Metropolitan Case Studies
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Ahmedabad, India
Scaling Up with Contiguous Replication of Town Planning Schemes
Madhu Bharti and Shagun Mehrotra
CASE STUDY 1: METROPOLITAN AHMEDABAD

Scaling Up with Contiguous Replication of Town Planning Schemes

Madhu Bharti and Shagun Mehrotra


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

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

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.

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.

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.

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. 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.

3. 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.
The Metropolitan Context

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,1 after the formation of Gujarat in 1960, the new state government planned industrial townships near Ahmedabad2 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—Naroda, Odhav, and Vatva in the far eastern part of the city—were identified for industrial development and established by 1962.
1985–2015 Urban extent by year

Sources: German Aerospace Center (DLR); IDOM: NASA SRTM 30m; OpenStreetMap Contributors

MAP 1
URBAN EXPANSION
1985–2015

Urban extent by year

MAP PROJECTION: UTM ZONE 42N, WGS-84 DATUM
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>
<thead>
<tr>
<th>TABLE 1. POPULATION GROWTH, 1991–2019</th>
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<tbody>
<tr>
<td>City—Ahmedabad Municipal Corporation Limit</td>
</tr>
<tr>
<td>Population (millions)</td>
</tr>
<tr>
<td>Annual growth rate (%)</td>
</tr>
</tbody>
</table>

Source: All data except for 2019 from the Census of India, 1991, 2001, 2011; the 2019 figure has been interpolated.

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. 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.

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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)\(^4\) 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

\(^4\) 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>
<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.

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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 plots\(^6\), 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.

\(^6\) 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.
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 (AUDE 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).

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8 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-institutions 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.\(^{11}\) 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.

### TABLE 3. AVERAGE TRIP LENGTH AND ROAD DENSITY, AHMEDABAD VS BANGALORE

<table>
<thead>
<tr>
<th>CITY</th>
<th>DENSITY (PEOPLE PER SQUARE KILOMETER)</th>
<th>AVERAGE TRIP LENGTH (KM)</th>
<th>ROAD DENSITY (ROAD LENGTH IN KILOMETERS PER SQUARE KILOMETER)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahmedabad</td>
<td>12,000</td>
<td>5.02</td>
<td>5.15</td>
</tr>
<tr>
<td>Bangalore</td>
<td>11,800</td>
<td>7.79</td>
<td>2.47</td>
</tr>
</tbody>
</table>

Source: World Bank analysis, based on data from the Census of India (2011), Ministry of Urban Development, Government of India; World Resources Institute; AMC; and Bruhat Bengaluru MahanagaraPalike (Center of Excellence in Urban Transport–CEPT University 2013).
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.
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


______. 2013. Mukhya Mantri GRUH (Gujarat Rural Urban Housing) Yojana: In Situ Slum Rehabilitation Policy Through PPP (Public Private Partnership) for the Slums Located on Public Lands. Gandhinagar: Department of Urban Development and Urban Housing Development.


Note: This product was made utilizing the LandScan 2017™ High Resolution global Population Data Set copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory under Contract No. DE-AC05-00OR22725 with the United States Department of Energy. The United States Government has certain rights in this Data Set. Neither UT-BATTELLE, LLC NOR THE UNITED STATES DEPARTMENT OF ENERGY, NOR ANY OF THEIR EMPLOYEES, MAKES ANY WARRANTY, EXPRESS OR IMPLIED, OR ASSUMES ANY LEGAL LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS, OR USEFULNESS OF THE DATA SET.

Ahmedabad: Scaling Up with Contiguous Replication of Town Planning Schemes


NASA (National Aeronautics and Space Administration). SRTM 30m (Shuttle Radar Topography Mission 30 meter).

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**ABBREVIATIONS**

| AMC   | Ahmedabad Municipal Corporation |
| AMTS  | Ahmedabad Municipal Transport Service |
| AUDA  | Ahmedabad Urban Development Authority |
| BRT   | Bus Rapid Transit |
| DMRC  | Delhi Metro Rail Corporation |
| EPC   | Environment Planning Collaborative |
| FSI   | Floor Space Index |
| GTPUDA| Gujarat Town Planning and Development Act |
| GUIDA | Gandhinagar Urban Development Authority |
| IIMA  | Indian Institute of Management, Ahmedabad |
| ITDP  | Institute for Transport and Development Policy |
| MEGA  | Metro-Link Express for Gandhinagar and Ahmedabad |
| PMAY-U| Pradhan Mantri Awas Yojna-Urban |
| PPP   | Public-Private Partnership |
| RAY   | Rajiv Awas Yojna |
| TOD   | Transit-oriented Development |
| TPS   | Town Planning Scheme |
| UD&UH | Department of Urban Development and Urban Housing |
| UMC   | Urban Management Centre |
Comprehensive Climate Plans

Myriam Ababsa and Ahmad Z. Abu Hussein


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

Integrating climate action with transit and refugee housing

Figure 1
Integrated planning model

Key Findings

1. Amman is the first Arab city to adopt a Climate Plan to tackle inefficient land use and the cost of imported energy. A Bus Rapid Transit system nearing completion, which links cities beyond the metropolitan boundary, is being supported with intensification policies along the two trunk routes, allowing Amman to scale up earlier inclusive housing initiatives into more walkable, mixed-use neighborhoods with green building standards and carbon-free electricity.

2. Promoting climate objectives is strategic to Amman’s financial resilience and environmental sustainability, reducing the associated costs of imported energy, new housing, and expanded infrastructure.

3. Amman has utilized urban growth scenarios proving that densification and improved public transport would allow the city to absorb its population increase by 2030 within the current built-up areas, reducing building and transport greenhouse gas emissions.
IDEA IN BRIEF

Comprehensive climate action builds on urban densification, recent transit corridors, and historic housing of forced migrants by utilizing participatory integrated planning and informal settlement upgrading near job centers.

Amman offers a metropolitan integration model that integrates downtown revitalization, peri-urban sites and services, transit, and deliberate decarbonization in a three-step solution. First, the city integrated a million refugees through participatory site and services projects and by incentivizing downtown home owners to build additional rooms in existing homes for rental accommodation. This allowed for increasing density in the core city while socially accommodating marginal groups near job centers.

Second, with new Bus Rapid Transit lanes the city is stitching together a mosaic of higher-density downtown areas with its urban periphery, building cross-boundary transit, and curtailing sprawl along metropolitan growth corridors.

Third, to maximize its efforts to decarbonize, Amman has prepared a comprehensive climate action plan that addresses issues of energy efficiency across a wide range of urban systems—energy, water, transport, buildings—while expanding public open space.

Figure 2
Sectors addressed by the case
The Metropolitan Context

A city of 4 million inhabitants, Greater Amman Municipality (hereafter, Greater Amman) is the vibrant heart of the Hashemite Kingdom of Jordan, accounting for 40 percent of its population. The capital city is the economic engine of the country, representing 80 percent of its enterprise capitalization (DoS 2012, Table 20). It is also the political center where power is concentrated, including the presence of the royal court, the parliament, foreign embassies, UN agencies, and international nongovernmental organizations (NGOs). As of 2019, Amman’s GDP accounts for more than $30 billion out of Jordan’s total GDP of $42 billion.1 The city is the locus of the kingdom’s banking, information technology, and pharmaceutical companies. Amman is also a “medical tourism” destination for the Middle East region, featuring 46 hospitals and no fewer than 1,200 pharmacies.

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1 World Bank 2019, p. 2. No data is available on Amman’s GDP, but it is more than 20 billion (or 4 million by $4,248 of GDP per inhabitant).
2 Here and throughout this chapter, all dollar amounts refer to US dollars.
Nearly half (40 percent) of Amman’s population is under the age of 20 (DoS 2015, Table 3.4). The informal sector accounts for 26 percent of the national economy (UNDP 2013). Unemployment is a major concern for a third of the youth and for women generally, a problem that is reinforced by the absence of reliable public transportation, especially for women.

**A REFUGEE-HEAVY POPULATION**

For more than half a century, Amman has been a haven for tens of thousands of Arab refugees, ever since the first Israeli–Arab war in 1948, when the main wave of refugees—70,000—came from Palestine. Those who arrived in that wave were given Jordanian citizenship between 1949 and 1954. A fifth of the people in that first wave were settled in refugee camps established by the United Nations Relief and Work Agency (UNRWA) in Jordan’s major cities.

Amman still hosts three refugee camps: Wahdat, Jabal Hussein, and Marka (Schneller), hosting 147,980 persons (UNRWA 2018). The city has managed to integrate its several refugee waves, as people have become established not only in camps and informal areas but also in dynamic neighborhoods (such as Jabal Amman, Jabal Lweibdeh, and Shmeissani). In 1967, Amman’s population doubled in just a few weeks with the arrival of 300,000 Jordanians from the West Bank. In January 1991, Amman received another 350,000 Jordanians expelled from Gulf countries in one month. This last wave helped develop west Amman (Gardens Street, Sweifieh, Khalda, Deir Ghbar). Then, in 2003–2005, around 200,000 Iraqi refugees settled in Amman, stimulating the real estate market.

Today, fully a fourth of Amman’s population has refugee status: 1,080,716 Palestinian refugees are registered by UNRWA within the boundaries of Greater Amman (UNRWA 2019), the vast majority of them being Jordanian citizens. While another 193,361 Syrian refugees are registered by the UNHCR (UNHCR 2019), according to the population and housing census of 2015, a total of 435,000 Syrian refugees have progressively settled in Amman since 2011 (DoS 2015), joining the 121,000 Iraqi refugees who arrived after 2003 (DoS 2015, Table 2.3). The most recent wave is composed of 27,000 Yemeni refugees, who arrived since 2014.

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3 This figure is calculated by adding together the registered refugees in UNRWA following the administrative categories: Amman Town North (317,024), Amman Town South (381,402), Prince Hassan unofficial camp (112,406), the Marka suburbs (76,160), Sweileh (42,722), Wadi Seer (3,022), and the three camps of New Amman (Wahdat, 59,205; Jabal Al Hussein, 32,775; and Marka, 56,000).
Most of this population with refugee status lives in overcrowded conditions: a seventh of them live within camps, and most of the rest live in informal areas developed around the camps in the central and eastern parts of the city. The majority of Palestinian refugees are Jordanian citizens, so they have access to civil service jobs and their children have access to both UNRWA and governmental schools and UNRWA medical services. By contrast, Syrian refugees face difficulty accessing school for their children (only 50 percent of Syrian children are attending school) and finding decent jobs. Moreover, the Syrian refugees are competing for jobs with 390,000 Egyptian workers and 140,000 Asian domestic workers (DoS 2015).

**DENSITY CHALLENGES**

Greater Amman’s population density reached 13,600 inhabitants per square kilometer in 2019 (equal to 136 inhabitants per hectare, 4 million on 293 km² of built-up area), but goes down to 4,987 inhabitants per square kilometer for the entire municipality (802 km). However, this density is very uneven, with some districts reaching more than 20,000 inhabitants per square kilometer, among the highest urban densities in the world. This overcrowding increases the incidence of respiratory disease, forces children and young adults onto the street, and leaves children with a poor study environment within refugee camps and poor neighborhoods (Al Husseini 2011). The great variation in density is illustrated in Map 2.

Greater Amman’s footprint has reached 293 square kilometers, twice as large as that of Barcelona, which has a similar population (165 square kilometers for 5.4 million people) (ESA 2015). The city is suffering from growing spatial and social inequalities between its western areas, developed on large plots of more than 1,000 square meters each, its ancient neighborhoods near its central commercial areas, and its eastern informal settlements, which developed around the three refugee camps of Jabal Hussein, Wahdat, and Marka.

The sharp rise in the city’s population has placed a strain on resources and infrastructure, including water, education, jobs, transportation, housing, and medical services. The Syrian refugee crisis, in particular, has contributed to an 83 percent increase in public debt, a 30 percent increase in youth unemployment, a 40 percent increase in the demand for water, and a 17 percent increase in the cost of rental housing since 2011 (GAM 2017).
To estimate population density, LandScan uses remote sensing imagery analysis to disaggregate census counts within administrative boundaries. For example, built-up areas such as airports and industry may appear to have a residential population where there isn't one.

