using data from India and its peer markets to compare city-level development data. This deviates from the GMM cluster analysis, which required a comparison of metropolitan areas. However, owing to missing or insufficient data, this analysis could not include Alexandria and Shantou.

Across the developmental literature, access to clean sanitation is fundamental to physical health and a fundamental driver of economic opportunity. In this case, the Indian markets consistently trail their peer cities. First, only 80 percent of all households in Visakhapatnam have access to treated water within their homes, while Allahabad and Ajmer are below even 75 percent (Figure 57). Second, toilet access within the home is lower in Visakhapatnam (88 percent), Allahabad (78 percent), and Ajmer (71 percent) than peer cities (Figure 58). In nearly all peer cities, nearly 100 percent of residents have direct access to a toilet. Overall, this is a striking difference in sanitation services, creating higher health risks in India and leading to lost time for residents who must seek those services outside the home.

**FIGURE 57. Piped Water in Home**



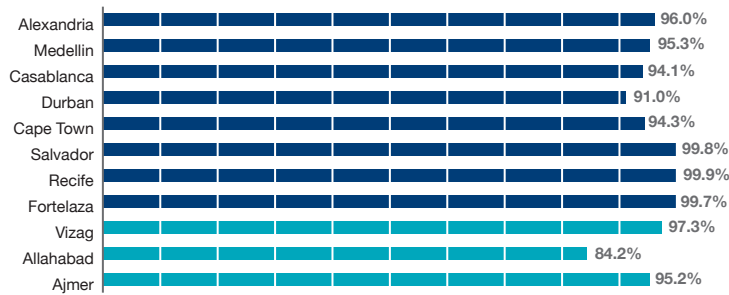
**FIGURE 58. Household Toilet Access**



Source: Brookings analysis of national Indian, Colombian, Moroccan, South African, and Brazilian data.

Electricity is equally important to economic development, and it is a key requirement to operate Smart City technologies. It is simply impossible to operate digital infrastructure without electricity. Here, the Indian cities trail their Brazilian peers, but Visakhapatnam and Ajmer both exceed Medellín, Casablanca, Cape Town, and Durban (Figure 59). However, Allahabad has easily the lowest electricity access of all cities. The inability to charge a laptop or connect to the Internet from Indian homes presents a serious barrier to any Smart City project that requires direct individual interaction.

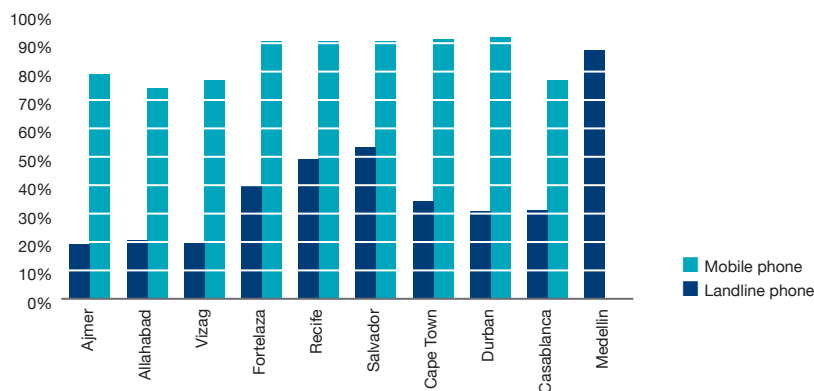
**FIGURE 59. Household Electricity Access**



Source: Brookings analysis of national Indian, Colombian, Moroccan, South African, and Brazilian data.

Gaps in electricity and wealth may help explain a similarly large gap in landline telephones (Figure 60). The Indian cities trail their global peers, although none of the cities even reach 60 percent penetration. The Indian cities also lag behind on mobile phone adoption—70-80 percent adoption rates compared with 90 percent in Brazilian and South African cities. Smartphones are a particularly important component of Smart City projects, allowing mobile access to web services such as transit arrivals, utility usage monitoring, and mobile financial transactions. Although not indicative of smartphone adoption and the availability of mobile data plans, the higher mobile phone adoption rates in peer markets are likely to offer a clear advantage when pricing-out future Smart City deployments.

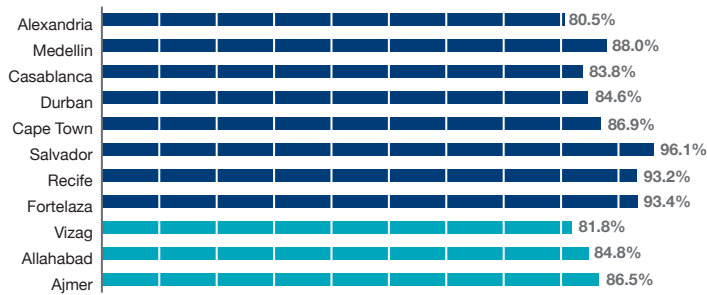
**FIGURE 60. Household Phone Adoption**



Source: Brookings analysis of national Indian, Moroccan, South African, and Brazilian data.

