Ahmedabad, India
Scaling Up with Contiguous Replication of Town Planning Schemes

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The Synthesis Report offers a range of integrated solutions (Mehrotra 2020).
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ACKNOWLEDGMENTS

This World Bank report was produced by a team led by Shagun Mehrotra and comprised of Anna-Maria Eftimiadis, Lincoln Lewis, Bruno Bonansea, María Pomes-Jimenez, and Miguel Ruiz at the World Bank, and Mariana Orloff, Robin King, and Beth Olberding at the World Resources Institute (WRI). Excellent research assistance was provided by Hamza Atumah, Maya James, Julian Lark, and Avnish Dayal Singh.

Overall strategic guidance was received from World Bank’s Sameh Wahba (Global Director, Global Practice for Urban, Disaster Risk Management, Resilience, and Land), Ede Ijjasz-Vasquez (Regional Director Sub-Saharan Africa, Sustainable Development), Maitreyi Das (Practice Manager, Urban Global Programs), Peter Ellis (Global Lead, Sustainable City Infrastructure and Services), Xueman Wang (Senior Urban Specialist and Program Coordinator of the Global Platform for Sustainable Cities, GPSC), and WRI’s Ani Dasgupta (Global Director, Ross Center for Sustainable Cities).

The team is deeply grateful to the reviewers for the insightful comments and deliberative discussions beyond the formal review process. Peer reviewers included Aloke Barnwal (Global Environment Facility, GEF), Rafeef Abdelrazek, Chyi-Yun Huang, Annie Gapihan, Qingyun Shen, Yuan Xiao, Anjali Mahendra (WRI), and Jessica Seddon (WRI). The team also deeply appreciates the thoughtful advice of Professor Peter Newman at the report’s framing stage.

In addition to the core report team, case study contributors were: Myriam Ababsa, Hazem Abdelfattah, Antar AbouKorin, Ahmad Z. Abu Hussein, Abudlrahman Alsayel, Laura Azeredo, Madhu Bharti, Amartya Deb, Jaya Dhindaw, Amy Faust, Natalia Garcia, Wiwandari Handayani, MaryGrace Lugakingira, Jorge Macias, Felipe Montoya, Luiza Oliveira, Bintang Septiarani, Rukuh Setiadi, Jiawen Yang, and Jiangping Zhou. Specific authorship acknowledgements are mentioned within each case and the authors thank those who were interviewed for the cases.

Valuable technical contributions and comments were provided by Karina Acevedo (Annex B), Brenan Gabriel Andre, Spandana Battula, Mary Donnovan, Lina Duque, Peter Griffiths (Annex C), Robert Mansour Harrison, Dany Jones, Ryan Kemna, Jeffery Dean Lawrence, Christiana Nikola Reichshaler, Apoorva Narayana Shenvi, Adeel Abbas Syed, Vickie Taylor, Oliver Uberti, and Matthew Woundy (Annex D).

The report benefited from discussions, thoughtful insights and suggestions from several colleagues who have specific expertise and locational experience,
including Lina Abdullah, Mohamed Bakarr (GEF), Venessa Alexandra Velasco Bernal, Ashok Das (University of Hawaii), Narae Choi, Eric Dickson, Somik Lall, Kevin Milroy, Vincent Roquet, Katia Herrera-Sosa, Steffen Soulejman Janus, Jad Raji Mazahreh, Alex Ortiz, Gayatri Singh, Horacio Christian Terraza, and Mariko Yamamoto.

Data contributions were graciously provided by: Thomas Esch, Daniela Palacios Lopez, and Mattia Marconcini (German Aerospace Center, DLR); Pir Mohammad and Ajanta Goswami (Indian Institute of Technology, Roorke); and Antar AbouKorin and Abdulrahman Alsayel.

Excellent administrative and production support was generously provided by Elizabeth Acul, Adelaide Barra, Lucie Albert-Drucker, and Cinthia Donantchat. The writing process greatly benefited from Marc DeFrancis’ manuscript editing. Jacqui Lewis and Mary Paden copyedited the report. Typesetting was performed by Puntoaparte’s Mateo Zúñiga, Andres Barragán, Sarah Peña, María Rojas, and Carmen Villegas.

The contributors graciously acknowledge GEF’s Sustainable Cities Integrated Approach Pilot program which supported the production of the report. This program is a broader partnership between GEF, World Bank’s GPSC, participating countries and cities, project-implementing agencies, and Resource Team organizations (comprising WRI, C40, and ICLEI Local Governments for Sustainability). WRI contributed to the report and case studies through the grant “Urban Networking to Complement and Extend the Reach of the Sustainable Cities Integrated Approach Pilot” which is managed by the World Bank’s Anna-Maria Eftimiadis. The case study of Dammam was supported by the Kingdom of Saudi Arabia through the Reimbursable Advisory Services project managed by World Bank’s Hazem Abdelfattah.

The editors and authors thank the wider World Bank and WRI teams, and others not specifically mentioned here, who contributed to the concerted efforts to publish the report and its extensive case studies.
THE SOLUTION

Making space for high-density mixed land use and integrating peri-urban expansion by replicating contiguous town planning schemes

The city has expanded its fiscal space through improved property valuation, tax coverage, and collection. Reorganizing land into accessible plots with integrated urban infrastructure has unlocked land value capture opportunities too. In 1998 it issued India’s first municipal bond without a state guarantee.

KEY FINDINGS

1. Nearly 100 micro town planning schemes (TPS) were aggregated into the 76km Sardar Patel Ring Road project. An affordable housing zone along the road, supported by a national program, has reduced congestion and housing pressure, while increasing connectivity and densities. The bus rapid transit system (BRT) has already provided city-wide mobility in Ahmedabad; a metro link to Gandhinagar is expected to further unify this emerging metropolitan area.

2. TPS use a participatory form of land readjustment to enable infrastructure expansion without land acquisition. These compact, mixed-use urban extensions contribute to relatively shorter average trips, limiting travel-based emissions, and curtail sprawl. Market-driven incentives also encourage private developers to rehabilitate slums at higher densities.
IDEA IN BRIEF

Metropolitan authorities can establish a macro-planning or regional spatial framework with a development plan and flexibly utilize town planning schemes to finance and implement integrated development of the urban periphery.

Ahmedabad offers policymakers a well-structured model of metropolitan integrated planning that combines a development plan (DP) with town planning schemes (TPS). By utilizing the development plan—a metropolitan regionwide masterplanning approach for land use and infrastructure coordination—Ahmedabad has established a vision and framework to shape its rapid expansion over the next decade while setting guidelines to curtail sprawl.