**1987-2001, 2013 ONWARDS GREATER AMMAN MUNICIPALITY AREA**

**MAP 2 POPULATION DENSITY 2017**

Population per square kilometer

| 10,000 | 20,000 | 5,000 | 2,500 | 1,000 | 200 |

Greater Amman Municipality Boundary

Primary road

Governorate boundary

Sources: LandScan; NASA SRTM 30m; OpenStreetMap contributors

Map projection: UTM Zone 36N, WGS-84 Datum

5 Kilometers

Map projection: UTM Zone 36N, WGS-84 DATUM

**2007-2013 GREATER AMMAN MUNICIPALITY AREA**
INFRASTRUCTURE NEEDS

Amman has a semi-arid climate and suffers from aridity, lack of renewable water sources, and energy dependency. Jordan imports 96 percent of its energy, and since 2010 it has turned to an energy mix that includes solar energy. Since the 1960s Amman has derived water from the Azraq aquifer, and since 2013 from the fossil Disi aquifer, 350 kilometers south of the city, on the Saudi border. Water distribution in Amman is restricted to 24 hours per week on average, which represents less than 150 liters per person per day. As such, storing water in tanks by each household is the norm. Water networks and sewage systems need to be upgraded; in fact, water losses in bad networks and non-revenue water account for 50 percent of water distributed.

Amman has received institutional, technical, and financial support from the World Bank since the 1960s to solve its main urban issues: its housing crisis (the upgrading of informal settlements and sites and services policies), its insufficient water and sewage networks, and its incomplete highway network (construction of the Amman Ring Road from the industrial zone of Sahab to Zarqa, southeast).

However, despite international technical assistance, Amman’s infrastructure has not kept up with the pace of its demographic and urban growth rate. Because its population has doubled in just a decade and a half, from 1.7 million in 2004 to 3.5 million in 2015 and 3.9 million in 2019, the city is no longer functional in terms of transportation, housing, and access to public spaces (DoS 2004; DoS 2015; DoS 2020).

HOUSING

Amman today is suffering from a major housing crisis. Twenty-three percent of its housing units are vacant, and 10 percent of them are overcrowded (DoS 2015, Table 2.7). Informal housing sprawl is also an issue. The lack of public transportation (14 percent of the modal share) now translates into traffic congestion, particularly since 2011 and the arrival of Syrian refugees (GAM 2015). Spatial disparities have been growing between the informal areas in the center and eastern parts of the city, on the one hand, and the western part, on the other. The city lacks enough public parks and green areas, and air pollution is a major issue too. Amman is still lacking proper public participation incentives in its policies, and its governing authorities’ communication with residents needs to be scaled up.

* Greater Amman has signed an Air Quality Agreement Form with the Air Quality Index and shares its data. http://aqicn.org/city/jordan/amman/railway-station/
Between 1980 and 1997, the municipality of Amman implemented an innovative policy of upgrading informal areas, creating access to home-ownership, employment for residents, and genuine public participation. This approach benefitted thousands of residents and helped their social and spatial integration within the city and its economy. Urban policies afterwards focused more on transportation and commercial areas along development corridors rather than on upgrading residential areas.

**PLANNING**

Amman has followed a comprehensive masterplan since 2008, with a horizon of 2025. This plan includes transit-oriented development and development corridors with high-rise buildings, following a high-density mixed-use model. Foreign direct investments have been directed to the city’s new central business district Abdali, administrated by Mawared, a semi-public, semi-private institution, to develop military land. Three major infrastructure projects have also been developed: a Bus Rapid Transit (BRT) system, the Amman Ring Road, and the Al Ghabawi landfill, the latter featuring waste-to-energy solutions. Note that no BRT or light railway is yet scheduled to connect Queen Alia International Airport to the city center (9 million passengers).

In 2017, the city adopted the Amman Resilience Strategy to cope with its main urban problems compounded by the refugee influx and the effects of climate change. It proposed an action plan based on five pillars, namely, to become:

1. “Integrated and smart”
2. “Environmentally proactive”
3. “Innovative and prosperous”
4. “Young and equal, and
5. “United and proud.”

The Amman Resilience Strategy aims to connect refugee response efforts with the city’s long-term actions and to focus on job opportunities and enhanced access to municipal social centers for refugees. The Amman Climate Plan was launched in June 2019 as a development of the resilience strategy.

The major change in Greater Amman's planning policies has been the adoption of the Amman Climate Plan, with its focus on shifting transportation modalities, energy efficiency (e.g. LED lights, photovoltaic panels, insulation, and green building codes), waste sorting, and energy conversion.
Greater Amman was supported in the 1980s by the World Bank to upgrade its informal settlements, which are inhabited by Palestinian refugees, with on-site renovations and with sites and services projects (in East Wahdat, Jabal Jofeh, Nuzha, Hay Amir Hassan, and Wadi Rimam). Those successful projects included cost recovery for replicability and the regularization of land tenure. They were conducted along with the preparation and adoption of Jordan’s National Housing Policy in 1987. 

However, all of these upgrading projects were interrupted in 2008, when the Housing and Urban Development Corporation (HUDC) was tasked to direct the Royal Initiative of Decent Housing for Decent Living project (2008–13). To date, though, only 8,445 housing units have been built out of the planned 100,000 units in this project’s five years in Public-Private Partnerships (see Section III).

In 2008, Greater Amman launched the Greater Amman Master Plan 2025 (hereafter referred to as the masterplan), announcing the details in *Amman Plan: Metropolitan Growth Report* (GAM 2008). This is still the main guiding document for its transportation projects (including the BRT system), its ring roads (the Amman Development Corridor), and its innovative intensification policy along development corridors, which allows developers to build on up to 50 percent of a plot and increase the floor area ratio by adding additional floors. (See Table 1 for a more detailed listing of innovative projects). The masterplan serves as the unified planning guideline for the 22 districts. Its three main components are:

- A radial road network and ring roads
- An emphasis on public transport, and
- The use of development corridors and centers to direct urban expansion.

The Greater Amman Master Plan 2025 was innovative in several ways. The first was its focus on public participation and strong stakeholder involvement through the mayor’s roundtable sessions and citizen awareness campaigns. Such public consultation went into the preparation of the masterplan itself, signifying a move away from authoritarian technical planning. The second was the way the BRT system was implemented in 2007–2008, that is, during the preparation of the masterplan, in order to push the project as the cornerstone of all transportation plans. However, when the masterplan was presented in 2008, the master transportation plan was not yet ready. It was only approved in 2010 and is currently being updated. Map 3 illustrates the existing and planned road hierarchy.
### TABLE 1. URBAN INNOVATIONS

<table>
<thead>
<tr>
<th>TIMELINE</th>
<th>INNOVATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1878</td>
<td>Circassian settlement built within the Roman ruins of “Philadelphia” as a new foundation to Amman</td>
<td>The Ottoman Empire brought Circassian soldiers with their families from the Caucasus to control the pilgrimage road from Damascus to Mecca. With improved security, they brought in Syrian and Palestinian merchants, and Amman came back to life. Its site had been abandoned due to Bedouin attacks and seismicity (with earthquakes in the years 749, 1202, and 1759).</td>
</tr>
<tr>
<td>1909</td>
<td>Amman Municipality created</td>
<td>The first mayor elected is Ismael Babouk, a Circassian.</td>
</tr>
<tr>
<td>1921</td>
<td>Amman becomes the capital of the Emirate of Transjordan</td>
<td>In order to counterbalance the political power of Salt, Irbid, Kerak, and Maan urban elites, Amman is chosen as the capital of the Hashemite Emirate of Transjordan under the British Mandate (1921–1946).</td>
</tr>
<tr>
<td>1927</td>
<td>Rebuilding after July 11 earthquake</td>
<td>Dozens of houses destroyed when earthquake strikes Amman; 242 persons killed. Decision is taken to build on top of hills, with solid foundations.</td>
</tr>
<tr>
<td>1938</td>
<td>First land-use regulations</td>
<td>Adopted by the British administration</td>
</tr>
<tr>
<td>1948</td>
<td>Palestinian refugees resettled in camps (Nakba)</td>
<td>70,000 Palestinian refugees, expelled from their land, settle in Transjordan, the majority in Amman. Red Cross camps are set up for them, transformed into UNRWA camps in 1949 and 1951.</td>
</tr>
<tr>
<td>1955</td>
<td>First Comprehensive Plan for the city’s development</td>
<td>Plan is prepared by United Nation consultants, along with the First Municipality Law.</td>
</tr>
<tr>
<td>1967</td>
<td>Second large wave of Palestinian refugees arrives in Amman</td>
<td>Around 300,000 Palestinian refugees are expelled from the West Bank. They settle in central and east Amman.</td>
</tr>
<tr>
<td>1977</td>
<td>Comprehensive Plan, Amman-Balqa region</td>
<td>The Amman Urban Region Planning Group is established within the Ministry of Municipal Affairs and prepares a comprehensive plan for Amman and the Salt (Balqa) metropolitan area.</td>
</tr>
<tr>
<td>1980–2008</td>
<td>Informal settlement upgrading with public participation and sites and services low-income housing projects</td>
<td>The Urban Development Department is created within Greater Amman with World Bank financial support. It becomes HUDC in 1992.</td>
</tr>
</tbody>
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</tr>
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<tbody>
<tr>
<td>2003–2014</td>
<td>Amman Development Corridor</td>
<td>This project was a success in limiting the urban envelope, but land acquisition costs were too high. The development project also lacked coordination between the main stakeholders and donors (WB and EIB).</td>
</tr>
<tr>
<td>2007–2013</td>
<td>Expansion of Amman south</td>
<td>Over a six-year period, Amman incorporates six municipalities to the south, doubling its size to 1,300 km².</td>
</tr>
<tr>
<td>2008</td>
<td>Second Comprehensive Master Plan, including Corridor Intensification Strategy</td>
<td>The Greater Amman Master Plan for 2025 includes transport-oriented development and development corridors to attract investors and promotes a Bus Rapid Transit System. There is genuine public participation.</td>
</tr>
<tr>
<td>2008</td>
<td>Amman Institute for Urban Development established; Transport Mobility Master Plan</td>
<td>Amman Institute for Urban Development established as an urban planning institute with highly qualified Jordanians and international experts to implement the Greater Amman Master Plan. Trains Iraqi Arab urban planners in 2009, and prepares Irbid Master Plan.</td>
</tr>
<tr>
<td>2008–2019</td>
<td>Industrial rezoning and classification</td>
<td>Greater Amman Municipality and the Ministry of Environment carry out these reclassifications to relocate small and medium industries in three locations.</td>
</tr>
<tr>
<td>2013</td>
<td>Green Building Density Bonus for Densification</td>
<td>Density bonus is offered to support the cost of green building. With TOD.</td>
</tr>
<tr>
<td>2015</td>
<td>Construction resumes on Bus Rapid Transit system</td>
<td>The BRT work started in 2008, was suspended in 2011, and resumed in 2015. It will be operational in 2020, with 150 buses running on 32 km of bus lines.</td>
</tr>
<tr>
<td>2017</td>
<td>Amman Resilience Plan</td>
<td>To adapt to climate change and cope with the refugee crisis, this plan was prepared by 100 Resilient Cities (Rockefeller Foundation).</td>
</tr>
<tr>
<td>2017</td>
<td>Electrification of public taxi fleet</td>
<td>Plan is to add 150 electric cars to the public taxi fleet. To date, 10 electric car charging stations built, 5 with solar energy, to save 40 kilotons CO2 per year; 20 additional charging stations are planned.</td>
</tr>
<tr>
<td>2017–2018</td>
<td>Urban Growth Scenarios</td>
<td>Developed by the World Bank and CAPSUS, this study shows that compact growth within current zoned areas would reduce greenhouse gas emissions and infrastructure costs</td>
</tr>
<tr>
<td>2017–2018</td>
<td>LED street lighting and solar farm within the Amman Climate Plan</td>
<td>To date, 130,000 LED lights have been installed, and an additional 130,000 will be installed with EBRD support. Greater Amman will install a solar farm (wheeling) on 1,200 acres.</td>
</tr>
<tr>
<td>2019</td>
<td>Green City Action Plan; Amman Climate Plan</td>
<td>Green City Action Plan is launched in Feb 2019, supported by EBRD. Amman Climate Plan is launched by the World Bank in June 2019. Plan includes green belt to limit urban expansion in east Amman (Ohoud) before Al Ghabawi solid-waste treatment plant.</td>
</tr>
</tbody>
</table>

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* European Investment Bank  
* Capital Sustainable (Urban planning consulting firm, Mexico)  
* European Bank for Reconstruction and Development

RESILIENCE STRATEGY AND CLIMATE PLAN

Amman’s resilience strategy was published in 2017. It identifies a range of actions that will help city residents adapt to climate shocks and become more resilient. Jordan’s nationally determined contribution to the Paris Agreement commits to greenhouse gas emissions level 14 percent below a business-as-usual scenario by 2030.