Finally, there is a literacy gap between the Indian cities and their peers (Figure 61). All of the cities exceed an 80 percent literacy rate, but the Latin American markets are clearly more literate than the Indian and African cities. Much like electricity, literacy is a fundamental input for Smart City services. It is impossible to expect an individual to have the digital skills necessary to use the Internet or maximize a smartphone's capability if he or she cannot read or write. As the global economy transitions to a more information-rich era, these literacy gaps will be a significant barrier to long-term individual opportunity.

**FIGURE 61. Literacy Rate**



Source: Brookings analysis of national Indian, Colombian, Moroccan, South African, and Brazilian data.

Although these developmental gaps demonstrate how infrastructure and education may be holding back India's urban economies, they also reveal a clear opportunity for Smart City improvements to deliver the greatest return on future investments. For example, "leapfrogging" to mobile phone infrastructure in emerging economies may offer an important lesson in infrastructure provision. Similarly, rather than building new water pipes, electric transmission systems, and telecommunications networks using current technology, India has the chance to build advanced infrastructure that is more affordable in the long run and more responsive to lower household incomes. Whether constructing water pipes that self-monitor for leaks or installing smart utility meters, cities can better target maintenance efforts, monitor usage patterns in real time, and potentially reduce system capacity needs. Expanded digital communication networks can also offer improved data access alongside voice transmission, unlocking the potential for telemedicine, digital learning, and coordinated transportation operations.

Inasmuch as these performance metrics highlight the need to focus on digital technologies to address developmental challenges, they should also make public officials question any project not specifically targeting shared prosperity. Developmental economics clearly finds that policies and projects boosting quality of life for all of society will deliver the greatest economic returns, which in turn lead to greater tax revenue and investment opportunities for governments. However, many of the most famous Smart City efforts in the world have focused on district-scale and greenfield redevelopments. Those may make sense in advanced economies where essential infrastructure has full penetration, but that is simply not the case in India.

## 6. Implications and Recommendations

**A**s India begins to accelerate its Smart Cities Mission, it faces a variety of challenges and opportunities. Across the country, cities have a steep path ahead in implementing new plans, designs, and investments. Ajmer, Allahabad, and Visakhapatnam have several institutional barriers and structural gaps to creating greater economic opportunity, including ongoing interjurisdictional conflict, high levels of income inequality, and shortfalls in service delivery.

Unreliable infrastructure, in particular, is a long-standing impediment. As India's cities have expanded their industrial base and heightened the pace of their economic growth, the physical assets supporting this market activity—from health and education facilities to energy and water distribution systems—are often lacking. The need for a more dependable, multimodal transportation network is equally important to ensuring greater economic access. Reliable electricity, sanitation, and broadband connectivity, likewise, remain inadequate in many areas, even though they are essential to unlocking digital solutions, such as sensors and telemedicine.

Ultimately, collaborations between newly formed special purpose vehicles (SPVs), local governments, and their state and federal peers must target infrastructure improvements tailored to the needs of individual regions. Unlike other more developed markets internationally, India's urban local bodies (ULBs) have frequently lacked the institutional capacity to develop projects and collaborate with private-sector partners on their own. Indeed, the inability to attract alternative revenue streams and develop more durable local funding sources is a severe financial constraint to states and cities alike. Although SPVs offer a new approach to chart more efficient urban development, they are unlikely to solve all of these various governance and investment concerns by themselves. The same applies to the central government, whose continued top-down support will be instrumental to advancing urban objectives but cannot be the sole source of funding.

A key motivating factor for cities across India, then, is to explore more flexible, innovative ways to manage and finance urban development. By better articulating local needs and establishing clearer benchmarks for future action, India can craft more comprehensive strategies in support of its Smart Cities Mission. This report recommends three categories of governance reform to assist in such efforts.

**“By better articulating local needs and establishing clearer benchmarks for future action, India can craft more comprehensive strategies in support of its Smart Cities Mission.”**



## 6.1 DEVELOP SCALABLE, FOCUSED PRIORITIES

First, India must focus on creating more customized solutions as part of its Smart Cities Mission. These solutions should be shaped according to local infrastructure priorities and institutional capabilities. Public and private leaders must respond more directly to sector-specific challenges, emphasizing those improvements that help deliver widespread economic prosperity in the long run.