The TPSs translate the DP vision into action. These TPSs use a land-pooling mechanism of one to two square kilometers, employing participatory planning to design, finance, and deliver integrated infrastructure and social services while creating mixed-use extensions to the city. This enables local bodies to anticipate and steer metropolitan urban growth through a close collaboration with peri-urban land owners and negotiation with other stakeholders. Under its 2011 DP, Ahmedabad is crowding in density by integrating transportation networks, making space for mixed land use, and developing peri-urban infrastructure, such as the Sardar Patel Ring Road, a beltway developed by aggregating nearly 100 town planning schemes. Ahmedabad’s DPs and TPSs work hand in hand to create their own metropolitan integrated planning process, which has the demonstrated benefit of integrated planning that delivers compact urban growth while meeting the social and economic aspirations of its citizens.
BACKGROUND

AHMEDABAD IS SITUATED in west-central India on a generally flat plain along both banks of the Sabarmati River. This strategic sitting amid a vast agricultural catchment allowed the earlier primate city to expand uninhibited with a polycentric urban growth pattern. While this geography has provided Ahmedabad significant development advantages, the relative ease of development has also presented significant challenges to the meaningful coordination of strategies and integration of the metropolitan area’s population growth.

During the early twentieth century, Ahmedabad gradually transformed from its functional role as a center of trade and commerce to become a textile manufacturing hub, a “Manchester of the East.” As part of a national industrialization policy, after the formation of Gujarat in 1960, the new state government planned industrial townships near Ahmedabad industrial plots with basic amenities and subsidies were built by the public sector to create jobs and shape the growth of the city using area-based integrated urban planning. Ahmedabad drew migrant laborers from Uttar Pradesh, Bihar, and Orissa (Yagnik and Sheth 2011).

During the 1960s, Ahmedabad served as the capital of Gujarat state, prior to the creation of the new planned capital city of Gandhinagar. With the decline of its textile industry in the 1980s, the historic city lost population as peri-urban expansion occurred toward the western part of the city across the Sabarmati River. Since 2000, the city area has further expanded beyond the municipal corporation limits in the eastern and western metropolitan areas. The historic core, a walled city, retains its rich built heritage with ‘pols’, a traditional housing type, embedded within a dense urban morphology. This core was designated as India’s first World Heritage City by UNESCO in 2017. Metropolitan Ahmedabad is shown in Map 1.

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1 The Industrial Policy Resolution was adopted by the Indian parliament in 1956. This resolution was a comprehensive economic policy on the country’s industrial development and guided the development of urban manufacturing clusters for several decades thereafter.

2 Three locations—at Naroda, Odhav, and Vatva in the far eastern part of the city—were identified for industrial development and established by 1962.
Ahmedabad has experienced significant population growth in the last 30 years, as shown in Table 1, and today it ranks among the 19 fastest-growing cities in the world (Kotkin 2010). By 2030, Ahmedabad is expected to account for 21 percent of Gujarat state’s urban population and 43 percent of its GDP (Sankhe et al. 2010). It has an export-led industrial economic base, mainly consisting of the pharmaceutical, chemical, textile, and garment industries.

### TABLE 1. POPULATION GROWTH, 1991–2019

<table>
<thead>
<tr>
<th>City—Ahmedabad Municipal Corporation Limit</th>
<th>Metropolitan Area—Ahmedabad Urban Development Authority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (millions)</td>
<td>2.88  3.5  5.5  6.6</td>
</tr>
<tr>
<td>Annual growth rate (%)</td>
<td>2.15  5.7  2.5</td>
</tr>
<tr>
<td></td>
<td>3.7</td>
</tr>
</tbody>
</table>

In rapidly urbanizing India, Ahmedabad, with a current population of 6 million nested in an urban agglomeration of 7.6 million, is projected to become one of seven Indian mega-cities by 2030 (UNDESA 2019). Metropolitan development is stimulated by mega-projects, such as Gujarat International Finance Tec-City, Smart Mission projects, and the Delhi–Mumbai Industrial Corridor passing through the state of Gujarat in proximity to Ahmedabad. The city is a growing urban hub offering job opportunities and improving living conditions, and it has an active real estate market.

Metropolitan Ahmedabad, administered by the Ahmedabad Urban Development Authority (AUDA), includes the Ahmedabad Municipal Corporation (AMC), its rapidly expanding peri-urban areas, and its densely populated core walled city. These are shown in Maps 1 and 2. By 2031, the Ahmedabad urban agglomeration is expected to have a population of 1.66 million beyond the municipal jurisdiction. This increase in population is also expected to be accompanied by the spatial expansion of Ahmedabad.

Ahmedabad has curtailed sprawl, defying a global trend of declining urban population densities (Map 2). Between 2000 and 2013, while Ahmedabad’s population grew by 2.1 percent annually on average, the urban extent expanded at a slower pace of 1.9 percent every year (Angel et al. 2012). AUDA administers a metropolitan area of around 1,900 square kilometers, about a quarter of which is under AMC municipal jurisdiction. Since 2010, with the announcement of the Sardar Patel Ring Road, the city has expanded along this metropolitan beltway.
Revenue
The AMC is increasing its financial autonomy. Actual municipal revenue for the last three years has increased by one-third from $358 million to $408.8 million.
3 While federal and state transfers to the AMC have been decreasing, its own-source revenue has increased by an average of 23 percent per year, of which the non-tax revenue has been increasing at a faster pace. There is potential to further increase revenue. Over five consecutive fiscal years (2014–2018), the AMC fell short—75 to 85 percent—of the targeted revenue collection set at the beginning of the fiscal year. This shortfall is due to a combination of poor tax administration, poor revenue collection, and overestimation.

Expenditure
For the fiscal year 2018–19, the AMC has a budget estimated at $986.73 million, which is equally divided into recurrent expenditures and capital expenditures for urban asset development. For the last five years, the actual capital expenditure components have been significantly lower than the budget allocations—between 65 and 75 percent of the allocations for each year. Under spending indicates the AMC’s inability to start or complete some projects on time. Nevertheless, recurrent expenditure has been in the range of 85 to 90 percent of the proposed budget, due to regular payments for salaries, retirement benefits, and other obligations of the AMC.

The AMC has developed a capital investment plan with 2031 as the horizon year (Bhavsar 2018). With increasing municipal revenues, the city is expanding investment for capital improvements in trunk infrastructure, including roads, the bus rapid transit system (BRT), and the Sabarmati Riverfront Development. For the riverfront project, the city has borrowed from financial institutions. The AMC dedicates about 20 percent of its expenditure to service debt.

Under a national urban investment program, the Jawaharlal Nehru National Urban Renewal Mission, the city received federal transfers for urban development projects like the BRT system. These federal transfers were contingent upon leveraging state and local government resources and expediting municipal finance reforms that the AMC implemented. With a strengthening of municipal finances, the city is able to tap capital markets and derive further value from urban land.