Another development that emerged from the 2017 resilience strategy, and which the city is now working on, is implementing the Amman Climate Plan. Greater Amman is the first Arab city to implement such a climate action plan. Amman’s plan is both cross-sectoral and horizontally integrated. It relies on eight pillars:

1. Carbon-free-sourced electricity;
2. Green building guidelines for newly constructed buildings along with renovations to improve energy efficiency;
3. Citizen engagement with awareness programs and information campaign;
4. Renewable energy for Greater Amman buildings and photovoltaics solutions for residential and commercial buildings;
5. Sustainable mobility with clean public transport, electric-powered private vehicles, and walking promoted by the improved walkability of the city center and main avenues;
6. Waste that is reduced, sorted, composted, and recycled, with the remainder to be processed to produce energy;
7. Harvesting of rainwater, efficient use of water, and treatment of wastewater; and
8. Concerning urban planning and land use: New development focused on public-transit-oriented corridors and an increase in green open spaces.

GREEN CITY ACTION PLAN

Greater Amman is currently developing a Green City Action Plan, in partnership with the European Bank for Reconstruction and Development (EBRD). It emerged from the June 2019 Prioritization Workshop, where Greater Amman identified a forward-looking vision and prioritized the challenges currently facing the city. In response to these priority challenges, the project team developed a list of over 300 actions that could be implemented to address these challenges. With its Green City Action Plan, Greater Amman is taking part in Jordan’s National Action Plan for Green Growth 2019–2030, which calls on it to (i) Rethink solutions to economic, environmental and social challenges and (ii) Rethink the role of environment in increasing economic opportunities for sustainable development.
GREEN INFRASTRUCTURE

In 2017, Greater Amman launched a green infrastructure project in the city’s poor and dense neighborhoods. This project promotes walkability and increases pedestrian safety by linking upgraded informal areas to the BRT lines through staircase renovation. The 5-million-euro project (July 2017–July 2021) is being implemented by the German development agency Gesellschaft für Internationale Zusammenarbeit (GIZ), in partnership with Jordan’s Ministry of Environment and Greater Amman, with funding from the German development ministry Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ) and GIZ expertise. It aims at improving living conditions in poverty-stricken areas in Amman by rehabilitating stair networks that connect poor neighborhoods with BRT bus stations in Ras al Ayn (in Badr and Basman) and through the creation of two small community parks. These small projects focus on both greening and walkability. “On the neighborhood level, the aim is to counteract the degradation of urban spaces, improve social cohesion and foster interaction between different population groups. On a higher level, the infrastructure networks contribute to filtering air and water pollutants, preserving local biodiversity, decreasing the impact of urban heat waves and stabilizing soil to reduce erosion.”

URBAN GROWTH SCENARIOS

Amman’s most recent innovation has been the preparation of urban growth scenarios in 2017–2018, which were also developed for the cities of Russeifa and Zarqa within the Amman metropolitan area to accommodate the 1,231,325 new residents expected by 2030. The study, which was commissioned by the World Bank and was developed through consensus to make informed decisions for sustainable development, discussed the cross-sectoral effects of public policies. It compared the environmental, social, and economic impacts of different urban growth paths to guide sustainable urban investment projects (World Bank 2018b).

Integration

GREATER AMMAN has a history of integrated urban planning projects focused on housing solutions through sites and services and upgrading operations aimed at enhancing the living conditions of refugees and poor residents. Those solutions

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5 One park is on left-over land in Palestine Street, Jabal Nasr, occupying 380 m²; the other is in Mahmoud Al Qda Park, in Jabal Nasr, occupying 1000 m².
6 GIZ, Green Infrastructure Project leaflet, p. 2.
7 Following DoS high-growth model, 944,513 additional inhabitants are planned for Amman in 2030, 124,517 in Russeifa, and 162,294 in Zarqa (World Bank 2018b).
have crossed district boundaries within Greater Amman, reducing the segre-
gation between poor and dense east Amman and wealthy west Amman. They
have involved multiple sectors, including housing, transportation, and social
services. In addition, as mentioned earlier, Greater Amman is the first Arab city
to implement a climate plan, which is part of its resilience strategy.

Paradoxically, the adoption of the Metropolitan Growth Master Plan in 2008
has halted integrated urban planning outside Greater Amman’s boundaries.

**HOW INTEGRATED PLANNING IS DEFINED AND ADOPTED**

Amman’s first development plan was produced in 1955, the year its municipal
law was also adopted. Following the arrival of Palestinian refugees in 1967 and
the expansion of informal areas in the city’s center and to its east, a Civic Center
Development Plan was prepared in 1968. In 1976, the Amman Urban Region
Planning Group (AURPG) was founded with assistance from the US Agency
for International Development (USAID) and prepared an overall development
plan for Amman and its surrounding areas, including Salt, Madaba, and Zarqa.
Although this area plan provided guidelines on urban growth and transportation
plans for several municipalities, each municipality then developed its own land
use plan.

**Early projects, 1980–1987**

An Urban Development Department (UDD) was created within the Amman Mu-
nicipality in 1980 to direct growth through development centers and corridors
and to limit urban sprawl. The UDD prioritized capital improvement projects
and defined an integrated transit and transportation strategy. Its mandate was
twofold: to develop infrastructure services and community facilities in informal
areas and to provide low-income housing. The UDD aimed to solve the informal
settlement issue and adopted the then-new World Bank concept of upgrading
by involving the population. The World Bank supported the preparation of the
first Building Regulation Law in 1985 and of the Greater Amman Comprehensive
Development Plan (GACDP) in 1987 in order to solve the housing crisis.

The first Urban Development Project (1980–1987) for Amman, which was
financed by the World Bank and implemented by the UDD, developed low-cost
replicable solutions for the production of shelter and infrastructure services
in East Wahdat, Jabal Jofeh, Rimam, and Nozha. Small serviced plots of land
(150 to 300 square meters) were made available at affordable prices with legal
property registration so that low-income residents and migrants could build
homes incrementally on a self-help basis. The success of the project relied
on subsidized loans for home renovation and access to property to ensure
replicability. The small service plots were attractive to the lower end of the
housing market, due to the unavailability of affordable plots for low-cost housing. Importantly, fully 85 percent of the beneficiaries paid back their loans. The project also included loans to small-scale enterprises and vocational and commercial training to achieve improvements in productivity (totaling $5.3 million). Shops and workshop plots were provided. This policy, which relied on both the purchase of land by the government and repayment by the buyers, proved to be a public investment of good quality.

**Planning since 1987**

Greater Amman has managed to develop integrated urban planning within its boundaries since 1987 for 56 urban and 10 rural communities, and local plans were developed based on this. But some of the urban land developed during the 1980s race for land was in areas presenting geological risks, specifically landslides.

The 2008 Greater Amman Master Plan included a Metropolitan Growth Master Plan, which outlined the overall direction for the metropolitan area and established priority policy areas for growth, including (i) growth boundaries; (ii) generalized land use; (iii) transportation network, including public transit and hierarchy of roadways; and (iv) natural and cultural heritage, including major metropolitan parks.

The 2008 Greater Amman Master Plan delineates eight planning areas and 228 communities within those areas that would require a plan of their own. Specific area plans detail policies for land use, natural and cultural heritage, transportation, and urban infrastructure for the eight planning areas. Community plans are also prepared for strategic neighborhoods that require special attention, such as heritage districts, redevelopment or urban regeneration areas, natural heritage areas, and parks. Detailed community plans were developed for these areas, providing specific directions for development. Site plans and associated development agreements or large-scale projects are then drafted, and a site planning approval process is implemented, just as it is for high-density, mixed-use (HDMU) areas. These site plans are accompanied by development agreements that outline the obligations of Greater Amman and the investor/developer. They include imposition of a tax on additional floors to support a Community Development Fund.

The 2008 Metropolitan Growth Master Plan is based on densification and intensification along development corridors. It fosters transit-oriented development to reduce traffic congestion and the sprawl of informal settlements. However, this integrated urban planning concerns only Greater Amman and
does not include adjacent cities. As a consequence, the city of Zarqa is not represented in the technical committee for the implementation of the BRT system linking both cities. Only Greater Amman, the Ministry of Transport, the Land Transport Commission, and the French Development Agency are members of the technical committee, which points to a lack of integrated planning at the metropolitan level.8

**PROCESSES, FINANCING, AND IMPLEMENTATION MECHANISMS WITH TOOLS AND SECTORS INVOLVED**

In 1984, 7 percent of Amman’s population lived in low-income squatter settlements (World Bank 1996). The most challenging conditions were in East Wahdat, developed near the UNRWA-run Palestinian camp of Wahdat. It was built out of sheet metal and wood as the owners of the land refused to allow more permanent construction.

From 1980 to 1997, Jordan became the first Arab country to implement the World Bank’s innovative policy of upgrading informal areas with public participation. Initiated in the 1960s in Peru by the urban planner John F. C. Turner, this policy aimed to involve the inhabitants of informal areas during every stage of the renovation of their homes and to allow them access to home-ownership through long-term loans guaranteed by the state. The Urban Development Project 1 (UDP1) was piloted from 1981 to 1987 in four informal sites in Amman (East Wahdat, Jabal Jofeh, Rimam, and Nozha).

The basic idea behind this new development approach was to renovate informal areas while involving their occupants in all stages of the process from design to construction, including funding (Turner 1968). Occupants had to pay a nominal fee to access home-ownership through long-term loans, while they trained in construction trades to help them leave unemployment. The use of long-term and therefore more affordable loans was a condition for the replicability of urban upgrading programs, because the reimbursement of the loans could be used to fund other, similar projects.

The aim of the project was to improve the living conditions of residents in informal settlements by enabling them to secure land tenure and providing them with basic infrastructure, shelter, and community facilities. The land was bought from the original owners and mortgaged to the householders with monthly installments based on a formula of 33 percent of the income of each beneficiary. Beneficiaries had to pay the full cost of on-site infrastructure services, as well as the cost of the land, through a long-term mortgage loan from the Jordan Housing Bank. Further, Palestinian refugees with Jordanian citizen-

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8 Interview with the head of BRT project at the French Development Agency, July 18, 2019.
ship gained access to legal property titles. The HUDC engineers were awarded the Aga Khan Award for Architecture for this project in 1992.9

UDP1, which was supported by the World Bank, was the first shelter-related project in Amman designed to solve the housing crisis among poor citizens and refugees. It consisted of the upgrading of four sites: East Wahdat, Jabal Jofeh, Rimam, and Nozha; and the creation of three sites with services: in Marka, Quweisma, and Russeifa. These sites and services projects aimed to prepare land for purchase at affordable prices, based on the division of property into small plots (150 m²), thus creating a new “E” zoning type, with core units and all services provided. Most of the upgrading in these informal areas has taken place in downtown Amman since 1980.

Sites and services were provided at the North Russeifa site (covering 30.2 hectares, with a target population of 14,000 persons); at the Marka site north-east of Amman (covering 22.1 hectares with a target population of 10,000); and at the Quweisma site in east Amman (covering 35.4 hectares with a target population of 17,000). The three sites were selected for low-income beneficiaries on the basis of affordable land prices, proximity to employment opportunities, and reasonable costs for site preparation and off-site infrastructure. Each development site required two new schools for the nine grades of compulsory education, because there was no available spare capacity in existing schools nearby.

UDP1 was successful in its affordability and its cost recovery as well as in terms of enhanced beneficiary participation. It aimed to make serviced land available at affordable prices, and it facilitated housing construction through loans and assistance with building designs and permits. The beneficiaries were involved in the several phases of conception and implementation. The project has succeeded beyond its stated objectives by making significant improvements in the quality of life for low-income families, including through the provision of a wide range of community facilities and activities such as childcare and improved hygienic practices (e.g. soaps for hand-washing near the toilets).

As of 1986, UDP1 was the first shelter-related project in Amman aimed to solve the housing crisis of poor citizens and refugees. The UDD mandate was broadened to upgrade informal settlements and develop low-income plots on a nationwide basis. The new project included the training of municipal staff in urban management practices. In April 1992, the UDD was merged with the Housing Corporation to form HUDC. It became an independent government agency responsible for the housing and urban sectors, and it is still the main provider of housing that is addressing the needs of different groups, in particular low-income ones.

1980s–1990s

In Amman in the 1980s, several innovative planning tools were developed during the UDP1 project. The main components of the upgrading policy were these:

- Land tenure consolidation—in which the UDD bought the land and sold it to the squatters;
- Cost recovery—to ensure the principle of project replicability;
- Self-help—to enable squatters to acquire building skills;
- Job opportunities—created by requiring at least half the workers to come from the local population;
- Community involvement—to facilitate the process and cope with the population’s needs; and
- Incremental housing—by starting each building with a core unit equipped with a sanitary section.

The upgrading program was based on full cost recovery. Beneficiaries had to pay the full cost of on-site infrastructure services as well as the cost of the land, through a long-term mortgage loan from the Jordan Housing Bank. Meanwhile, the government was responsible for the cost of the community facilities and off-site infrastructure. The Jordan Housing Bank usually asked the beneficiaries to provide a guarantor; in many cases, beneficiaries failed to satisfy the bank’s requirements, while others rejected the idea of taking out a bank loan for religious reasons. Therefore, the government took the initiative to allow this category to pay directly to the UDD with reasonable arrangements, which did not require any guarantee, although the beneficiaries were still charged an interest rate equivalent to that charged by the bank (Al Daly 1999).