Essential infrastructure—including water, sanitation, and waste management—poses perhaps the most significant developmental gaps in many Indian cities and should consequently be a top priority. To reach the MoUD's benchmarks on efficiency, quality, and connectivity in these infrastructure sectors, not only must SPVs and ULBs partner more effectively with other government bodies and private-sector stakeholders to improve physical performance, but they must also continually investigate ways to better manage costs and mitigate risks when overseeing these projects. The same holds true for delivering other basic services in a reliable manner, such as consistent electricity and universal broadband. Meanwhile, more advanced technological upgrades, such as smart parking meters and telemedicine, should remain an area of consideration given their ability to lower costs and lead to other long-term efficiencies. However, as in each of these examples, local Smart City leadership must recognize that many of these advances work atop the foundation of reliable broadband, electricity, and sanitation infrastructure.

In addition to creating clearer infrastructure targets, Indian cities should also leverage their local economic strengths to develop priority industries and guide future development efforts. In many ways, Ajmer, Allahabad, and Visakhapatnam are emblematic of the rapid economic expansion and urban growth taking place nationally, but they still lag behind their international peers in their levels of wealth and breadth of industrial activities, particularly in higher-value tradable services. By focusing on higher value-add activities within manufacturing and service industries, the initial Smart Cities can deliver more competitive wages and increase demand for a more skilled workforce. Growing urban areas' advanced industrial base will also create a positive feedback loop for infrastructure deployment, given that such industries require reliable digital infrastructure and high-functioning transportation networks to move people and goods. Additional capital investments and technological upgrades in these industries over time, moreover, can help lead to greater efficiencies regionally. Overall, building more advanced industries will help India cultivate a more productive and opportunity-rich economy.

India's Smart Cities must also align their ambitions with institutional capabilities. SPVs, working alongside other state and local partners, must define a precise economic scope and geographic extent for future urban development efforts, especially given existing governance and financial challenges. Initially, at least, Indian cities should scale their project sizes in light of practical considerations on the ground. That may mean eschewing the most cutting-edge products and processes on display in other developed markets worldwide in favor of lower-cost alternatives. The same thinking applies to the number of projects undertaken. Although there may be demand for as many projects as possible, delivering successful projects is likely to engender greater public goodwill and, therefore, the capability to execute more projects in the future. Finally, although large-scale greenfield development may be attractive because of its relatively lower costs and no need for remediation, governments must give equal consideration to geographically targeted projects in more established urban areas given that they may deliver greater aggregate benefits by targeting at-risk populations.



## 6.2 IMPROVE GOVERNMENT CAPABILITIES AT ALL LEVELS

Second, India must look to improve government capabilities at all geographic levels to accelerate future urban development efforts. Despite recent reforms, city and state governments still often lack the needed autonomy, collaborative leadership, and institutional capacity to drive the type of transformational change envisioned as part of India's Smart Cities Mission. Although ULBs have generally assumed greater control over the planning process, they have struggled to drive new infrastructure investments and found it difficult to coordinate with other agencies and jurisdictions, frequently resulting in poor service delivery. Special Purpose Vehicles offer considerable promise in overcoming these challenges, but they must continue to embrace additional transparency and accountability when managing projects, in addition to embracing other changes described below.


At the city level, for instance, ULBs must modernize their overall governance approach by further clarifying their functions and by shifting some of their responsibilities to SPVs or other administrative bodies, which may possess more specialized technical expertise and a more targeted mandate. Without skilled leadership, predictable financial resources, and a clear programmatic direction, many ULBs remain mired in inefficient bureaucratic processes and are unprepared to address the ongoing infrastructure investment gap. However, drawing support from a new class of leaders—such as resilience and innovation officers—and sharing authority with other technical bodies may help assuage some of these concerns. Above all, ULBs should strive for greater consistency in their core functions and internal operations, from procurement to permitting to public-private partnership regulations, so they can respond more nimbly to local needs and serve as a dependable partner in future engagements with private-sector partners.

Beyond ULBs, SPVs will play perhaps an even more important role at the city level, where they must maintain their independence and offer clearer leadership in directing future urban development efforts. Distinct from other local bodies, SPVs can pursue a wide range of financing options, manage risks more flexibly, and bridge long-standing political divisions. Nonetheless, as other international examples have demonstrated, SPVs must operate in a transparent manner, especially when overseeing projects, determining levels of investment, and selecting board members. In this way, maintaining public trust and accountability should be crucial considerations; the creation of citizen commissions and other collaborative approaches can help SPVs respond more openly to local demands. Special Purpose Vehicles can also boost accountability by launching online dashboards to measure projects' progress and any progress on key economic development indicators. At the same time, board members should determine how they can share responsibilities and remain accountable for project outcomes, either positive or negative. Incorporating "sunset" legislative measures, for example, can help provide a clearer timeline for SPVs to carry out projects and achieve impact in the short-term.