The AMC pioneered municipal bond issuance and continues to generate resources through market borrowing. It was the first municipal corporation in India to issue a municipal bond without a state guarantee, which occurred in 1998 with a bond valued at $141.16 million. In January 2019 it raised about $28 million (Indian rupee 200 crore) for urban infrastructure development through a municipal bond issuance.

3 Here and throughout this chapter, all dollar amounts refer to US dollars.
EVOLUTION OF RESOURCES

The city is expanding use of land value capture tools for financing urban development. The value of these land-based finance tools has been constantly increasing over the last few years and in fiscal year 2016 was nearly $211.74 million. The AMC's share of municipal revenue collected from premium Floor Space Index (FSI) is increasing exponentially, from 10 percent in 2009 to 60 percent in 2016. Most of the premium FSI—to create higher-intensity urban development—is sold along the Transit Oriented Zone along the BRT and metro corridors. Since 2013, the contribution to revenue from development fees has also been increasing. The city owns substantial marketable land, which is estimated potentially to generate another $412 million per year. Since the AMC improved its property valuation, tax coverage, and collection, its property tax revenue has been steadily contributing about 20 percent of municipal revenue, and this is expected to increase.

Integration

HOW INTEGRATED PLANNING IS DEFINED AND ADOPTED

GUJARAT HAS A WELL-DEVELOPED LEGISLATIVE FRAMEWORK for metropolitan-level integrated urban planning. The Gujarat Town Planning and Urban Development Act (GTPUDA) requires defining a metropolitan zone for planning purposes. That zone should far exceed the municipal limits of the primate city that is expected to experience urban growth. This enables better planning for the metropolitan agglomeration (Ballaney 2008).

Urban planning in Gujarat is a two part procedure outlined in the Town Planning Act. Part one of the process is to create a development plan for the entire metropolitan area. The second part is to prepare a town planning scheme for sub-sections of the development zone.

The development plan outlines macro-level strategic direction for growth and envisions the integrated development of metropolitan infrastructure. This integrated urban development plan adopts a system of systems approach weaving together a wide range of issues from land development to land use zoning, to peri-urban expansion areas, to regulations to determine density and built form. It also identifies land for public uses, such as road network and transportation, water supply and sewerage, stormwater drainage, open spaces and green areas, environment and pollution control, and land reclamation. This decadal development plan is intermittently adjusted to reflect the ever-changing

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* Premium FSI is allowance for additional built area per plot of land offered at a fee.
metropolitan context. Public participation is part of the process of creating and updating the development plan (Ballaney 2008).

**The Town Planning Schemes**

TPSs are parts of the development plan. On the metropolitan periphery, in anticipation of urban expansion large tracks of land are identified and subdivided into one-to-two-square-kilometer patches. Then every such patch of one or two square kilometer identified has a TPS (micro-plan) engaging up to 250 land owners through rigorous and interactive public participatory processes. The town planners utilize a combination of land pooling, readjustment, and land deductions to reconfigure agriculture land parcels into rectilinear urban land plots with access roads and land set aside for public purposes such as schools, healthcare, parks, and affordable housing. Physical infrastructure systems are designed and land value capture tools are utilized to finance the provision of these basic services that include access to electricity, water, transport, embedded in a mixed land-use configuration that integrates institutional, recreational, commercial, and residential uses (Ballaney 2008; Mahadevia, Pai, and Mahendra 2018).

In effect, the TPS is a form of land readjustment for expanding urban infrastructure without any compulsory land acquisition. It is an equitable, participatory, and cost-effective method of development and urban expansion that provides amenities for trade and business activities for residential, commercial, and industrial areas in the city.

**Implementation**

AHMEDABAD HAS COMBINED the use of a development plan and TPSs to achieve spatial and urban systems integration at the metropolitan scale. Both the development plan and TPS are statutory plans, prepared at different scales and levels of resolution. Under the provisions of the Gujarat Town Planning and Urban Development Act of 1976, the state of Gujarat setup AUDA to guide metropolitan-level development of the AMC and its 146 surrounding villages. The development plan establishes a 20-year spatial coordination vision and framework to integrate urban development with guidelines for urban systems coordination.

**DEVELOPMENT PLANS**

Ahmedabad’s development plan was first sanctioned in 1965 (DP1965) under the Bombay Town Planning Act of 1954, and since then has been revised approximately every 10 years. Upon each revision, AUDA’s limit has been increased and new villages and municipalities have been included in the development area.
Similarly, the AMC also revises its boundaries periodically; in the last revision, the AMC added 469 square kilometers of area to its boundary. This increases the coverage of municipal services and amenities for the larger population outside the original municipal limits.

Through the iterative revision of development plans (in 1965, 1975, and 1982 by the AMC and in 1987, 2002, and 2013 by AUDA), a successive pattern of ring roads around the city and radial roads cutting through these concentric roads have been built. A review of these successive development plans reveals that implementation in the early years was weak, but has strengthened overtime (Table 2).

**TABLE 2. CHRONOLOGICAL PROGRESS OF AHMEDABAD’S DEVELOPMENT PLAN AND IMPLEMENTATION, 1965–2014**

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PLAN</th>
<th>ISSUES/REMARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>DP1965, AMC</td>
<td>Development of eastern industrial areas of Naroda, Vatva and Odhav. Establishment of planned industrial estate, Gujarat Industrial Development Corporation (GIDC) led to job opportunities and increases in population. Informal and low-income residential areas came up outside the municipal boundary. AMC proposed a green belt around the city to contain the development.</td>
</tr>
<tr>
<td>1975</td>
<td>Revised DP1975, AMC</td>
<td>No action was taken for the implementation of DP1965 for land acquisition. Residential development started to occur as infilling between the corridors and along the municipal boundary, hence the land use of reserved land (previously for green belt) was changed to use for public housing.</td>
</tr>
<tr>
<td>1975 1987</td>
<td>DP2001, AUDA</td>
<td>As land acquisition failed, under GTPUDA the land could not be re-acquired / re-designated if not acquired within 10 years of declaring intention. As one of the strategies to achieve the housing goal, the complete “green belt” area was reserved for public housing by different agencies. Though many public housing projects were not executed around the city, nor were they developed in the green belt area.</td>
</tr>
<tr>
<td>1997</td>
<td>DP2011, AUDA</td>
<td>Applying the basis principle of TPS, AMC returned 50% of the plots back to the owners. Owners filed a case against AMC. AMC vs Ahmedabad Greenbelt Khedut Mandal was resolved in 2013. Finally, in the revised development plan of 1997, the land reserved for “public housing for different government organizations” was de-reserved. The area was still proposed as “restricted residential utility services and other uses zones.” In 1999, the plan was revised. All reservations were removed. The area was declared an R1 Zone (restricted residential utility services and other uses). The SP Ring Road was proposed as a voluntary contribution of land owners to the city’s development. Compensation at market rates was given after development of TPS in the areas around the ring road.</td>
</tr>
<tr>
<td>2002</td>
<td>Revised DP2011, AUDA</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>New TPSs</td>
<td>New schemes were proposed through the TPS mechanism, under which up to 50% of land can be acquired by the authority for development of amenities.</td>
</tr>
</tbody>
</table>