The UDD built a community center on each of the project sites. The objectives of the community centers were to mobilize and organize local community initiatives, promote income-generating activities and literacy campaigns, raise public awareness, and encourage women’s involvement in the community development process. Furthermore, women’s vocational training centers were built to provide vocational training for women and promote their economic activities through an access-to-credit program (Al Daly 1999).

The project also permitted an upgrading of environmental sanitation over the project period on the upgraded sites. In 1981, very few households on these sites were connected to sewers, but by 1985 nearly all were connected to the mains. The number of households directly connected to municipal water mains more than doubled over the project period, until 95 percent
of all households were connected to the water mains (World Bank 1989). These changes were reflected in health outcomes, as households changed their own healthcare practices with the addition of new sanitary facilities. Infant mortality in the upgraded neighborhoods fell from an average of 68 per thousand to 55 per thousand, and child mortality fell by 20 percentage points in a decade (1981–1991).

Public participation through local committees in each neighborhood and the construction of several HUDC offices on site has been key to the success of the former upgrading projects carried out in the 1980s and 1990s.

**Since 1997**

In 1997, the government of Jordan launched a national strategic plan to reduce poverty and unemployment through a huge urban infrastructure program in both refugee camps and informal areas: the Community Infrastructure Program (CIP). For the first time ever, an urban planning project included the 10 UNRWA Palestinian refugee camps and the three Palestinian Affairs Department camps. The objective of the first part of this infrastructure (CIP-A) was to renovate infrastructure in informal settlements and camps, while the objective of CIP-B was to improve infrastructure in rural areas and small towns, in coordination with the Ministry of Municipal Affairs. CIP-C concerned the internal development of HUDC through training and technical and computer equipment.

CIP-A was implemented between March 1998 and February 2002, mainly in Amman, but also in Zarqa for informal areas and throughout the country for camps. The essential services included water supply and sanitation (environmentally sound wastewater and solid-waste disposal); drainage systems to minimize property damage and reduce the risk to human life due to floods; safety measures through accessible roads and lighting; and the provision of schools, health facilities, and community centers. Major roads were widened and lit within informal settlements. The widening of streets was done around the UNRWA camps, but not within them, in order to protect their physical integrity. Finally, in informal areas, eight schools, five clinics, and eight community centers (where literacy activities and association meetings are held) were built.

CIP-A benefited 450,000 people living in informal areas and another 220,000 living in camps. Just under half the cost of these projects (JD 46 million in total) was covered by the Jordanian government (JD 20 million); around a quarter of the cost was funded by the World Bank (JD 10 million); and the remainder was
paid for by the German development bank Kreditanstalt für Wiederaufbau (KFW) (JD 8.5 million), Islamic banks (JD 6 million), and the Arab fund (JD 1.5 million).

The CIP programs provided a set of services while demanding nothing in return, and did not aim for cost recovery at all. They gave very good indemnities and compensations to all families affected by house demolition or displacement. Yet the fundamental aspect of land tenure was abandoned, the official reason for this being that land had become so expensive that even the government could not afford to buy and sell it. Moreover, the families concerned had become too poor to be able to take out 20-year loans with the Housing Bank, the Islamic Bank, or the government (Ababsa 2012). Low- to medium-income citizens did have the option of registering for rotating accounts at saving and credit associations to borrow a few thousand dinars on two- or three-year loans at no interest to build additional floors (Tobin 2016).

Since 1997, HUDC has changed its policy for two reasons: first, the considerable rise in the cost of land; and second, the difficulty of targeting populations able to get sufficient loans from banks. With the prevailing loan terms for housing finance (25-year loans at 8.5 percent interest), households below the fifth decile cannot afford to obtain a loan of more than JD 25,000. The rising cost of land—it has more than tripled since 1997—is such that the government can no longer advance the funds needed to purchase the property.

In May 2010, the HUDC camp and informal areas department was closed, and all its employees were engaged in the production of the Royal Initiative of Decent Housing for Decent Living. Since 2015, HUDC has focused its action on the provision of sites and services, using affordable plots of land. In September 2019 it launched its new housing program to build 916 housing units in Amman, Zarqa, and Kerak, with Public-Private Partnerships. But due to lack of funds, it did not resume its upgrading work in the poor neighborhoods of Amman, where additional housing units have been built informally for a growing population over the last decade.

Map 4 illustrates the rapid expansion of the urban footprint as all of these projects and population influxes occurred, between 1987 and 2015.

Transportation
Greater Amman is fostering intensification along the two BRT lines by allowing developers to build on up to 50 percent of the plot and to add additional floors. The Amman and Amman-Zarqa BRT lines are the backbones of the Amman–Ru-
seifa–Zarqa integrated public transport network. This project started in 2008, was suspended in 2011, and then resumed in September 2015 with financial support from the French development agency AFD. Its main target is to increase the share of commuters using public transport from 13 percent to 25 percent by the year 2025. Once completed, the Amman BRT will become the city’s first Bus Rapid Transit system, in which high-capacity buses will run exclusively on 25 kilometers of segregated lanes. (See Map 5.)

Putting the system into effect will require development and design of stops, stations, interchanges, and passenger information, as well as vehicle specifications. The aim is for buses to run on a frequency as rapid as one bus every three minutes along Amman’s busiest corridors. An extensive network of feeder services is being designed along with the BRT, consisting of buses and smaller vehicles to reach densely inhabited areas of east Amman with narrow streets.

The Amman BRT is expected to reduce the distance traveled using private vehicles by 85 million kilometers per year and the distance traveled using taxis by 12 million kilometers per year. By 2021, the 150 rapid buses in Amman will be carrying 315,000 passengers a day. Additionally, 4,000 native trees (requiring less water and care than other trees) will be planted on median islands separating BRT lanes from traffic lanes along corridor 1 (Sweileh–Mahatta). International donors are pushing for electric buses along the BRT lines, but contractors prefer to import Euro 5 diesel-fueled buses.

Implementation

IN RECENT YEARS, Greater Amman has been focusing on the implementation of its metropolitan growth plan and Bus Rapid Transit system. Those policies have been embedded within the Amman Resilience Plans since 2017 and are also part of the Amman Climate Plan. All the current urban planning policies have been modeled within the urban growth scenarios prepared by the World Bank in 2017–2018 for the large metropolitan area of Amman, Russeifa, and Zarqa.

ACTORS

An autonomous entity, Greater Amman has developed its several urban planning policies in close collaboration with specialized entities such as HUDC, the Department of Land and Survey, the Jordan Electric Company, and Amman’s water company Miyahuna.
Amman Civil Airport
Queen Alia International Airport
Ean Albasha
Mahes
Al Balad Quarter
Al Berah Quarter
Ira
Al Jadeed Quarter
Al Rayyan
Alkhaldean
Al Rashead
Al Moroj
Alorobah
Al Maadi
Sahab
Ainoqairah Zomlet
Al Olya
Al Mowaqar
Alrawnaq
Marj Al Hamam
Al Mqabalain
Alyadodah
Shmeisani
Abdoun Al Janobi
Zabud
Alshounah
Alwestah
Al al Jlol
Um Alamad
Al Qastal
Al Jizah
Husban
Al Wadi Al Akhdar
Alfuhais
Al ZaraQA
Ar Rusayh
AMMAN
AL ZARQA
AR RUSAYFAH
NAWOOR
AS SALT
MADABA
AL/hyphen.caseBALQA
AL/hyphen.caseZARQA
To Dayr Allah
To Jarash
To Mafrak
To Libb
To Dabaa
To King Abdullah City
GREATER AMMAN MUNICIPALITY AREA
2007–2013
GREATER AMMAN MUNICIPALITY AREA
2019
SOURCES: NASA SRTM 30m, OpenStreetMap Contributors
MAP PROJECTION: UTM ZONE 36N, WGS/hyphen.cap84 DATUM
International donors are playing a major role in funding and technical assistance: the World Bank for infrastructure and climate change adaptation, AFD for the BRT project, the EBRD for the al Ghabawi landfill and waste-to-energy solutions, GIZ for green infrastructure projects, and USAID for CITIES (Cities Implementing Transparent, Innovative and Effective Solutions) program 2016–2021, among others. However, there is room for these initiatives to be more coordinated and to minimize duplication. For instance, the UNDP is supporting Greater Amman in building thermal insulation and retrofitting (known as Project SURE: Systemic Approach to Sustainable Urbanization and Resource Efficiency in Greater Amman Municipality), which complements the Amman Climate Plan, while EBRD is promoting green growth. Greater Amman does not restrict donors from contributing to similar sectors, as it gives additional funds to the city and training opportunities to its staff.

The Amman Climate Plan provides a framework for engagement between government agencies, citizens, and the private sector. The objective is to involve stakeholders in the development, design, and implementation of actions, providing an opportunity for obtaining a better understanding of the social and environmental impacts of proposed projects. Stakeholder input will improve the design and increase local ownership and involvement. As a result, outcomes will improve and residents will experience a better quality of life.

Individual participation and behavior change are key to many of the actions of the Amman Climate Plan. As such, the residents of Amman will have to be engaged in the implementation and invested in the outcomes. Therefore, a general public awareness-raising campaign will be implemented by the municipality to address the role of important stakeholders in the climate actions proposed in the plan.

Since 2008, Greater Amman has also been working in close collaboration with the Ministry of Environment to produce its Interim Industrial Land Policy. The aim of this is to relocate small and medium industries scattered in the central and southern areas to three main areas: the Sahab–Al Muwaqar corridor for medium and large industries (it is now outside the Greater Amman boundaries); the al Qastal industrial area for light to medium industry, along with offices and research centers; and the Al Jeezah industrial area for light and medium industrial uses, along with residential units.

The decentralization law, adopted in 2015, gave much power to the members of the elected municipal councils (outside Greater Amman). Those councils are now pushing to zone additional land, as they are themselves under direct pressure from land owners wishing to benefit from the land gains. In turn, the head of the planning department is under pressure from elected local councils. These councils often only think of providing services to their own areas, without taking wider comprehensive planning into consideration. The executive director...
Amman’s dense neighborhoods have rapidly absorbed refugees over several decades. Upgrades and transport infrastructure, such as along Al-Urdon Street shown here, have helped integrate these areas into the city’s fabric.

Source: Manuel ROMARIS/Moment via Getty Images.
can make suggestions to extend zoned areas in order to please some city dwellers. As a result, informal urban sprawl is still occurring.

**INSTITUTIONAL ARCHITECTURE**

In order to implement its main urban development projects, Greater Amman signs memoranda of understanding with national institutions and contracts with international donors. It has the power to formulate its own legislation and enact it. For instance, Greater Amman has been working with the Jordan Green Buildings Council (JGBC) since its establishment in 2009 to promote and advocate for green building.

Greater Amman has created its own green building unit within the planning department, which manages the program in close coordination with relevant entities, including the Construction and Sustainable Building Center (CSBC), the Civil Defense Department, Jordan Engineers Association, and others during the process of reviewing drawings, issuing building permits, and issuing certificates of compliance. It has published a green building incentives manual online.

A resilience unit was also created within Greater Amman, which serves to coordinate several departments, including transport, solid waste, and urban planning.

**SUSTAINABILITY**

Integrated urban planning in Amman has room for improvement. First of all, it is concentrating on projects within Greater Amman boundaries, with no interrelations with the large metropolitan cities, due to regulatory barriers between the Ministry of Local Administration and the independent municipality of Amman. Second, there is a lack of trained planners in the secondary cities. Third, integrated urban planning is scattered among different projects, including the BRT, solid-waste management, and energy transition, and these are insufficiently coordinated. Greater Amman’s comprehensive urban planning department, for instance, faces difficulties obtaining GIS and statistical data from the GIS Department and from the Land Use department.

Greater Amman has not developed institutional relations with the large cities of Russeifa and Zarqa, which comprise the larger metropolitan area. Those cities are struggling to limit their urban sprawl and implement zoning regulations. Municipalities are not empowered with the ability to prepare their own masterplans, and lack the staff, equipment, and training to do so. They may only update their land use plans. For instance, Zarqa Municipality’s urban control department (*rakaba*) has no car to visit sites.10

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10 Interview with head of urban planning, Zarqa, January 28, 2019.
The preparation of the urban growth scenarios in 2017 was the first urban planning activity to bring together urban planners from these three main cities of the Amman metropolitan area. The scenarios were prepared in close collaboration with Greater Amman, the Ministry of Municipal Affairs (now the Ministry of Local Administration), and HUCD, under the Ministry of Planning and International Cooperation supervision. The planning engineers of those three cities received technical assistance and capacity-building to assess the socioeconomic and environmental costs and benefits, as well as the drawbacks, of different paths of urban development. However, no coordination framework had been established by the end of the project between the three cities, and decision makers in Zarqa and Ruseifa did not take up the recommendations for lack of power and funding.