Nationally, the central government must continue to support state and local governments as they advance their Smart City efforts, with a particular focus on devolution. As initiated by the 74th Constitutional Amendment Act more than two decades ago, states and ULBs are gradually assuming more control over their urban development, but the pace of this transfer in power and responsibility has been highly uneven. The financial dependence of ULBs on revenue besides their own—including grants-in-aid and other transfers from the central government—has been a complicating factor in this respect. ULBs must look to improve their credit status and develop more robust internal procedures to attract private capital. The wide variation in state and city politics has made it difficult to spearhead such change, but local administrations must undertake a more pronounced role in governing their affairs.

In turn, a major reimagining of local governance is required nationally to boost city governance, namely by empowering city mayors. Mayors should assume the limelight of city administration with the delegation of greater decisionmaking authority, including increased fiscal autonomy and additional oversight of municipal commissioners. In addition, through more direct elections and longer





terms (of at least five years), mayors can be more responsive to resident concerns and have the consistent institutional powers necessary to improve local services and infrastructure.<sup>60</sup> States, of course, must be willing to delegate more power and financial capital, giving mayors and local governments the ability to steer change. Rather than practicing partial democracy at the city level, as is currently done through appointed officials, local governments should act from a position of strength alongside their central and state government peers.

Because many cities lack the immediate capacity to drive all of these improvements, the central government must continue to provide a reliable foundation to support these local efforts. For instance, maintaining direct capital flows to SPVs is necessary, at least in the short run. Such capital can equip them with the necessary resources to manage pressing projects. Likewise, establishing public-private partnership units can serve as valuable intermediaries in managing new financing options and assisting negotiations with the private sector. Similarly, more robust national urban data should be a major priority, including creating a centralized project database. With so many cities already advancing to the implementation stage as part of the Smart Cities Mission—and another 60-plus waiting to follow their lead—a central clearinghouse offering additional guidance is needed. Although the exact form of this database should be explored in greater depth, at minimum it should include project details from each market, such as the type of infrastructure being addressed, the financing model used, and the performance measures considered. Ideally, data would link with local dashboards managed by SPVs. In much the same way, states should coordinate these technical and administrative efforts, better linking up AMRUT program goals and measures with Smart City plans.

## 6.3 MAKE INDIAN URBAN AREAS MORE ATTRACTIVE INVESTMENT MARKETS

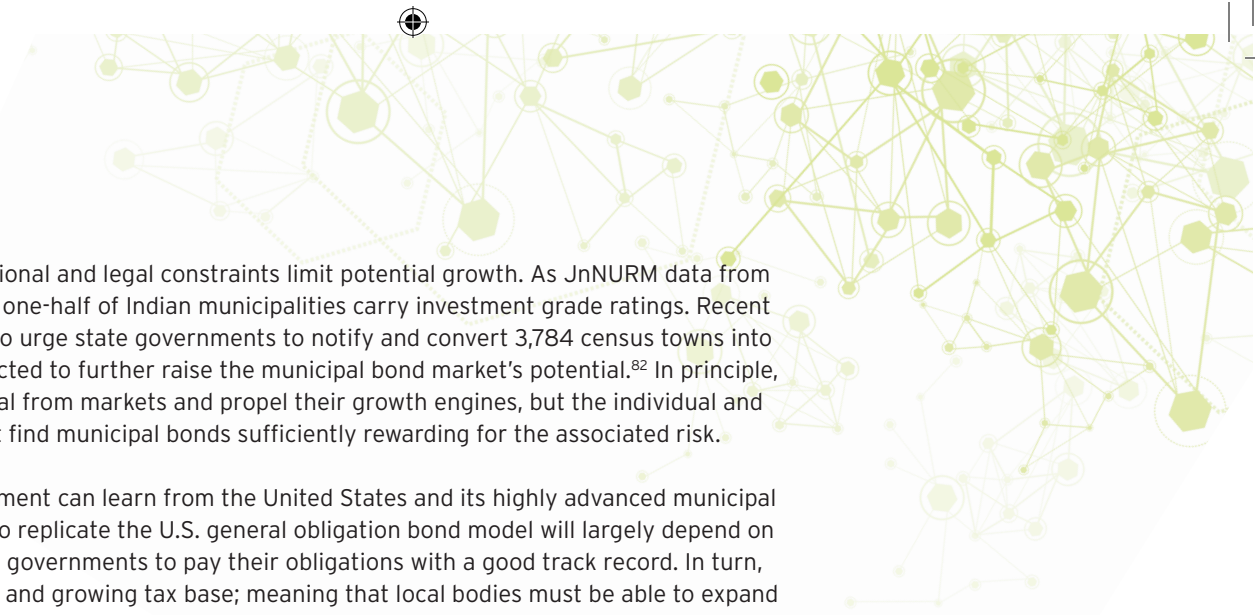
Finally, in the pursuit of various infrastructure improvements and institutional changes, India must elevate the investment profile of its urban areas. Without additional financial support, in the form of new local funding sources or new private capital flows, for instance, India's Smart Cities Mission will remain encumbered by a lackluster business environment.<sup>61</sup> Minimizing costs and maximizing economic returns are enormous, long-term challenges, which will require more coordinated leadership from central, state, and local governments and more extensive domestic and international stakeholder engagement.