Why the city grew on the periphery

In Ahmedabad’s DP1965, a green belt 240 meters wide was proposed on private agricultural land covering a total area of 8.4 square kilometers. At this time, Ahmedabad had an area of just 93 square kilometers (AMC 1975) (it now has an area of 1,900 square kilometers), of which the green belt covered 9 percent. The main objective of the green belt was to restrict urban sprawl and regulate and balance open versus built development. It was also meant to protect the natural and semi-natural environment and act as a sink for urban pollution.

However, the green belt proposal met resistance from land owners, who were unhappy with the compensation for land transfers and registered their complaints in court. As a consequence, the AMC was unsuccessful in acquiring the land. Over time, both land owners and non-land owners encroached on these reserves to build houses. In 2013, the Supreme Court of India ordered that land holdings be apportioned between land owners and the AMC in the amounts of 60 and 40 percent, respectively.5

Additionally, during the 1980s and 1990s the city rapidly expanded beyond the municipal corporation limits, leading to fragmented urban expansion, particularly along the western fringes of the city. This fragmented development outside the city limits was partly attributed to the Urban Land Ceiling and Regulation Act of 1976 (now repealed), under which the excess urban private land was acquired by the government, thereby leading to an artificial increase in land prices within the city limits. Consequently, formal housing development for middle- and low-income households shifted outside the city limits, leading to unregulated and haphazard development in the new areas, such as the western villages of Bopal and Ambli.

Managing Sprawl: Ahmedabad Development Plan 2021

The Ahmedabad Development Plan 2021 (DP2021), with a horizon year of 2021, envisions Ahmedabad as a livable, environmentally sustainable, and efficient city for all its citizens, one with robust social and physical infrastructure, and a distinct identity (AUDA 2014a). Half of the focus of the development plan of Ahmedabad is related to setting metropolitan urban development goals, while the other half is related to achieving the goals with plan implementation, coordination, and management (Adhvaryu 2011). The overarching vision of the plan is in its planning and growth management principles, including compact growth, land-use transport integration, a green network, environmental sustainability, and affordable housing development. The key approach taken in AUDA’s DP2021 is its use of zoning as a planning tool, which has become important in helping to manage growth, regulate density, and organize land use within the urban area. DP2021 is shown in Map 3.

5 This order was applicable to lands under the green belt in the Ahmedabad Development Plan 1965. By 2017, three draft TPSs on the western green belt had been sanctioned by the government of Gujarat; they are now under implementation.
Ahmedabad Development Plan 2021 incorporates several mechanisms to rein in sprawl and shape a compact city structure, with high density in zones having accessible public transport (ITDP 2013). The plan includes specific provisions to promote affordable housing. It also offers flexibility in permitted land use in each zone, thus retaining the mixed-land-use approach for urban planning. Some researchers have pointed to the dis-junctures between planning, governance, and poverty alleviation, because the plan did not integrate the concerns of the poor. That neglect may be attributed to the plan’s primary emphasis on land use allocation while neglecting socioeconomic disparities (Mahadevia, Joshi, and Sharma 2009).

The development plan aims to achieve a desired density and has followed a graded-intensity zoning method in its planning. The R1 Zone is a high-intensity zone, which can be maximized with an overlay zone of transit-oriented development (TOD). The R2 Zone is a medium-intensity zone, located beyond the ring road. The
Swami Vivekananda Bridge, previously known as Ellis Bridge, was the first road connection linking the western and eastern parts of Ahmedabad across the Sabarmati River.

Source: Tejas Patel/500px via Getty Images.
R3 Zone is the primary residential area in the city, characterized by individual housing such as bungalows and farmhouses. This last zone also permits such uses as educational and cultural activities, party plots⁶, and public utility buildings.

Local area plans are for the smallest unit of planning, making possible new development on already built-upon land or in an area such as the heritage zones within the old walled city. This mechanism works on the principle of incentivizing redevelopment and encouraging compact development by increasing the FSI. At the same time, local area plans also identify additional land to be acquired and rezoned as public right-of-way to add new streets, improve pedestrian connectivity, and increase green cover.

The revised development plan emphasizes some basic principles. Projects are designed to be fair and desirable for landholders, whose property rights are respected. Projects are developed with a commitment to ensure legal feasibility, financial viability for the development authority, and financial desirability of developers interested in Public-Private Partnership (PPP) ventures.

In the revised DP2021, overlay zones aim to steer urban expansion and population density by utilizing TOD strategies, a central business district, and affordable housing zones. In these zones higher FSI has been proposed, and FSI-related incentives are also suggested. The General Development Control Regulations (GDCR) suggest that the revenue would be generated from the FSI proposed in the Transit Oriented Zone and be used for rapid public transport projects. Various categories of new roads are proposed as part of improving connectivity in the local area.

In 2013, AUDA assembled a committee headed by the commissioner to decide the modalities for disposing of public land. The committee prepared the land disposal regulation of 2013 for the leasing of public land, whereby the committee decided the base price (based on the market price of land), which was ratified by the standing committee (Government of Gujarat 2002). After this, the land was put up for lease through an auction for a maximum lease of 99 years, with the condition that the approved land use will be followed.

Under DP2021 for the AUDA area, preparations for a physical network of roads and infrastructure for developing the urban area have been completed. Likewise, for city-level projects under the plan, land acquisition and preparation of detailed TPSs have been completed. TPSs have also been developed to earmark plots for public use and provide amenities for each plot.

To implement the development plan, Ahmedabad has experimented with several urban development interventions, resulting in a laboratory for learning, as explained in Box 1. These interventions range from retaining traditional use of pooling and readjustment—lessons gained from the earlier industrial worker housing—to creative use of instruments such as additional FSI and the transfer of development rights to induce private developer participation while improving publicly provided metropolitan mass transit options.