The main policy goal applied in the urban growth scenario, to reduce the current land vacancy rate from 23 percent to 8 percent, is addressed through the policy lever of guarantees made to landlords to rent out their apartments and subdivide them if they are too large. About 742,910 future inhabitants could be housed in 141,238 existing but empty homes in Amman, instead of building new dwellings on the outskirts of the city. This measure will house three-quarters of the expected population growth of the city by 2030. It would require financial and legal guarantees, but at this stage they are considered too difficult to implement, even within the housing strategy. The taxation of vacant land has been suggested several times by the World Bank and USAID, but political deciders and parliament members have not yet been convinced, as many of them have made short-term personal profits in the current land speculation.

The second policy measure is a transport-oriented development policy, which aims to increase densities along the new BRT lines twofold. This lever yields benefits in reducing commuting distances and increasing proximity to urban services. Only inducing the new population to settle near employment areas and public transportation could prevent the city from expanding horizontally. The number of housing units that can be built according to the land uses defined in the current masterplan and following the building norms and limitations is large enough to house the population growth expected for 2030 without any further urban expansion (densification).

According to the Basic Business as Usual scenario, if no urban policy is conducted, Amman’s consumption of city land will increase by 14 percent between 2015 and 2030, in the amount of 41.44 square kilometers. Almost half of this growth (17 km²) is expected to happen outside zoned areas. Green or arable lands in the east and south of Amman are likely to be converted to urban use. This business-as-usual scenario consumes most land, costs the most in

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11 The Business as Usual scenario considers the city growth without any urban intervention.
terms of service delivery, and produces much more pollution. It may be the most likely scenario in Russeifa and Zarqa, where urban planning is weak and where political pressure is exerted on the mayors and the elected municipal council members to expand the zoned areas.

The masterplan scenario shows that enforcing Greater Amman’s current masterplan could reduce the new land consumption to 24.19 square kilometers, saving valuable lands from becoming urban. But the total land consumption in the scenario could reach up to 99 square kilometers if all residential land uses are urbanized by 2030. Greater Amman manages to resist the political pressure to zone additional land and extend the zoned areas by phasing out its activities by geographic zones.

The 2008 masterplan is applied through five-year phases, by area. This full masterplan scenario is actually worse than the business-as-usual scenario, because it would lead to a leapfrogging development of the city and to higher costs for infrastructure and municipal services.

To sum up: The vision and compact growth scenarios suggested by the World Bank entail urban intensification with no additional built-up areas in the coming years. They are the least expensive in term of service delivery and greenhouse gas emissions. They both prove that all the population growth expected for 2030 can be accommodated within the existing city boundaries with proper planning, policy, and investment interventions. The two main policies are transport-oriented development and reduction of the vacancy rate to 8 percent with guarantees to the owners (World Bank 2018b).

In term of service delivery, the worst scenario is the business-as-usual scenario, as it requires high investment for infrastructure. About JD 231 million would be required to provide 41.44 square kilometers of new urban area with streets, walkways, water, drainage, and electricity networks. This is twice the cost of the masterplan scenario and 13 times more expensive than the vision scenario, which entails only maintenance of current networks. Concentrating infill along the BRT lines allows the Vision scenario to reduce the investment needed to upgrade the networks to JD 16.5 million.

**PRIVATE PARTICIPATION**

Public-Private Partnerships (PPPs) have been used to alleviate Jordan’s housing shortage. In 1996, the World Bank supported the creation of the Jordan Mortgage Refinance Company and pushed for the implementation of a housing PPP. HUDC, in partnership with the private sector, has created 52 such projects so far. In most Jordanian PPPs, the government designs a publicly owned asset and prepares the marketing. Developers obtain guarantees by the state in the form of prior payments at high market prices, and they are given building code exemptions, allowing for higher-storied buildings and greater density.
The biggest housing PPP so far has been the Decent Housing for a Decent Living Initiative—known in Arabic as Sakan kareem la ‘eish kareem—a project launched by King Abdullah in 2008. The initiative included a plan for private contractors to build some 100,000 subsidized housing units over five years on state land. The projects were to be carried out in five governorates. Initially, however, the state did not financially support the project, and as a result the banks refused to offer loans to most people who applied. Only civil servants and army veterans managed to obtain loans. In March 2010, the government decided to reduce the apartment prices by 15 percent and pay 3.5 percent of the 8.5 percent interest rate. By November 2011, with several banks having withdrawn from the project, only 8,448 housing units had been built—as compared to the 100,000 that were planned—and only a third of those had been sold. In August 2014, the Ministry of Education purchased all the apartments for its employees, with payment deducted from their salaries.

The Decent Housing for a Decent Living project was unsuccessful due to its inability to target public subsidies toward the needy segments of the population, as well as to its high cost to the government as a subsidy-driven program. Developers were paid JD 265 dinars ($373) per square foot, and the apartments were sold to the applicants for JD 220 ($310) per square foot. This was very costly to the government. In a functioning PPP, the rate of return for the private sector must be large enough to attract private investments yet small enough to protect public interest. Such PPPs must include clear provisions for monitoring, marketing, and credit facilitation. In the case of this project, building maintenance costs were not taken into consideration.

Several PPPs are ongoing for the construction of the BRT. For the construction of several bridges and a line section, several PPPs of more than $20 million each have been signed. The total cost of the project is $250 million, of which two-thirds is financed by AFD.12 The operations of the BRT will be handled by a private operator selected through competitive bidding. It will be responsible for developing the depot, hiring and training drivers, and handling customer service functions.

Types of solutions and phasing

The Greater Amman Master Plan includes a Corridor Intensification Strategy for 10 separate but interconnected urban transportation corridors located in the west-central part of Amman and measuring over 40 kilometers in total length (e.g. Mecca, King Abdullah II, Queen Rania II, Zahran, and Arar streets). Investors are given incentives with the permission to build up to 50 percent of the plot (instead of 39 percent in Residential A and 45 percent in Residential B).

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COMMUNITY DEVELOPMENT RIGHTS

In 2007, the Greater Amman interim growth plan included a mechanism to allow for the purchase of “community development rights” by developers who would like to build higher than the allowed eight floors. This was presented in 2007 as the “Made in Amman Solution.” The developer would have been allowed to build up to 100 meters in height, on the condition that a quarter of the additional levels would be taxed to fund an Amman Community Development Fund. This fund was conceived to develop green areas and public infrastructure in eastern neighborhoods. This was designated as a land-value capture mechanism, or “Robin Hood” tax to achieve a fairer redistribution of public resources. (Figure 1).

The high-rise mixed-use plans offered land in the valleys to allow for 100-meter towers, along transportation corridors. Active transportation in the form of walking and cycling was also promoted. Specific design considerations were given, including a reduced number of parking lots. Four locations for the development of tall buildings were offered: the Al Abdali Business District in Shmeissani; the Central Parkway between the Abdoun Bridge and Prince Ali Bin Al Hussain intersections; the Al-Jubayhah Business Gateway along the Jordan Road, north of Al-Shaheed Ring Road and east of the Queen Rania Road; and the Amman Southern Gateway (Zeadat 2018).

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Figure 4
Amman community development rights
The community fund was created, but very few projects have contributed to it due to the global financial crisis in 2008. But more structurally, the high-density mixed-use plan for tall buildings was contested. Its purpose in using land within the valleys was to limit the apparent height of the buildings seen across the skyline. But when excavations started on the “Limitless” project, water appeared in the lowest part of Wadi Abdoun, blocking any further development. As this coincided with the financial crisis, several projects were suspended, which has left behind a landscape of excavations and unfinished towers (Amman Gate project, 6th circle).

**Density Bonus**

Since 2013, Greater Amman has offered developers wishing to build green a “density bonus” in the form of additional percentage to the original floor area ratio (FAR). This is expected to compensate the owner for the expected extra capital cost incurred from implementing green building. The main concept of the bonus is to allow a larger land coverage ratio within identical setbacks.\(^{14}\) As an incentive, green building applications are free of charge, on the condition that owners or developers have paid their property taxes (musaqafat). Certified green buildings are exempt from fees according to Amman’s 2019 building and zoning law.

Green building has been slow to build market share in Amman. It is considered to be too expensive by owner-builders and developers. So far, only 10 buildings have received the Leadership in Energy and Environmental Design (LEED) certification in Jordan. Building policies are set at the national level. Greater Amman plans to extend to owner-builders with more incentives and a better marketing campaign to build awareness.

Greater Amman currently faces difficulties acquiring land to create public parks, because since the mid-2000s land has become too expensive. Gardens and open space constituted less than 1.1 percent of the total area in 2015, with 9.1 square kilometers, which equaled just 2.2 square meters per inhabitant. In 2019 this figure increased to 11.7 square kilometers, including 8.6 square kilometers of parks.\(^{15}\) This is a major issue for the residents’ well-being. The World Health Organization recommends a minimum of 9 square meters per resident, and if possible 50 square meters (Russo and Cirella 2018). For Amman, this means that open spaces should reach 36 square kilometers and ideally 200 square kilometers. Nevertheless, the city is currently engaged in the design of 73 small parks with private participation by banks (in Jabal Amman 1st circle) and insurance companies (Jabal Amman 3rd circle). GIZ is also working closely with Greater Amman to transform vacant land into community parks.

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\(^{14}\) Specifically: 25 percent additional for Residential A; 20 percent additional for Residential B; 15 percent additional for Residential C; and 10 percent additional for Residential D.

Greater Amman is facing difficulties freezing the expansion of zoned land in its western part, under political pressure exerted by land owners. One of its planning policies is to foster the development of “Residential Green” zones in the western parts of the city on 2,000-m² plots of land (Green A and B) and 1,200-m² plots (Green C). In Residential Green A and B, only 39 percent to 45 percent of the plot can be built on, with a maximum of two floors and a total height maximum of 8 meters. This is presented as a solution to preserve green areas within the city for climate change purposes, but it does not allow for the expansion of public spaces.

**Risk management**

The cost of land acquisition is the main challenge in any upgrading or infrastructure project, because land value increases as soon as a development project is adopted. The Amman Ring Road Project included the objective to provide access to affordable land for productive investment and urban development. It was ambitious for the short time period and for the inputs provided through the project. The masterplans and promotional activities envisaged under the project would only provide seeds for further action plans and activities that would begin to address the objective proposed. A Land Acquisition and Resettlement Plan was completed before the ring road project could go ahead. As to resettlement, the initial survey indicated that the road project would impact about 500 plots, with about 1,900 identified owners (costing $40 million), the very large majority being private parties. Special attention was given to vulnerable groups, including women. Follow-up during implementation included independent monitor reviews. The final estimate was that 3,028 people were affected and the final cost of land acquisition amounted to $158 million—a 2.48-fold increase in the per-person cost.

Another risk to include is the lack of institutional support, as is the case between Greater Amman and the electric company in the waste-to-energy project. Al Ghabawi landfill for instance is only half a success. Jordan’s largest, and only lined, sanitary landfill serves five municipalities: Amman, Russeifa, Zarqa, Sahab, and Muwaqar. Located 32 kilometers from Amman, it has only one transfer station. Created in 2003, Al Ghabawi is the first municipal carbon finance partnership in the Middle East. The site receives 4,300 tons of solid waste daily (1.5 million tons in 2018). Since 2014, three cells have been producing methane gas; they could produce 4.8 million watts per hour for the grid. But due to governance issues with the public electricity company, this methane gas is flared off, further contributing to air pollution.
GEB outcomes and scale-up

In 2013, the Government of Jordan endorsed the National Energy Efficiency Action Plan (NEEAP), which sets a national energy efficiency target of 20 percent by 2020 and proposes concrete measures in a number of key sectors to guide Jordan towards a reduction in greenhouse gas emission. These tackle both the demand and the supply side. On the demand side, they address energy labels, lighting, reduction of energy consumption in public buildings (by 10 percent), building codes, and the development of minimum standards/specifications for appliances. On the supply side, they address solar water heaters, PV, capacity-building in wind energy and concentrating solar power, and the solar energy code. Further, the NEEAP outlines several horizontal and cross-sectoral measures, including tax exemptions for energy efficient and renewable energy equipment, development of energy service companies, a green lending program, and university curricula.