Across all levels of government, particularly among different city agencies, India must ensure that dependable capital flows are available to meet economic goals in years to come. Under JnNURM, for instance, too many cities struggled to complete new projects and carry out other service improvements, which speaks to their inadequate revenue base, inefficient procurement practices, and lack of cross-agency (and cross-sectoral) collaboration. Ensuring that proper frameworks are in place to protect new and existing revenue streams should represent a key priority in this way; in other words, government agencies must do a better job pooling revenue streams and targeting future spending over the full course of a project's lifecycle. These agencies should also look to reduce the cost of capital and meet financial obligations more efficiently by addressing current shortcomings as reflected in their municipal credit ratings.

As India's cities consider more flexible and reliable ways to pay for Smart City improvements, municipal bonds can serve as a valuable future model. India's municipal bond market lies untapped. Because of severe constraints in both supply and demand, only a limited number of ULBs have experience raising funds through municipal bond issues.

India's ability to deepen its municipal bond market and to raise finance for its infrastructure needs depends on several key reforms. The opportunity to expand municipal bonds market in India is exten-





sive, but the existing institutional and legal constraints limit potential growth. As JnNURM data from November 2012 show, about one-half of Indian municipalities carry investment grade ratings. Recent central government efforts to urge state governments to notify and convert 3,784 census towns into statutory towns is only expected to further raise the municipal bond market's potential.<sup>82</sup> In principle, these ULBs could raise capital from markets and propel their growth engines, but the individual and institutional investors do not find municipal bonds sufficiently rewarding for the associated risk.

The federalist Indian government can learn from the United States and its highly advanced municipal bond market. India's ability to replicate the U.S. general obligation bond model will largely depend on the ensuing capacity of local governments to pay their obligations with a good track record. In turn, this will necessitate a robust and growing tax base; meaning that local bodies must be able to expand their own revenue with grants or subsidized funds from central and state governments. In addition to general obligation bonds, India should also examine the potential of revenue bonds. Special Purpose Vehicles are an important consideration in this regard. SPVs will operate independently and, if executed correctly, control specific revenue streams to serve as collateral for private investment. In the United States, an enormous range of regional bodies have issued revenue bonds, from the San Francisco Bay Bridge Authority to the New York / New Jersey Port Authority. Internationally, corporate utility bonds display many similarities.

Indian investors are often conservative by nature. Banking data demonstrate that they generally prefer fixed deposits, small saving schemes, or gold as personal savings instruments. Indian consumers, however, have historically shown great faith in financial instruments floated by the Indian government. Bonds issued by municipalities with good financial track records could be a strong alternative investment opportunity. In this regard, in the eyes of investors, the credibility of the local government as the institution of governance for local matters that affect their daily lives will be central. The ability of local individual investors to track projects will also motivate them to contribute to such instruments.

Municipal bonds may also be good option for private placements with large investors such as provident funds, pension funds, and insurance companies. Because these entities can better assess the risks of individual projects and the concerned municipalities than individual investors, a deeper municipal bond market will likely raise competition among ULBs to access capital. This competition, in turn, should incentivize market discipline to meet long-term objectives for project delivery and sustainable funding. Not only will municipal bonds serve as a market signal for the performance and capabilities of ULBs to execute and complete projects, but they will also direct more private capital toward better-performing ULBs.

Many wealthy American investors are attracted to municipal bonds because of their tax-free status. However, MoUD regulations limit the issuance of tax-free bonds by municipal bodies to a maximum interest rate of 8 percent per year. Because this ceiling may limit potential investors, we recommend lifting the 8 percent cap and investigating more flexible regulations.

Apart from improving other internal institutional processes, India's cities must look outward toward a host of different partners to advance their Smart City improvements and ultimately get projects done. Increased private-sector engagement should be a paramount goal, which requires more active, coordinated leadership in project management, technical guidance, and risk mitigation.<sup>83</sup> Simply put, Indian urban areas can no longer rely solely on public capital flows. Although SPVs mark a step in the right direction toward clarifying project priorities and establishing a clearer business environment—where companies can more easily weigh risks and returns—additional institutional arrangements and incentives will likely be needed to encourage future public-private partnerships. For example, having a more predictable permitting process, standardized review period, and dependable sources of information to track sector-specific projects could help build more momentum behind these investments.