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⁶ A party plot is a large area of open land, often consisting of a small service building with changing rooms, toilets, storage, and a hall, laid out for conducting social events like weddings and parties.
BOX 1. URBAN INNOVATIONS

Peri-urban Sanand Industrial Estate
At the metropolitan periphery, Sanand, a small municipality with 41,500 people, covering 41 square kilometers, was identified in Ahmedabad’s metropolitan development plan 2021 as a growth center and zoned for industrial use. The government of Gujarat acquired 5,000 acres of land from land owners—at prices greater than the market rate—to give momentum to industrial development. When Tata Motors built an automobile manufacturing plant in 2008 for its low-cost compact car Nano, Sanand drew other manufacturers of automobile parts and accessories (Business Standard 2015). The area emerged as a rapidly developing industrial manufacturing cluster. As a result, areas in close proximity to Sanand, particularly around the Sardar Patel Ring Road along the southwestern edge of Ahmedabad, have seen a boost in real estate development, which has dispersed the urban population toward Ahmedabad’s metropolitan periphery (Mishra 2016).

Bus Rapid Transit System
The bus rapid transit system (BRT) project was launched in 2009 to cover 88 kilometers. Ahmedabad BRT, also known as Janmarg, is operated by a municipal corporation subsidiary. Prior to the BRT, the public transport operated by the city had limited routes and unreliable service. Ahmedabad BRT now caters each day to about 160,000 passengers, up from 25,000 passengers per day in 2009. The BRT has an operational fleet of 250 buses and 153 bus stations over a network of 88 kilometers, with an average bus speed of over 28 kilometers per hour, offering an efficient city-wide mobility option.

Ahmedabad–Gandhinagar Metro Corridor
The Ahmedabad–Gandhinagar Metro rail project will connect the eastern and western parts of the city (DMRC 2014). This rapid transit system will strengthen inter-municipal mobility in the metropolitan agglomeration and anticipates urban expansion along the metro corridor. As per the general development regulations, all land within 400 meters of the metro and BRT corridors is zoned for TOD with an enhanced FSI, thus intensifying the development along the transport corridors. This sort of urban densification linked with mobility investment succeeds in avoiding sprawl by crowding in integrated and compact development.

FSI Incentives for Private Developers to Rehabilitate Slums
Implementation of the Slum Rehabilitation Policy by the AMC started in March 2010 under a PPP with real estate developers. The main objective of this policy was to provide slum dwellers with clean, permanent housing
along with legal tenure. Under the scheme, the developers were provided with higher FSI, which they could sell at market rates to generate resources for building the slum redevelopment units. Kalish Nagar at Sabarmati and Lakhudi Talavadi at Naranpura are successful examples of such pilots (Government of Gujarat 2013). The city is ready for large-scale redevelopment through intensified use of land (FSI), building connectivity, and developing amenities. This private developer-led model builds on the success of the integrated approach of the Slum Networking Project in the 1990s, which partnered with slum dwellers and the private and public sectors to deliver better access to water, sanitation, education, health, and livelihood opportunities. Thirty-four slum areas in Ahmedabad, representing about 11,500 households, benefitted from the initiative, which was then scaled up in another 13 areas (WSP 2007).

**Affordable Housing Zone**

In 2013, AUDA sanctioned a zone for an affordable housing scheme in the revised DP2021. This zone is proposed along the 73.5-kilometer stretch of the SP Ring Road and is intended to accommodate an additional 1.5 million residential units. The availability of this land for affordable housing and the active role of private developers have given a boost to the housing sector and increased the affordable housing supply in the city. Locations in the zone along the ring road, like Bopal, Sheelaj, and Vaishnodevi Circle, became the prime hubs for the mid-to low-segment home buyers and saw significant demand in the real estate market (Economic Times 2019). Other affordable housing schemes outside this zone were built in 2013 under the Mukhya Mantri GRUH Yojana (Government of Gujarat 2013).

**Sabarmati Riverfront Development**

The Sabarmati Riverfront Development Authority generated city-level open spaces along the river. In partnership with private developers, the project is reclaiming 58,598 hectares of land along the riverfront, of which 21 percent is to be sold for residential and commercial development with a revenue potential of $68.88 million (EPC 1998). The rest of the area is proposed to be developed as green open space, sports facilities, and other public areas. For the central business district to be developed along the riverfront, a special FSI is provided. Additionally, the city has introduced use of transferable development rights for compensating owners of cultural heritage buildings and to encourage conservation of the urban morphology of this historic walled city, which is situated along the riverfront and designated a UNESCO World Heritage Site.
Ahmedabad: Scaling up with contiguous replication of town planning schemes

The city has a good network of roads totaling 2,399 kilometers. This includes five rings and 17 major roads in a radial pattern, with a road density of 5.15 kilometers per square kilometer covering 90 percent of the city. The network is enhanced by 12 bridges across the Sabarmati River. Because the predominant form of land use promoted by the development plan is mixed-use, the average trip distance of 5.02 kilometers is significantly lower than that in other cities of the same size in India.

The Sardar Patel Ring Road

The Sardar Patel Ring Road was conceptualized in the 2001 revised development plan to facilitate integrated urban development along the metropolitan periphery of Ahmedabad. AUDA envisaged the SP Ring Road along the outer periphery as facilitating the movement of heavy regional traffic that does not need to enter Ahmedabad. In developing this metropolitan beltway, as shown in Figure 1, it adopted an integrated approach by aggregating a series of TPSs.

The SP Ring Road was launched as a PPP project to integrate the outer growing areas of the city and accommodate future urban growth. AUDA’s chairman at
the time motivated the land owners to take part in a PPP, recognizing the value proposition of:

- private land values enhanced by infrastructure development;
- land owners being offered deductions for pooling and reconfiguring their land; and
- land sales without immediate compensation for individual land parcels.

Land measurements and records were kept by AUDA, and land owners were compensated after the SP Ring Road was built. This was possible due to several meetings held by AUDA officials, led by the chairman, a political leader who earned the trust of the landlords through a public engagement process.7

Demand for better infrastructure services and a need for expanded road transportation soon emerged from the rapid real estate development along the western section of the SP Ring Road. Industrial development along the eastern axis of the ring road also drove up demand. The revised development plan 2001 responded by proposing the development of 64 square kilometers of urban land within the ring road and a widening of the road. The 60-meter-wide ring road was proposed to reduce traffic congestion on peripheral roads, separate regional and urban traffic, increase connectivity, and steer the metropolitan expansion of Ahmedabad (UMC 2007).

Widening this metropolitan beltway to four lanes in Phase 2 of the project utilized a built-operation-transfer mechanism for private participation. The construction and operation of this project resulted in planned development and management of the rapidly urbanizing metropolitan fringe. Subsequently, the clusters and locations along the SP Ring Road drew rapid real estate development of residential and industrial areas at beltway intersections such as Vatva, Narol, Vaishnodevi Circle, Bopal, and Jundal (Magicbricks 2016). The automobile manufacturing industrial development clustered around Sanand and the pharmaceutical industry development clustered at Changodar are also attributable to the development of the SP Ring Road.