Amman’s C40 emission inventory measured the city’s emissions in 2014 at 7.4 million tons of CO₂e. This is similar to the emission of cities such as Paris, Philadelphia, and Washington, D.C. However, on a per-capita basis, Amman’s emissions are much lower than these cities’, at roughly 2.1 tons of CO₂e per person. Without action, emissions are projected to double by 2030 and would reach almost 40 million tons by 2050. Since the population growth rate is projected to be 1.8 percent per year until 2030, Amman’s population will reach 4.4 million in 2030, according to DoS (from 3.5 in 2015). Stationary energy and transportation are the two sectors that contribute the most to emissions (64 percent and 31 percent, respectively). More specifically, the largest subsectors of emissions were electricity in buildings and on-road transport.

During 2004–2014, residential energy consumption in Jordan grew at a rate of 8.5 percent, faster than the overall growth rate of 6.4 percent. Energy demand nationally grew 2.4 percent between 2005 and 2015, but this was significantly less than GDP growth, which increased at a rate of 4.4 percent per year. The country is already achieving a decoupling of economic development and energy consumption, a trend that needs to continue in order to achieve the 2050 Vision (Greater Amman 2019).

Amman’s resilience strategy, published in 2017, identifies a range of actions that will help city residents survive climate shocks and adapt and grow stronger. Jordan’s nationally determined contribution to the Paris Agreement commits to a reduction of greenhouse gas emissions by 14 percent compared to a business-as-usual scenario, by 2030. Jordan’s planned emission reduction actions are largely focused on
the energy sector. According to national level projections, national greenhouse gas emissions in 2020 will be roughly 38 million tons of CO₂e. According to CURB\textsuperscript{16} projections, the emissions scenario shows Amman at roughly 11 million tons of CO₂e in 2020, slightly less than a third of national emissions.

Several solutions have been adopted by Greater Amman to reduce its energy consumption. By 2020 solar panels will be installed on the rooftops of municipal buildings and LED lights will be installed along the main arteries (120,000 were installed in 2018) and in all Greater Amman buildings. The municipality has bought 100 electric cars, and in 2018 a Germany-based company, E-Charge, signed an agreement to install 10,000 electric charging stations across the country, many of which will be located in Amman.\textsuperscript{17} Greater Amman can further expand on their efforts by creating an awareness program for electric car incentives (World Bank 2019). But debates are ongoing concerning the 150 buses of the BRT project, as the EU and the AFD are pushing for electric buses, while Greater Amman is worried that the operator would not invest in such facilities.

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**Financing**

**ACCESS TO FINANCIAL RESOURCES**

In most projects, land acquisition for sites and services and upgrading is the key prerequisite. This has historically been a Greater Amman task, and in the 1980s, Greater Amman bought the land for UDP1 for sites and services projects. The Central Bank gave guaranties to the Jordan Housing Bank. The Urban Development Department (UDD) was the primary executing agency, with overall project responsibilities, and supervised the implementation. Construction loans were provided by the Housing Bank. An overview of several financing sources, sectorial and thematic allocations, and amounts is shown in Table 2.

The National Housing Corporation (NHC) was set up in 1965 under the Provisional Law No. 47 of the same year. Its functions were consolidated under Housing Corporation Law No. 27 of 1968. The main objectives of the NHC were to acquire land and design and construct housing for civil servants and limited-income groups, make recommendations to the government on housing policy, and grant loans for housing construction to cooperatives and to nominal and individual bodies.

Projects undertaken by the NHC have been substantially subsidized due to the fact that the NHC obtains most of its funds from the Central Bank on convenient financial terms.\textsuperscript{18} Also, government-owned land is provided free of charge, the

\textsuperscript{16} CURB is a World Bank interactive tool that is designed specifically to help cities take action on climate by allowing them to map out different action plans and evaluate their cost, feasibility, and impact. https://www.worldbank.org/en/topic/urbandevelopment/brief/the-curb-tool-climate-action-for-urban-sustainability

\textsuperscript{17} [www.jordantimes.com/news/local/10000-electric-car-charging-stations-be-built-jordan%E2%80%99]

\textsuperscript{18} at a 4.5% interest rate; it then on-lends to its clients at an effective rate of 4.5% over 20 years.
costs of land being recovered only if land has to be purchased. No property taxes are charged against beneficiaries until they have completed their repayments. Finally, annual house insurance premiums and the NHC’s operating expenses, mainly salaries, are met by government grants.

The service providers Amman Water and Sewerage Authority (AWSA) and WSC have waived their normal connection fees since the cost of on-site water and sewerage infrastructure (including connections) has been recovered from beneficiaries through plot charges. The fees to be waived are the charge of 25 percent of the value of the property in the year of installation and the charge of 4 percent per year for 20 years of the value of the property. However, the beneficiary has been required to pay the meter installation charge.

**UDP1 outcomes**

UDP1 reduced subsidies. The project even produced a small surplus of JD 1 million. Apart from the government’s contribution to costs associated with community facilities and off-site infrastructure, there has been no government subsidy for housing. The beneficiaries paid the cost of land acquisition, site preparation, on-site infrastructure, on-plot development, design, and supervision. The Urban Development Department (UDD) used cross-subsidies from the sale of commercial plots and some sales of Residential A. Beneficiaries were asked to make a down payment of 20 percent of the total cost of the plot or of the unit. Most of them took bank loans from the Housing Bank at 8.5 percent on 15-year loans. This is still the average for loans offered by commercial banks in 2019, although some banks also allow 20- and 25-year loans.

By making serviced land available at affordable prices, the project has shown that, when given legal access to land, households are motivated to invest time, effort, and financial resources in solving their own housing problems. This was amply demonstrated by the speed with which houses of good quality were constructed in slum areas, once land tenure had been granted to the residents. The overwhelming response to advertisements for the small serviced plots offered by the project also demonstrated high excess demand at the lower end of the housing market, due to the unavailability of affordable plots for low-cost housing.

**UDP1 cost sharing**

The Housing Bank participated in the low-income housing project by financing 43 percent of project costs, administering all project finances, and providing beneficiary mortgage loans for more than 70 percent of the total households in the project. Special conditions were granted to project beneficiaries, including the financing of up to 95 percent of the cost of land and buildings, whereas normally the Housing Bank would finance just 75 percent of the cost of the building only (World Bank 1989).
The UDP1 project cost a total of JD 21.3 million, of which JD 5.7 million was financed by the government of Jordan, JD 7.1 million by the World Bank/International Bank for Reconstruction and Development (IBRD), JD 7.4 million by the Housing Bank, and JD 1.1 million by internally generated funds. Civil work cost JD 14.5 million for residential units, JD 0.5 million for commercial units, JD 4.5 million for community facilities, and JD 0.4 million for technical assistance (UDD salaries and experts) (World Bank 1989). Note that the JD 7.1 million from the World Bank was equivalent to $24 million in 1987.

In the first year, the Housing Bank lost JD 58,903 each year on UDP1 operations, but these losses were covered by the surplus the bank made on other business operations. The Housing Bank provided 2,925 loans of, on average, JD 1,948 each. Residential plots were sold below their cost by subsidizing them from the surplus of the other plots sold at market prices. In addition, loans of JD 2,000 for building materials were granted to each beneficiary. The Central Bank of Jordan agreed to discount 30 percent of the Housing Bank’s total investment from its own resources lent to UDD at an annual reduced rate of 4 percent. Such a discount rate reduced the effective cost of the Housing Bank’s own money made available for the projects from 7.17 percent to 6.22 percent.

The World Bank has financed only 36 percent of the total UDP project costs. In 1980, the World Bank planned that the sites and services and upgrading components would together yield an estimated economic rate of return of 20 percent (World Bank 1983). The low-income housing project’s long-term replicability depended on the management of beneficiary repayments. Altogether, 70 percent of the plots were financed by Housing Bank loans, 20 percent of total beneficiaries, including a quarter of the upgrading beneficiaries, paid cash for their plots, and the remainder made monthly payments to UDD as they refused to take a bank loan on religious grounds.

The sites and services and upgrading projects came along with small business assistance and a manpower training program. The project included (i) serviced sites for shops and workshops, some with preconstructed core units, (ii) loans to small businesses for workshop construction, equipment, and working capital, (iii) vocational training for both men and women, and (iv) extension services for small businesses. The shelter program came along with employment projects in the form of shops, workshops, and core shop plots. They provided a range of retail and repair services on project sites.

Viability and feasibility

The financial viability of the UDP1 project depended on realizing adequate surpluses from the sale of commercial plots and some residential (type A) plots at market prices to cross-subsidize the low-income beneficiaries’ plots. The project
has been feasible thanks to the low cost of the plots. Whereas the cost for 1,000-m\(^2\) plots in Amman was more than JD 4,000, these plots cost about half that rate, around JD 300 per 150-m\(^2\) plot, or just JD 2 per square meter of served land.

In 1967, squatters had informally bought land at a cost of JD 1 per square meter using a *hujja* contract (a written informal contract between an owner and a buyer, not registered by the Department of Land and Survey, but recognized by courts) (Razzaz 1996). The most significant investment at the time was made by the informal-area dwellers themselves: at around JD 13,000 each to build an 83-m\(^2\) house. Note that the World Bank first suggested creating 100-m\(^2\) plots, but this was rejected by the government, which increased the size to 150 square meters. The size of rooms was also increased, from 3 x 3 meters to 3.6 x 3.6 meters. Some plots had a core unit, others were empty.

The World Bank also supported the construction of the Amman Ring Road between 2004 and 2014. It aimed, in part, to increase the efficiency of transport between the international airport in Amman and Jordan’s main industrial city of Zarqa, and to relieve congestion in Amman by rerouting traffic away from the city center. The development of an inland port with appropriate logistics was designed to build the necessary infrastructure to facilitate transport of trade and to remove existing bottlenecks. Transport sector studies and masterplans were to provide further guidance to take appropriate reform actions. By 2014 the ring road had been successfully built, and the airport highway to Amman had been widened to accommodate public buses, taxis, and cars.

**Composite combination of revenue resources**

For the Amman Ring Road project, the Government of Jordan contributed $194.6 million, and requested a loan from the European Investment Bank ($82.8 million), the Arab Fund for Economic and Social Development ($78.1 million), and IBRD ($71 million). Based on the input data outlined in the preceding section (the actual investment cost and the traffic volumes output from the original traffic model), the economic internal rate of return (EIRR) and the economic net present value (ENPV) have been calculated. The results of the economic analysis indicate that the viability of the ADC project is still positive, with an EIRR of 12.71 percent, despite the increase in investment costs since the original evaluation and the delay in completion.

A socioeconomic survey and census of project-affected persons (PAP) had already been carried out, also in 1999, as part of the Environmental Impact Assessment. An update of the ownership status of lands required for the ADC part of the ring road was carried out in August 2002, and an updated land acquisition analysis was issued in November 2003. A draft Land Acquisition and Resettlement Plan (LARP) for the project was submitted to the World Bank and disclosed for public inspection in February 2004. It indicated that the road
The project would impact about 500 plots, with about 1,900 identified owners, the very large majority being private parties.

An important adjustment to standard Jordanian practice up until that time was provision for post-compensation monitoring of PAPs, as required under World Bank guidelines. And a crucial element in the smooth implementation of the large-scale expropriation required for accomplishment of the project was the close cooperation that had already begun in 2003 between the two bodies mainly responsible: MoPWH (project management team and the community liaison officers) and the Department of Lands and Survey (DLS).

In the planning and management of the land acquisition, special attention was given to groups considered more vulnerable, and especially to women, who accounted for about one-third of the owners identified. Particular efforts were needed to ensure that these groups were properly informed, enabled to make their own decisions, and would actually receive the compensation and any other assistance offered. A particularly important measure was recruitment into a community liaison office, the unit responsible for direct contacts with PAPs throughout project implementation, of high-quality female staff. Another, much smaller group of PAPs that was also considered potentially vulnerable and in need of special attention was the users of customary rights, whose livelihoods almost totally depend on the rangelands through which most of the project runs.

Evolution over time of these resources

During the neoliberal economic shift, Greater Amman sold several of its plots of land to developers. In 2006, this led to the construction of two towers (Jordan Gate) at the sixth circle, on a plot planned to be turned into a public garden. This led to such a large protest that the mayor was replaced by His Majesty in 2006, and the new mayor was tasked with preparing a masterplan for the city.

Since 2006, Greater Amman has sold part of its land to investors. 18.6 hectares of municipal land has been sold to Sanaya Real Estate for $5.5 million. In July 2019, Greater Amman announced additional sales of its lands to investors. That is the worst way to capitalize on its land reserves; instead, Greater Amman should start renting vacant land to develop parks and additional open spaces for its population, along with community centers.
Informal areas upgrading with public participation

Land

Land was purchased by the government and sold at affordable prices to the informal settlement dwellers. The purchase of plots by beneficiaries allows projects to be replicated. Cross-subsidization by marketing the most desirable plots allows to finance affordable plots on footpaths and cul-de-sacs.