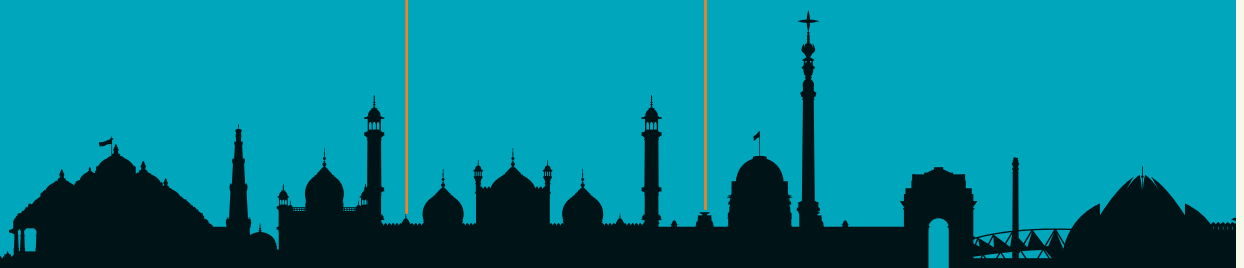
## 7. Conclusion

Considering the expected growth in India's urban population, the launch of the Smart Cities Mission offers an overarching opportunity and underscores India's urban challenges. The opportunity lies in using digital technologies in each of the proposed Smart Cities to improve growth trajectories, both in terms of quality of life and economic output. The challenge is confronting the significant hurdles to achieving such growth. Serving the urban population, especially the urban poor, will require dramatic improvements in basic amenities to achieve a decent standard of living. The decline of political and administrative leadership locally is alarming, with most cities confronting a complete collapse of local governments' institutional capability to govern and deliver. Recent federal programs intended to boost urban economies—including JnNURM, AMRUT, and HRIDAY—continue to show mixed results.

The local economies in the three focus cities exemplify the economic challenges facing India's cities—and how much those cities hope to achieve through the national Smart City Mission. Although all three cities are significantly poorer than other global markets, the fact that Visakhapatnam's per capita output is orders of magnitude higher than that of Ajmer and Allahabad is stark evidence of the significant variation among Indian markets. Agriculture is either the largest or second-largest industry by employment, signifying how much these cities trail global development stages. In terms of municipal services and demographic indicators, all three cities lag ideal benchmarks. Finally, our investment gap analysis reveals the significant financial costs needed to generate significant improvement among these indicators.

Taking lessons from the previous federally driven city efforts, the Smart City Mission can only reach its objectives if it focuses less on specific technologies and more on economic goals, governance reforms, and sustainable capital flows. That will require newly formed SPVs be afforded the independence necessary to execute their plans and strategies. This independence includes their ability to incorporate administrative efficiency, boost interagency coordination, and attract private capital with sustainable revenue streams. There should be a newfound openness to private institutions and developers interested in developing infrastructure for public civic amenities.

It is easy to imagine how integrating digital technologies into the urban fabric could deliver more prosperous, sustainable, and efficient cities. But that promise can only be fulfilled with clear objectives and effective governance frameworks. As the Smart City Mission continues to develop, it is critical that cities and their federalist peers deliver on these clear needs.



# APPENDIX A: STRUCTURE AND RECOMMENDATIONS FOR INDIA MUNICIPAL BOND MARKET

The Corporate Bonds and Securitization Advisory Committee (CoBoSAC) of Securities and Exchange Board of India (SEBI) formulated a framework for issuing municipal bonds and disclosure norms.

The committee proposed the following four different institutional structures for municipalities to independently access the debt market and to issue bonds.

## I. Directly by ULBs

The municipal corporations may issue general bonds or revenue bonds. Issuing general bonds is conditioned on being made available for public offering but shall be issued only on private placement basis to institutional investors. The rationale for such limitation is because the cash flows from the general bond project become part of common revenue of municipalities and thus specific funds cannot be earmarked for repayment of such bonds.

## II. Corporate municipal entity (subsidiary)

This structure permits municipalities to establish a Corporate Municipal Entity (CME). The CME then borrows by issuing bonds and lends the funds to the respective municipality. The premise was to create a facilitating entity. This structure conditioned that CME may not hold or carry out any projects of its own. Further, if any such transfer of projects from municipalities to CME is to be carried in lieu of equity, it requires legislative approval.

## III. Separate statutory body


This structure facilitates establishing a statutory body or a 100 percent government-owned undertaking that could borrow from the market and lend to municipalities, depending on the requirement. This body may have adequate capability to assess/appraise the viability of each projects of the municipality and its governance level before meeting the body's financing requirements.