**Town Planning Schemes**

The TPSs are local-area or block-level plans, usually encompassing an area of one to two square kilometres each. These are usually prepared on green-field sites, consisting primarily of agricultural land that has been identified as a prospective urban development area. Sometimes, the TPSs are also proposed on areas that may already be facing haphazard development. Such areas, when

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7 Discussion with Prof. Himanshu Thakkar, retired town planner, AUDA, on August 31, 2019.
covered by TPS, can be provided with services and amenities and experience increases in land prices (AUDA 2014a). The preparation of development plans and TPSs follows a participatory process in which land owners are consulted at various stages, from the notification to the final valuation of their land and settlement.

Throughout this process, margins are maintained along all the major roads and developed following the requirements of the area and budgetary provisions. This process gives the AMC positive control over the design and the timing of the urban growth, along with stakeholder participation at each stage. After the draft scheme is prepared, a meeting of land owners* is called, and all are requested to give suggestions and raise objections if they have any. Based on the inputs received from land owners and other citizens, the draft TPS is finalized. The state government appoints a town planning officer, who issues individual notices to each land owner and finalizes the preliminary TPS. This officer works out the valuation for each land owner and provides a final plot number. Figure 2 lays out the normal sequence and timeline for the decisions necessary in designing and establishing each TPS.

The TPS approach works at the micro-level by pooling all the land originally under different owners and redistributing it in a properly reconstituted form, after deducting the land required for open spaces, social infrastructure, services, housing for the economically weaker sections, and the road network. Land for public utilities and infrastructure is provided through a land-pooling mechanism, the government using 25 to 50 percent of the land for roads, open spaces, and other public purposes (including 5-10 percent of it for sale). The remaining 50 to 75 percent is returned to the original owners, who benefit from an increase in their land value.

The original plots are returned to the landlords as final plots, each bearing a new land survey number for identification, known as its FP, or final plot number. The residents receive the final plots with all the new amenities and services. Each plot under the TPS has direct access to the road, thus increasing its potential market value. This process enables the local authority to develop the land without actually acquiring it, so the financial burden on the local body is reduced to a minimum as the development expenses get offset by the land generated for public purposes. Part of this public-purpose land is sold by the local authority to finance urban infrastructure development (see Figure 3).

* The original owners of the landholding title, as cited in the land revenue documents.
By adopting such an integrated urban development approach, the city has implemented a planned and phased growth, equitably spread, and well connected. Since 2000, the built-up area has spread in all directions along the transport corridors toward the five growth centers of Sanand and Kalol in the western part, Dehgam in the northeast, and Bareja and Memdabad in the southeast part of city. This is evident in the continuous and balanced spatial growth of the city along the SP Ring Road. The equitable and well-connected growth can be attributed to the well-thought-out mechanism of city planning that integrates the development plans with TPS and urban-level projects.

**ACTORS**

The Constitution of India states that all activities related to urban development, land development, and housing are in the domain of the state governments. The government of India, through its Ministry of Urban Development and Ministry of Housing, Poverty Alleviation and Employment, formulates the guidelines and provides financial assistance to certain centrally sponsored schemes, such as the Jawaharlal Nehru National Urban Renewal Mission, Rajiv Awas Yojna (RAY),
and Pradhan Mantri Awas Yojna-Urban (PMAY-U). These urban development guidelines and fiscal transfers to finance projects evolve with the electoral cycles and governance priorities.

At the state level, the Gujarat Department of Urban Development and Urban Housing (UD&UH) is headed by a minister (through an election to the state legislative assembly) and is assisted by the senior administrative officials, primarily from the Indian administrative services. All the sub-organizations function as line departments directly under UD&UH; these include urban local bodies (e.g., municipal corporations, municipalities), urban development authorities, the town planning and valuation departments, the Gujarat Municipal Finance Board, and the Gujarat Housing Board.

**INSTITUTIONAL ARCHITECTURE**

The AMC is an administrative body covering 468.92 square kilometers. The area is part of the Ahmedabad City sub-district (taluka/tehsil) of 474.51 square kilometers. This sub-district primarily consists of the AMC, with marginal contributions from other urban and rural areas.

To achieve the objective of integrated planning in peri-urban areas outside the boundaries of the municipal corporation limits, the state government set up AUDA. The development authority has a jurisdiction of 1,866 square kilometers and is tasked with undertaking or overseeing planned development and growth across all the rural and urban local bodies within its area. AUDA consists of non-elected officials who are vested with planning powers, particularly concerning land use and infrastructure.

**PRIVATE PARTICIPATION**

Private real estate developers are building affordable housing to complement the structured urban expansion and its associated infrastructure development. The performance of the state housing board responsible for provision of housing in urban areas has been severely inadequate (Dave 2003). Private developers

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9 Census 2011, Table A-1 (Number of Villages, Towns, Households, Population and Area).
10 According to the Gujarat Institute of Housing and Estate Developers Association (GIHED), there are about 450 developers registered in Ahmedabad. Additionally, there are many developers who are not members of GIHED but contribute to the supply of housing stock in the city.
fill the housing gap by building a range of housing types—from high-density apartment complexes to standalone houses—to meet market demand.

Private developers were previously unable to access the affordable housing development subsidies and grants available to the public sector (Srivastava 2015). Now, with the introduction of the PMAY-U (a national housing program), there is a level playing field that offers incentives for affordable housing to the private sector as well. The affordable housing zone along the SP Ring Road has become the new hub for real estate.

Financing

FINANCING THE TOWN PLANNING SCHEMES

TPS IMPLEMENTATION IS FINANCED through internal generation of resources. This approach reserves a proportion of the land for AUDA and AMC to auction in the open market for residential and commercial use. Funds generated through these land sales are used by AUDA and AMC to finance the development of infrastructure in the local area. These TPS infrastructure construction expenditures are recorded in the municipal budget under specific departments, such as for water supply and road construction. Income from the sale of public land parcels is accounted for as capital income.

AUDA financed the development of city-wide arterial road networks identified under the development plan. To sustain such investments, AUDA continues to accumulate funds, mainly through the sale of public land parcels, levies of improvement charges, and the sale of FSI. As of March 2019, it had more than $150 million. Commercializing unused or underutilized public land through sale or lease, reclassification of land use, and enhanced density can unlock resources adequate to finance city-wide infrastructure, slum upgrading, and slum prevention. A total of about 33 square kilometers (about 12 square miles) of land in Ahmedabad is public and marketable land (Ballaney et al. 2013). About one-third of this land is vacant, owned by AMC, and located within an approved TPS area. Official government records estimate the land value as in the range of Rs 20,000 to Rs 30,000 ($278 to $417, averaging about $350) per square meter. The market value of this public urban land is about 40 to 50 percent higher than the official estimates; approximately $412 million.
Global Environmental Benefits: Outcomes and Scale-up

CURTAILING SPRAWL

Metropolitan Ahmedabad has reduced the carbon footprint of its urbanization because of its curtailment of sprawl. Over three decades, 1990–2020, the densities within the urban built-up area and urban extent boundary have either increased or remained stable. This compact city development is achieved by converging the rate of land consumption to matching, or staying below, the pace of population growth (see Table 1). The Ahmedabad metropolitan area has combined the development plan and contiguous TPSs to intensify the utilization of existing peri-urban land.