Infrastructure

The World Bank financed only 36 percent of the UDP total project costs. The Housing Bank and the government of Jordan paid the rest.

Amman Bus Rapid Transit

Land

The law permits the expropriation for public use of 25% of a plot of land for free, only once; typically this is done to widen streets.

Roads and infrastructure

AFD loan to the government of Jordan

150 million euros in 2011 (information not public later)

Amman Ring Road

Land

The indemnities for land acquisition were underestimated by a factor of 2.5 during the initial design. Vulnerable groups have received compensation.

$158 million for land acquisition


Replication

EXTERNAL VALIDITY

POLICIES PROMOTING PUBLIC PARTICIPATION in the upgrading of informal areas are no longer a priority in Jordan, as it has become too expensive for the government to purchase the land. In the 1980s, Jordan was very successful in improving the living conditions of poor dwellers and in allowing them access to home-ownership through long-term loans guaranteed by the government. However, since Amman is now working on the implementation of its climate plan, a citywide retrofitting project of formal and informal buildings with roof insulation and double-glazed windows could be added.
The city is concentrating its current efforts on intensification along the transportation corridors. But the impoverished central and eastern areas should also be included in detailed district urban planning. Linking the upgrading of informal areas to the Amman Resilience Strategy would benefit the large majority of residents. This policy is conducted by GIZ as part of the Green Infrastructure Project, repairing staircases and creating parks in the dense informal neighborhoods.

The 2019 Amman Climate Plan recommends some short-term objectives as well:

- **Improving** energy efficiency in Greater Amman municipal buildings and public lighting to show leadership and demonstrate cost-effectiveness;
- **Improve** the enforcement of existing building codes;
- **Incentivize** commercial and residential green building best practices for new construction;
- **Partner** with the national government and international organizations to implement energy efficiency programs for existing residential buildings.

**Figure 5**
Replication example, Greater Amman

POTENTIAL POLICY CONSIDERATIONS FOR FUTURE DEVELOPMENT PROJECTS

Energy efficiency. The energy efficiency programs that are currently receiving major attention should be associated with upgrading policies in informal neighborhoods inhabited by vulnerable citizens and refugees. This would be a way to revisit well-known upgrading policies and to link them to climate change mitigation policies.

The green building incentives are not sufficient for low- and medium-income households. The standardization of building materials (with limited sizes for windows, doors, and blocks) would allow a larger range of citizens to access affordable building materials and insulation solutions that would actually foster the development of more energy-efficient dwellings and neighborhoods.

Water management. Rainwater harvesting solutions such as collection wells should be subsidized by the government with donor support. In Jordan only 3.4 percent of households harvest water in cisterns, and in Amman only 0.4 percent do so. Most Jordanian buildings’ rainwater gutters are connected to the sewage networks, rather than to plastic tank or concrete cisterns. The new building code makes it mandatory to have concrete cisterns built during the excavation of the foundations for new buildings. The system is well developed by Palestinians as an inexpensive source of water and reduces flooding.

River restoration. Zarqa River restoration should be supported by the donor and international communities, as suggested by the urban growth scenarios. This has been requested by Zarqa Municipality for 30 years, because the riverbanks were informally built by polluting industries. Restoration, at least in the city center, would increase access to public parks in Amman’s metropolitan areas, improve air quality through reforestation, and contribute to the upgrading of poor neighborhoods along the river.

19 DoS Census 2015, Table 2.5.
INVENTORY OF SOLUTIONS

An overview of the Amman case’s inventory of solutions is shown in Table 3. In an economic context characterized by liberal policies and privatization, policies to upgrade informal areas allow municipalities to protect the public realm and coordinate large investments for the benefit of all. They can be linked to transportation development projects.

A citywide retrofit program could be adopted for existing buildings. This could include incentives to the adoption of a thermal building code and retrofit guidelines. This would require the standardization of construction materials in order to reduce their costs and allow citizens to install double-glazed windows and wall insulation at reduced costs.

<table>
<thead>
<tr>
<th>SOLUTIONS</th>
<th>MECHANISM</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>Upgrading of informal areas with public participation</td>
<td>Low-cost upgrading</td>
<td>Small serviced plots of land made available at affordable prices with legal property registration so that low-income residents and migrants could build homes incrementally on a self-help basis</td>
</tr>
<tr>
<td></td>
<td>Cross-subsidization</td>
<td>Marketing the most desirable plots allows to finance affordable plots</td>
</tr>
<tr>
<td>Intensification along development corridors</td>
<td>Community Development Fund “Robin Hood” tax</td>
<td>To increase density, the Amman 2007 interim growth plan included a mechanism to allow for additional floors</td>
</tr>
<tr>
<td></td>
<td>Green Density Bonus</td>
<td>To allow larger land cover ratio and additional floor area with green construction</td>
</tr>
<tr>
<td>Urban Growth Scenarios</td>
<td>Improving energy efficiency in Greater Amman municipal buildings and public lighting</td>
<td>LED lights and solar panels in public buildings and streets</td>
</tr>
<tr>
<td></td>
<td>Green building</td>
<td>Incentivizing commercial and residential green building best practices for new construction</td>
</tr>
<tr>
<td></td>
<td>Building retrofitting</td>
<td>Partnership with national government and international organizations to implement energy efficiency programs for existing residential buildings.</td>
</tr>
<tr>
<td>Green Infrastructure Project</td>
<td>Increase walkability</td>
<td>Outdoor staircase renovation to link informal neighborhoods to the Bus Rapid Transit lines</td>
</tr>
<tr>
<td></td>
<td>Community parks</td>
<td>Parks created on slopes and brownfields</td>
</tr>
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</table>

Distributed renewable energy systems present a great opportunity for the Amman metropolitan area, because it is very sunny. Greater Amman has created and shared design guidelines for rooftop solar PV systems. Combined with the 2012 Renewable Energy Law, which allows individuals to sell excess output back to the grid, a substantial uptake in rooftop solar PV has occurred. By 2017 around 25MW of rooftop solar capacity was installed. However, the exchange price per kilowatt between producers and the grid should be revisited.

Creating energy using clean sources at the city level will reduce city government spending on energy, freeing up resources for other initiatives. It could also lead to an increase in jobs and a reduction in air pollution, while reducing reliance on imported fuel and oil. For individuals installing building-integrated solar systems, household spending on utilities will be reduced. In addition, jobs in the renewable energy engineering, construction, operations, and maintenance sectors would increase.

Greater Amman needs to increase its green open spaces by modifying existing regulations through zoning and the creation of more public open spaces. Greater Amman also needs to properly enforce existing regulations and zoning policies to implement its 2025 masterplan and stop urban sprawl.

The second urban development plan, initiated by the World Bank in 1996, managed to develop new neighborhoods where commercial property and the more desirable housing sites on main streets were sold at market prices to cross-subsidize lower-costs plots on walkways for low-income beneficiaries. This created mixed-income communities with the full range of infrastructure, public buildings, and urban and social services they required. Following this model, the Royal Court is currently developing three housing and urban revitalization initiatives in partnership with the private sector, in Amman, Zarqa, and Irbid.

It is now time to develop mechanisms for land-value capture solutions: purchase of community rights (e.g. with a tax on additional floors above the eighth to fund social housing, as suggested during the 2007 masterplan consultative sessions); increases in vacant land taxation; or the renting of vacant land plots located in the heart of the city to develop open spaces.
Density

Amman’s city core has been densifying. Municipal area population density nearly doubled between 2000 and 2017 from 1,500 to 2,800 people per square kilometer.

Figure 6
POPULATION DENSITY, 2000

Municipal
- Maximum: 20,014 people/km²
- Minimum: 2 people/km²
- Average: 1,543 people/km²

Metro (using 2007–2013 boundary)
- Maximum: 10,483 people/km²
- Minimum: 3 people/km²
- Average: 107 people/km²
AMMAN: COMPREHENSIVE CLIMATE PLANS

Figure 7
POPULATION DENSITY, 2017

Municipal
Maximum: 47,816 people/km²
Minimum: 1 person/km²
Average: 2,796 people/km²

Metro (using 2007–2013 boundary)
Maximum: 23,614 people/km²
Minimum: 1 person/km²
Average: 260 people/km²

Figure 8
Overlay of density levels, 2000–2017
REFERENCES


**ABBREVIATIONS**

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<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>AURPG</td>
<td>Amman Urban Region Planning Group</td>
</tr>
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<td>AWSA</td>
<td>Amman Water and Sewerage Authority</td>
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<tr>
<td>BRT</td>
<td>Bus Rapid Transit</td>
</tr>
<tr>
<td>CIP</td>
<td>Community Infrastructure Program</td>
</tr>
<tr>
<td>CITIES</td>
<td>Cities Implementing Transparent, Innovative and Effective Solutions</td>
</tr>
<tr>
<td>CSBC</td>
<td>Construction and Sustainable Building Center</td>
</tr>
<tr>
<td>DLS</td>
<td>Department of Lands and Survey</td>
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<tr>
<td>DoS</td>
<td>Department of Statistics</td>
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<tr>
<td>EBRD</td>
<td>European Bank for Reconstruction and Development</td>
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<tr>
<td>EIRR</td>
<td>Economic Internal Rate of Return</td>
</tr>
<tr>
<td>ENPV</td>
<td>Economic Net Present Value</td>
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<tr>
<td>FAR</td>
<td>Floor Area Ratio</td>
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<tr>
<td>GACDP</td>
<td>Greater Amman Comprehensive Development Plan</td>
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<tr>
<td>GAM</td>
<td>Greater Amman Municipality</td>
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<tr>
<td>HUDC</td>
<td>Housing and Urban Development Corporation</td>
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<tr>
<td>JGBC</td>
<td>Jordan Green Buildings Council</td>
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<tr>
<td>LARP</td>
<td>Land Acquisition and Resettlement Plan</td>
</tr>
<tr>
<td>LEED</td>
<td>Leadership in Energy and Environmental Design</td>
</tr>
<tr>
<td>MoPH</td>
<td>Project Management Team and the Community Liaison Officers</td>
</tr>
<tr>
<td>NEEAP</td>
<td>National Energy Efficiency Action Plan</td>
</tr>
<tr>
<td>NHC</td>
<td>National Housing Corporation</td>
</tr>
<tr>
<td>PAP</td>
<td>Project-Affected Person</td>
</tr>
<tr>
<td>SURE</td>
<td>Project SURE: Systemic Approach to Sustainable Urbanization and Resource Efficiency in Greater Amman Municipality</td>
</tr>
<tr>
<td>UDD</td>
<td>Urban Development Department</td>
</tr>
<tr>
<td>UDP1</td>
<td>Urban Development Project 1</td>
</tr>
<tr>
<td>UNRWA</td>
<td>United Nations Relief and Work Agency</td>
</tr>
<tr>
<td>USAID</td>
<td>US Agency for International Development</td>
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</tbody>
</table>

**Currency exchange rate:** 1 USD = 0.71 JD (June 2020).
Bangalore, India
Crossing Boundaries to Integrate Core and Periphery

Amartya Deb, Jaya Dhindaw, and Robin King
CASE STUDY 3: METROPOLITAN BANGALORE

Crossing Boundaries to Integrate Core and Periphery

Amartya Deb, Jaya Dhindaw, and Robin King


The Synthesis Report offers a range of integrated solutions (Mehrotra 2020).
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Box 1  How eight local urban bodies improved their creditworthiness to float bonds
Box 2  What is Tender SURE?
THE SOLUTION

Crossing boundaries to integrate core and periphery

Figure 1
Integrated planning model

KEY FINDINGS

1. Bangalore has achieved sectoral and spatial integration at a metropolitan scale by supplementing its Masterplan with interim measures. This has strengthened its strategic capacity to accommodate rapid urban change and could be a solution for other cities with long periods between plans.

2. The Karnataka Water and Sanitation Pooled Fund Trust (KWSPFT) scales the integration of water and sanitation sectors across administrative boundaries. Increased efficiency and sharing of risk enabled the fund to access market finance, while tax-free municipal bonds were used to extend piped water and underground drainage into peripheral urban areas.

3. The metropolitan-level integrated delivery of water services and complete streets highlights the potential agencies created for specific purposes can have in facilitating coordination between different sectoral silos, civil society, and the private sector. Densification, improved walkability, and last mile public transit connectivity in the city core can lower emissions while similar initiatives on the periphery can reduce sprawl.
IDEA IN BRIEF

Bangalore’s rapidly expanding metropolitan periphery has a fragmented spatial growth. A multiplicity of stakeholders are involved in service delivery across the various administrative boundaries that form the metropolitan areas. Water supply and sanitation service delivery is an example of sectoral integration that demonstrates how urban local bodies (ULB) have collaborated across their administrative boundaries with the support of state government and private organizations. Another example, of road upgrading, reveals how multiple agencies are delivering tactical urban solutions such as completing street networks.