## IV. Pool finance development fund scheme (PFDF)

This structure enables a special purpose entity created by one or more municipalities to issue securities by securitizing their receivables. The guidelines prescribed by the MOUD stipulate that each state / union territory must either designate an existing state entity or create a new entity as a State Pool Finance Entity (SPFE) to execute the PFDF Scheme. SPFE can make a public issue or private placement of securitized debt instruments by complying with SEBI (Public Offer and Listing of Securitized Debt Instruments) regulations of 2008.

CoBoSAC committee recommended the following requirements, subject to which municipalities may issue debt securities:<sup>84</sup>

- I. The funds raised from issue of municipal bonds shall be used only for the projects that are specified under objects in the offer document.
- II. The proceeds of the proposed issue shall be clearly earmarked for a defined project or a set of projects;
- III. It will be mandatory for the issuer to obtain rating from a credit rating agency registered with SEBI before the issuance of Municipal Bonds.

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- IV. The municipal bonds should have a minimum maturity of 3 years. The issuers will have option to offer deep discount bonds or other financial innovations especially to enhance the tenor of the bond.
  - V. The issuers may have the option for buy-back arrangements of the face value of the bonds from an investor.
  - VI. The issuers shall maintain a separate account of the amount raised from the issuance of municipal bond, to be utilised only for the project related expenditure;
  - VII. The issuers shall establish a separate project implementation cell and designate a project officer who shall monitor the progress of the project(s) and be responsible for ensuring that the funds raised through
  - VIII. The funds raised by the issuer are utilised in accordance with the timetable for utilization of bond proceeds and only for the project(s) for which permission has been granted by the Central Government.
  - IX. With respect to audit of accounts of the Municipal bodies, it was suggested that within six months of the close of every financial year, the escrow account and the project account shall be audited by the auditors appointed by the Municipal Corporations, as permissible under their respective constitutions. However, if it is a statutory corporation, then the accounts shall have to be audited by the statutory auditor. Further, the accounts shall have to be audited in a manner, which is friendly with the investor community and also there should be a single point of contact in each ULB/Municipality, with respect to such accounts, with whom the investors can interact and clarify their doubts, if any.

## APPENDIX B. INPUTS TO INVESTMENT GAP ANALYSIS

To conduct the investment gap analysis, the authors used the High Powered Expert Committee's methodology and key assumptions of per capita cost estimates.<sup>85</sup>

### WATER SUPPLY

- The investment requirements for water supply are calculated for both domestic customers and industrial customers.
- For domestic customers, investment requirements are calculated as the sum of the investment subsectors: (1) water production (includes source augmentation, treatment, and transmission) (2) distribution extension for 24x7 standards (distribution network, storage, and metering) (3) distribution upgradates/replacements for 24x7 standards.
- For industrial customers, only production investments are calculated.
- Operations and maintenance costs are estimated separately on annual basis for domestic customers. However, for industrial customers, only the production O&M has been calculated.
- Nonrevenue water is assumed to constitute 20 percent of total consumption. Accordingly, the per capita production norm is 168 liter per capita per day for all size classes of cities.
- On average, 80 percent of distribution network pipes for delivering continuous water supply for all city sizes are to be replaced.
- For cities with population above 500,000, industrial water production is assumed to account for

about 20 percent of the total water production, and demand is assumed to grow at 7 percent annually.

- Cost of connection and metering per household is assumed to be INR 2,500.
- Service Standards for Water Supply: 100 percent individual piped water supply for all households, including informal settlements for all classes of cities.
- Continuity of supply: 24x7 water supply for all classes of cities.
- Per capita consumption norm: 135 liters per capita per day (LPCD) for all classes of cities.

## SEWER

- The investment requirements are calculated as the sum of the investment costs for: (1) network and (2) treatment (sewage pumping stations and sewage treatment plants).
- The investment requirements are calculated only for domestic customers.
- There is no excess treatment capacity in the existing sewer treatment plants.
- In estimating replacement costs, the service life of the assets is assumed to be 30 years.
- The average operations and maintenance cost for network is estimated at INR 3.3 per cubic meter; operations and maintenance cost for treatment is estimated at INR 5.4 per cubic meter on an average.
- The total O&M cost for sewer covering the existing and new assets is lower than that of water supply because of the existing low service coverage and lower unit cost of O&M.
- Industrial waste water collection and treatment have not been considered in estimating investment requirements.
- Underground sewer system has been considered for all city size classes.
- Sewage generated is assumed at 80 percent of per capita water consumption, and 5 percent sewage generation is assumed for infiltration from groundwater (113 liter per capita per day).