Between 2000 and 2013, Ahmedabad added about 52 square kilometers of built-up area. One-third of this area was in-filled within existing urban areas and another half was added as compact urban extensions on the periphery. Likewise, during the preceding decade (1989–2000), half was built up as infill and one-third was added through compact extensions (Atlas of Urban Expansion 2020).

However, there is room for improvement. Some residential zoning has led to lower-density development with a patchwork of unintended green open spaces. The development plan 2021 has the R1 and R2 residential zones, limiting built area to a maximum of FSI 0.8 (ratio of floor area to total area). In these residential zones, the built-up area (or ground coverage) makes up 40 percent of the plot area and construction is capped at two floors.

DE-CARBONIZING MOBILITY

Ahmedabad has twice the road density of Bangalore, allowing better access to land. By adopting a mixed-land-use approach to physical planning, Ahmedabad has formed itself into a polycentric urban structure with multiple destinations within its metropolitan area. Ahmedabad has de-carbonized its urban mobility, with average trip lengths of about 5 kilometers, as compared to 8 kilometers in Bangalore, which has comparable population densities (Table 3).

The modal share of public transport has nearly doubled in the last decade and is expected to grow further with up-zoning—increasing FSI—along transport routes. With the introduction of a BRT in the city between 2008 and 2018, the modal share of public transport grew from 10 to 17 percent. The Ahmedabad metro rail service initiated operations in 2019 and is expected to contribute to expanding public transport options. Non-motorized transport—walking and cycling—accounts for 46 percent of the modal share.

**MITIGATING MUNICIPAL EMISSIONS**

Ahmedabad Municipal Corporation produces about 700,000 tons of carbon dioxide-equivalent (CO₂) emissions each year. These emissions are associated with AMC’s direct provision of city services, like water treatment and supply, wastewater collection and treatment, solid waste collection and management, and public transport services (Ahmedabad Municipal Transport Service and BRT).

AMC aims to become carbon-neutral, with a near-term target of reducing carbon emissions by 54 percent by 2025 (TOI 2019). To achieve its carbon neutrality, the city has outlined a de-carbonization pathway with eight goals (IIMA et al. 2009). The plan adopts specific time-bound targets, to include:

- using renewable wind energy to cater to almost 50 percent of the AMC area;
- installing rooftop solar power systems on public buildings;
- reusing 70 percent of treated wastewater;
- adopting energy efficient wastewater treatment technology;
- utilizing circular economy approaches to become a “zero waste city” by 2022;
- making a 100 percent switch to electric vehicles;
- increasing green cover from 25,000 to 1 million trees; and
- adopting green building standards for affordable housing.
ADAPTING TO HEAT IMPACTS

Adapting to the heat impacts of climate change is equally important. Ahmedabad experiences high temperatures of 40°C and more during summer months. The urban heat island effect adds to these soaring temperatures, particularly with rising air pollution levels manifesting as black carbon (Map 5). Ahmedabad is adapting this extreme urban heat with guidance from a heat action plan, which has been revised annually since it was introduced in 2013. The plan takes a four-pronged approach: (i) building public awareness and community outreach; (ii) initiating an early warning system and inter-agency coordination; (iii) building capacity among healthcare professionals; and (iv) reducing heat exposure and promoting adaptive measures. AMC developed the plan in collaboration with the Natural Resources Defense Council and the Indian Institute of Public Health, Gandhinagar. Ahmedabad has reduced its incidence of mortality due to urban heat effects (Hess et al. 2018).

Because the share of land used for parks is less than half a percent, Ahmedabad lacks green space. The city is presently expanding its green cover, which offers the benefits of lowering urban heat island impacts as well as improving air quality and livability. Due to the arid climate, during the summer the rural areas in the metropolitan region around Ahmedabad experience higher daytime surface temperatures than the urban core does (Mohammad, Goswami, and Bonafoni 2019). Heat island plans need to respond to these presently neglected heat impact zones.

BIODIVERSITY

There are two biodiversity conservation areas within the metropolitan region under AUDA’s jurisdiction. Nalsarovar Bird Sanctuary is a 120-square-kilometer wetland conservation area far west of the Sanand industrial cluster. The sanctuary is home to over 200 bird species, is a hotspot for winter migratory birds, and is a Ramsar Convention site, meaning it has been designated as a wetland of international importance. Thol, an eco-sensitive conservation zone by an artificial lake, is home to flamingos, herons, and peacocks.
URBAN HEAT MAP
2018

AMDAVAD MUNICIPAL CORPORATION

I

ANDAVAD MUNICIPAL CORPORATION Boundary
District boundary
Highway
Primary road
Secondary road
Residential road

4 KILOMETERS

SOURCE: NASA SRTM 30m; OpenStreetMap Contributors; Mohammad and Goswami (see Mohammad et al. 2019)
Conclusion

Ahmedabad has had a strong tradition of conducting spatial planning through use of a development plan combined with TPS and local-area planning, as mandated under the Gujarat Town Planning and Urban Development Act. This mechanism has been successful in developing the city in a planned and systematic manner so that it has a good network of roads and public amenities, provides access to all the developed plots in the TPS, runs a land-bank of reserve commercial and residential plots for sale, and has developed an affordable housing zone.

The process is participatory in nature, as the Act mandates that the land owners, stake-holders, and other citizens be kept informed about the process at various stages by public notices and stakeholders’ meetings. At the draft stage, objections and suggestions are solicited from land owners and citizens. In view of the democratic principles of governance, if no satisfactory answer is received from the authority, the land owners can appeal to the higher authorities. Completing a TPS can take between three and seven years. Once the TPS is finalized, the entire infrastructure work is implemented following the collectively developed plan with minimal deviation, although procedural delays are common.

Development of the SP Ring Road and the affordable housing zone along the ring road has delivered a compact city. Development of the ring road was made possible by the mutual trust established between the land owners and AUDA, which was due to their productive engagement with one another. The SP Ring Road has diverted the through traffic and has also opened up new areas for industrial and residential development. It is expected that 1.5 million housing units will be developed around the ring-road, thus stabilizing land prices and making affordable housing accessible to the target income groups.
Figure 4 represents how individual TPSs (red squares) were aggregated to develop a metropolitan beltway surrounding the urban core (grey squares).