## SOLID WASTE MANAGEMENT

- The investment requirements are calculated as the sum of: (1) collection and transport (trucks, containers, pushcarts, mechanical sweeping, and transfer stations), (2) processing (treatment plants), and (3) disposal (development of landfill sites).
- The assumptions underlying solid waste management estimates are based on the Municipal Solid Waste (Management and Handling) Rules 2000.
- The higher PCIC in large cities is due to the higher per capita waste generated and lack of any significant economies of scale in processing.
- A uniform unit cost for operations and maintenance has been assumed for all city classes assuming that large cities would adopt highly mechanized systems while smaller cities would adopt comparatively more labor-intensive processes.
- Average per capita waste generation by city class (India Infrastructure Report 2006); Class IB: 425 grams per person per day, Class IC: 304 grams per person per day.
- Per capita solid waste generation is projected to increase 1.3 percent per year.
- 80 percent of the total waste generated is processed.
- O&M unit cost, INR 1,200 per ton, of which Rs 1,000 is for collection and transportation, and Rs 200 for disposal.

- 100 percent of solid waste is collected, transported, and treated as per the Municipal Solid Waste 2000 Rules for all city size classes.

### STORMWATER DRAINAGE

- The investment requirements are calculated as the sum of network and outfall. Components for network and outfall include widening drains and structures to prevent waste dumping, laying pipeline with pipe support bridges/culverts, catch pits, manholes, outfall structures with gates, and covers for the drain.
- Drain network covering 100 percent road length on both sides of the road for all cities.
- Unit cost is for fully covered drains (reinforced cement concrete pipes/piped drains) on both sides, except for natural drains that are open drains.
- Service life of the assets is assumed to be 20 years and, accordingly, no replacement cost is considered for the period.
- Annual operations and maintenance is assumed to be 1.5 percent of the PCIC, covering both existing and new assets.

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17. Ahluwalia (HPEC 2011)
18. Productivity is higher in urban areas than rural areas.
19. Rajgopalan and Tabbrrok, 2014
20. Municipal Corporations are a form of Urban Local Bodies for the governance of large urban areas.
21. Now renamed as 'Gurugram,' it is a major business town on the periphery of New Delhi.
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  62. The industry sector includes mining and quarrying, manufacturing (registered and unregistered), electricity, gas and water supply, and construction.
  63. The services sector includes trade, hotel and restaurants, real estate and ownership of dwelling, communication, public administration, banking and insurance, transport by other means and storage, and railways.
  64. Note that data limitations could be partially responsible for these trends.
  65. The city in this context is defined as area under the civic administration of Municipal Corporation of the respective city.
  66. As compared to 29 percent of the national average.
  67. National Crime Record Bureau.
  68. Ahluwalia (HPEC 2011).
  69. Even though the data are collected from the same source as other indicators, data particularly for Uttar Pradesh are missing for this indicator.
  70. Because data are unavailable for Ajmer, the Rajasthan average is used as a proxy.
  71. RTI applications were filled with MoUD and Urban Department of State Governments for the updated data, but there has been no affirmative replies.
  72. Each of the urban sectors is classified into subsectors. For example, in water supply, PCICs are separately calculated for water production and distribution. These are multiplied with the relevant population numbers for each city size class, including the backlog and the population projection for each class of city.
  73. In water supply, sewer, and solid waste management, PCOM are computed using (1) unit cost from project data, (2) estimates of production volume for each sector, and (3) the population covered. For the remaining sectors, the PCOM is assumed to be a percentage of the PCIC.
  74. Indian districts are comparable to metropolitan areas and were the unit of measurement within the cluster analysis.
  75. Starting with a principal components analysis, the remaining key components explained 80 to 90 percent of the variance in the data set and where the eigenvalue is equal to one. Next, k-means clustering subdivided the 303 global metros into smaller groups and used complete-linkage (furthest neighbor) and weighted-group average hierarchical clustering algorithms to the components. Visualizing the results using dendrograms revealed the most similar metro areas within their immediate branch. The result was 20 metropolitan areas that were typically clustered together, with a particular group of nine metro areas consistently "matched-up" with the three Indian metro areas.
  76. Those other Indian metro areas are Delhi, Mumbai, Chennai, Bangalore, Hyderabad, and Kolkata.
  77. World Bank statistics.
  78. For one traditional explanation of multiplier effects, see Cletus Coughlin and Thomas Mandelbaum, "A Consumer's Guide to Regional Economic Multipliers" (St. Louis: St. Louis Federal Reserve Bank, 1991).
  79. Brookings Institution, "Global Metro Monitor 2014: An Uncertain Recovery" (Washington, 2015).
  80. Janagraha, 2014.
  81. World Economic Forum, "Reforms to Accelerate the Development of India's Smart Cities: Shaping the Future of Urban Development and Services." (Cologne, Switzerland, 2016).
  82. Ministry of Urban Development, Press Release (New Delhi: Government of India, May 17, 2016).
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