The central government’s PMAY-U scheme has provided an added advantage to both housing suppliers and homebuyers, and the direct subsidy it offers to eligible buyers has proven effective. Other successful city-level infrastructure development schemes include the Sabarmati Riverfront Development, which has been able to reclaim open land along the Sabarmati River to be used as open space and parks as well as plots (to be sold by the AMC) for commercial and residential purposes. This development is also expected to generate revenue for the AMC.
Finally, the development of the Metro-Link Express for Gandhinagar and Ahmedabad (MEGA) between the cities of Ahmedabad and Gandhinagar is likely to establish the transport network—that is necessary to unify the two urban development authorities of Gandhinagar Urban Development Authority (GUDA) and AUDA into an emerging metropolitan area in a true sense.

**RECOMMENDED POLICY ACTIONS**

Although using the planning tools of a development plan and TPSs jointly has proved to be successful in Ahmedabad, three modifications are suggested that could further leverage the success.

**Plan metropolitan infrastructure development to keep pace with systematic and densely built area expansions.** The present policies as applied in Ahmedabad address development in a piecemeal manner rather than as a compressive-area development policy. Apart from the development of built space, the development of area-level infrastructure, which is critical, has not been included in the policy. The city is already lagging behind in its physical and social infrastructure, so by adding more built space the city will witness a negative impact on quality of life. To address this problem in a comprehensive manner, redevelopment policies need to be revisited.

**Enhance the efficiency of TPSs.** Given the technology and tools that have emerged since 1976, when the Act was first passed, it has become possible to decrease the total time needed for finalizing a TPS. This is desirable in order to stop unplanned and haphazard development occurring in the rapidly expanding urban periphery.

**Expand public open space.** The city should consider adopting a broader approach to spatial planning, one in which the development plan, the TPS, and the zonal plans work together. As further intensive development with higher FSI is being proposed within the TPS, it is time to reconsider the amount of land deducted for amenities and open spaces. Deduction of land can be linked to the gross FSI in the TPS area, land value of original plot, and other accessibility factors. Lack of an adequate amount of open space per person, insufficient provision for parking and pavement, and insufficient integration of the informal sector are all issues that remain to be addressed.

**Invest in last-mile connectivity.** Last-mile connectivity can enhance the effectiveness of mass transit systems like the BRT and metro rail. Although the city has a good transport network of roads (including the dedicated BRT roads) and a developing metro rail network, it has been unable to benefit from this investment due to a lack of last-mile connectivity, dependability, and frequency. In order to achieve the benefits, it is necessary to intensify the network and increase the frequency and dependability of the system. The city may need to make capital investments in the management and operation of the transport network.
Density

Ahmedabad’s municipal population density has significantly increased from an already dense settlement of 8,000 to 10,500 people per square kilometer between 2000 and 2017. During the same period the metropolitan population density also increased—indicative of compact peri-urban expansion.

Figure 7
POPULATION DENSITY, 2000

Municipal
- Maximum: 56,685 people/km²
- Minimum: 76 people/km²
- Average: 8,154 people/km²

Metro
- Maximum: 20,704 people/km²
- Minimum: 30 people/km²
- Average: 524 people/km²
Figure 8

POPULATION DENSITY, 2017

Municipal
- Maximum: 56,368 people/km²
- Minimum: 33 people/km²
- Average: 10,517 people/km²

Metro
- Maximum: 44,794 people/km²
- Minimum: 11 people/km²
- Average: 768 people/km²

Figure 9

Overlay of density levels, 2000–2017
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NASA (National Aeronautics and Space Administration). SRTM 30m (Shuttle Radar Topography Mission 30 meter).

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ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AMC</td>
<td>Ahmedabad Municipal Corporation</td>
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<td>AMTS</td>
<td>Ahmedabad Municipal Transport Service</td>
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<td>AUDA</td>
<td>Ahmedabad Urban Development Authority</td>
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<td>BRT</td>
<td>Bus Rapid Transit</td>
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<td>DMRC</td>
<td>Delhi Metro Rail Corporation</td>
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<td>EPC</td>
<td>Environment Planning Collaborative</td>
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<td>FSI</td>
<td>Floor Space Index</td>
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<td>GTPUDA</td>
<td>Gujarat Town Planning and Urban Development Act</td>
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<td>GUDA</td>
<td>Gandhinagar Urban Development Authority</td>
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<tr>
<td>IIMA</td>
<td>Indian Institute of Management, Ahmedabad</td>
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<tr>
<td>ITDP</td>
<td>Institute for Transport and Development Policy</td>
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<td>MEGA</td>
<td>Metro-Link Express for Gandhinagar and Ahmedabad</td>
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<td>PMAY-U</td>
<td>Pradhan Mantri Awas Yojna-Urban</td>
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<td>PPP</td>
<td>Public-Private Partnership</td>
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<td>RAY</td>
<td>Rajiv Awas Yojna</td>
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<tr>
<td>TOD</td>
<td>Transit-oriented Development</td>
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<tr>
<td>TPS</td>
<td>Town Planning Scheme</td>
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<tr>
<td>UD&amp;UH</td>
<td>Department of Urban Development and Urban Housing</td>
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<td>UMC</td>
<td>Urban Management Centre</td>
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Cities are the source of over 70 percent of the world’s greenhouse gas emissions. Cities are also the engines of the global economy, concentrating more than half the world’s population. By the year 2050, two-thirds of the world will be urban, with cities accommodating an additional 2.5 billion people over today’s total. Nearly all of this urban growth will occur in developing countries. This concentration of people and assets also means that the impacts of natural disasters, exacerbated by the changing climate, may be even more devastating, both in terms of human lives lost and economic livelihoods destroyed. Earth is on a trajectory of warming more than 1.5°C unless important decarbonizing steps are taken.

Often urban policymakers prescribe integration as the solution to steering urbanization towards decarbonization to achieve greater global and local environmental benefits. However, little is known about the struggles—and successes—that cities in developing countries have in planning, financing, and implementing integrated urban solutions.

Greater Than Parts: A Metropolitan Opportunity presents nine diverse metropolitan areas as individual case studies each with a selection of urban innovations. From the analysis, the report derives models, poses guiding questions, and presents key principles to provoke and inspire action by cities around the world.

The main objective of this report is to understand how developing and emerging economies are successfully utilizing horizontal integration—across multiple infrastructure sectors and systems—at the metropolitan scale to deliver greater sustainability. Integrated planning processes extending well beyond city boundaries are examined to determine how they have been financed and implemented. The report’s primary audience is therefore city decision makers, their financiers, technical advisers, and practitioners most interested in applying integrated approaches to sustainable urban planning in capacity-constrained environments.