Complementing the masterplan, this case highlights how integrated urban planning and implementation in Bangalore happens through a combination of long- and short-term initiatives, and with civil society efforts that complement traditional public sector led integrated urban planning solutions. Innovative solutions that helped implement projects include creation of nodal agencies to coordinate across administrative boundaries. A special purpose entity helps access finance through market borrowings. Bangalore continues to depend on central and state government grants to implement and scale up integrated planning solutions.
URBAN EXPANSION (1791–1955)

1955
1791
1854

URBAN EXPANSION (1854–1985)

1985
1955
1990
1995
2005
2010
2015

MAP 1
URBAN EXPANSION
1985–2015

Urban extent by year

Sources: German Aerospace Center (DLR); IDOM: NASA SRTM 30m; OpenStreetMap Contributors

Map projection: UTM Zone 43S, WGS-84 Datum
The Metropolitan Context

BANGALORE IS THE CAPITAL of the southern India state of Karnataka.1 Since the 1940s, Bangalore has seen two epochs of population growth and urbanization that moved it away from its traditional urban form and established global linkages (Nair 2005). First, from the 1940s to the late 1950s, several state-owned enterprises2 were established in and around the city, devoted to manufacturing electronic equipment for defense purposes. Second, from the early 2000s, population has grown exponentially because of a national effort to attract private information technology (IT)-sector investment that has driven successful economic development.3

Metropolitan Bangalore contains 36 percent of Karnataka state’s urban population. Between 2001 and 2011, the city saw a 35 percent growth in population. In 2007 the municipal Bangalore Mahanagara Palike corporation’s jurisdiction was expanded from 226 square kilometers to 741 square kilometers by the creation of the Greater Bangalore Municipal Corporation (Bruhat Bangalore Mahanagara Palike, BBMP) (Sudhira, Ramachandra, and Subrahmanya 2007). Since 1949, Bangalore’s area has increased tenfold (Sudhira, Ramachandra, and Subrahmanya 2007).

Whereas many cities grow from a dense core to less dense suburbs, Bangalore has developed pockets of dense growth on its periphery. Satellite data reveal that since the early 2000s rapid urban expansion of built-up areas has occurred in an outer ring around the city (Map 1). Each ward in the core city has a population of 21,000 to 33,000 people, while the peripheral wards have anywhere from 50,000 to 95,000 people each (Siddaiah, Ravichandar, and Yashvanth 2015). This indicates the increasing demand for service delivery to the city’s periphery.

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1 Bangalore was officially renamed Bengaluru.
2 Known in India as Public Sector Undertakings (PSUs).
3 Soliciting private companies followed liberalist policies adopted by the national government.
Since the 1990s, Bangalore has emerged as a prime hub for IT firms, attracting investment from private corporations from India and abroad. The resulting economic opportunities coupled with relatively high levels of social and physical infrastructure have been responsible for a surge of immigration into the city (Bose 2013). This growing population and commercial investment have increased the demand for land serviced by roads, utilities, and amenities. With Karnataka aspiring to move from a US$120 billion to a $700 billion economy by 2035, (Pandey 2016), this demand will only increase.

**BANGALORE’S URBAN AGGLOMERATION**

Our study’s scope is the urban agglomeration of Bangalore. The present Bangalore metropolitan area is governed by the BBMP, which was formed in 2007 by merging seven city councils, one town council, and 111 villages into a single metropolitan administrative area. However, even with this merger, the actual urban extent of Bangalore now spreads beyond the jurisdiction of the metropolitan authority (Map 2).

**FINANCING AT THREE LEVELS**

Bangalore is financed by three main revenue streams: the central government, the state of Karnataka, and the city’s own-source revenue. Of the metropolitan authority’s total revenue of $1.4 billion (9,244 crores) in the fiscal year 2017–18, more than half was raised by the municipal corporation, BBMP, mainly from property taxes and service charges (Janagrahaa 2018). Direct grants from the central government make up only 4 percent of BBMP’s revenue, whereas the state government provides almost half of BBMP’s revenue (Janagrahaa 2018). Although BBMP’s budget for FY2015–16 shows how the elected body earns and spends revenue in sectors such as horticulture, roads, drainage, and welfare, parastatals such as the state-owned Bangalore Water Supply and Sewerage Board (BWSSB) and Bangalore Electricity Supply (BESCOM) have their own sources of revenue, so their spending in the city is not reflected in the city budget.

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*All currency is in U.S. dollars. 1 U.S. dollar = 68.45 Indian rupees as of July 2019.*
To estimate population density, LandScan uses remote sensing imagery analysis to disaggregate census counts within an administrative boundary. As a result, built-up areas such as airports and industry may appear to have a residential population where there isn’t one.

MAP 2
POPULATION DENSITY 2017
Population per square kilometer

SOURCES: LANDSCAN; NASA SRTM 30m; OpenStreetMap Contributors

MAP PROJECTION: UTM ZONE 43S, WGS-84 DATUM

5 KILOMETERS
Integration

HOW INTEGRATED PLANNING IS DEFINED AND ADOPTED

As this case study highlights, although the city’s masterplan is the formal, legal tool for integrated urban planning, in fact integration at the metropolitan scale occurs via piecemeal planning and implementation, with the masterplan as a guiding framework. Well-planned neighborhoods and industries that could be representative of integrated planning—such as Malleswaram (Map 3), Basvanagudi, neighborhoods within the cantonment area, public-sector-undertaking townships, and to some extent the IT parks—have been developed through strategic initiatives rather than drawn from a unified city vision. As the city has grown into a metropolis, complexity in power, jurisdiction, finance, and authority has also increased, making integrated urban planning even more of a challenge.

Under the Karnataka Town and Country Planning Act of 1961, cities produce a masterplan every 10 years. In the past, this instrument has helped urban local bodies align their plans with national and state priorities. But the scale of intervention through this instrument is limited. While the masterplan prepared by the Bangalore Development Authority (BDA) forms a strong foundation for regulating city development, it is not able to provide a detailed road map for development because enforcement, implementation, and revenue collection all lie with other agencies (Gopiprasad and Shankar 2016). Due to the long gaps between revisions (10 years) the masterplan has been unable to keep up with the rapid rate of urban growth (Kappan 2013). Moreover, plan preparations do not allow room for the tactical maneuvering and adjustments required in policies to respond to the challenges that emerge during these gaps.

One problem—well acknowledged by professionals involved in Bangalore’s planning process—is that the agencies responsible for the city’s service delivery

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5 A news article in The Hindu (Kidiyoor 2019) brings out that transit-oriented development policy is not a part of Bangalore’s most recent masterplan, and the processes for preparing the two documents were separate; nevertheless both were submitted to the state government.
work in silos. The following telling anecdote from a member of the BBMP restructuring committee, which was set up to address the present challenges of Bangalore, shares a contextual definition of integrated planning:

“Say for example the state [Karnataka] wants to [construct] an apparel park in Devanahalli. An integrated planning process would ask where will people stay? Where will the jobs come from? How will people travel to the apparel park and back? Where is the educational infrastructure and social infrastructure for people in the area? Are electricity connections available? So integrated planning would take into consideration [issues] across the silos to make that apparel park a success, but we don’t have it. We will say [instead], the apparel park is the job of the KIADB (Karnataka Industrial Area Development Board). [The KIADB will designate a] land parcel [as an] apparel park, and they magically expect all other agencies will work towards the success of this. [But] it doesn’t happen [in Bangalore].”

Interviewed city professionals agree that intersectoral coordination and collaboration is not the norm, but that such cross-sectoral integration is nevertheless desirable and that it occasionally occurs despite the odds.

Planning in Bangalore happens in silos, and responsibilities for service delivery are fragmented among several agencies (BBMP 2017c). In the mobility sector, for instance, different government agencies have responsibilities for road construction, running the bus service, running the railways, and installing and maintaining the pedestrian infrastructure. At the same time, services that run along the roads—like electricity, water, and sewage—are the responsibility of another set of agencies. A committee set up to

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8. V. Ravichandar, BBMP restructuring and integrated urban planning in Bangalore, interview with A. Deb, Bangalore, April 19, 2019.
9. V. Ravichandar, BBMP restructuring and integrated urban planning in Bangalore, interview with A. Deb, Bangalore, April 19, 2019.
evaluate the status of BBMP found that currently in Bangalore, collaboration is unlikely since agencies operate with their own guidelines and funding sources and have limited capacity and resources (Siddaiah, Ravichandar, and Yashvanth 2015).

This lack of coordination among public agencies jeopardizes the intended effects of planning and can ultimately lead to poor service delivery. The procurement of spatial data by the public agencies in Bangalore is a good example. In Bangalore, several government departments need the same spatial data sets. But in reality, each agency outsources the creation of geospatial data separately (BBMP 2017a). This leads to unnecessary replication of information and increases the costs of procurement. Moreover, data are prepared by different consultants without standardized guidelines, resulting in inconsistent and often inaccurate data sets (BBMP 2017a). Another example is land procurement, which public projects often require. A lack of coordination or cooperation between BDA, the agency responsible for land procurement in Bangalore, and other agencies has led to increases in the time and cost of projects (BBMP 2017b). For example, the peripheral ring road was envisioned in 2005, but it has yet to be realized (Lalitha 2019).

Even within the transportation area, there is little coordination between bus and metro authorities. Bus stops are not coordinated with metro stops. Ridership, and thus finances, could increase with better coordination. Another challenge is duplication of services, with buses plying the same stretches as the metro rather than being allocated to less-served areas. These examples suggest that lack of governmental coordination makes it impossible to optimize assets.

While in theory the masterplan (or a land use plan) is the closest representation of sectoral and spatial integration, incorporating views from all agencies and serving as an instrument to map the city’s growth for the future, in reality this does not happen. Instead, in Bangalore horizontal integration has occurred in at least two other ways: first, through an overarching agency bearing the responsibilities of multiple sectors as we see with BWSSB and second, through legal mandates as in the case of Tender SURE (Tender Specifications for Urban Roads Execution).

The Greater Bangalore Water and Sanitation Project (GBWASP), which planned and delivered water supply and sanitation infrastructure to the peripheral areas

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11 S. Maiti, Integrated urban planning in Bangalore and STAMP project, interview with A. Deb, Bangalore, April 12, 2019.
12 V. Ravichandar, BBMP restructuring and integrated urban planning in Bangalore, interview with A. Deb, Bangalore, April 19, 2019.
13 A. Mahesh, Integrated urban planning in Bangalore and BBMP restructuring, interview with A. Deb, Bangalore, April 19, 2019.
14 R. Ashok, Integrated urban planning in Bangalore and STAMP project, interview with A. Deb, Bangalore, April 16, 2019.
15 R. Ashok, Number of planners in BBMP, interview with A. Deb, Bangalore, July 8, 2019.
16 A. Nair, BBMP restructuring reports and municipal finance, interview with A. Deb, Bangalore, April 22, 2019.
### TABLE 1. URBAN INNOVATIONS

<table>
<thead>
<tr>
<th>INNOVATION CHRONOLOGY</th>
<th>DESCRIPTION</th>
</tr>
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<tbody>
<tr>
<td>1800s</td>
<td><strong>Market and fort</strong> The market (petta) and fort are the oldest areas of Bangalore that still form a secure human settlement.</td>
</tr>
<tr>
<td>1860s</td>
<td><strong>Military Station or Cantonment</strong> Established during British rule, the cantonment was developed for military purposes. Neighborhoods within the cantonment were equipped with public spaces, electricity, drainage, water supply and sanitation.</td>
</tr>
<tr>
<td>1890s</td>
<td><strong>Planned neighborhoods</strong> Two neighborhoods (Malleswaram and Basavangudi) were planned as “model hygienic suburbs” to avert the risk of epidemic outbreaks.</td>
</tr>
<tr>
<td>1950s–1960s</td>
<td><strong>Public Sector Undertakings</strong> Designated as public sector undertakings, several central-government-owned industries were set up in Bangalore. They mainly catered to the defense sector.</td>
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<tr>
<td>1980s–1990s</td>
<td><strong>Special Economic Zones for Technology Parks</strong> Following the introduction of neoliberalist policies in India, two early information technology (IT) parks—Electronic City and Whitefield—were set up in Bangalore to encourage private-sector investment in Bangalore’s economy.</td>
</tr>
<tr>
<td>1999–2004</td>
<td><strong>Bangalore Agenda Task Force</strong> This task force was formed in 1999 by the Chief Minister of Karnataka to bring civic leaders and public agencies together to make decisions for the city.</td>
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<tr>
<td>1993 and 1999</td>
<td><strong>Citizen Report Cards</strong> The Public Affairs Centre, a Bangalore-based nongovernmental organization, introduced a score card to assess the performance of public agencies through user reviews.</td>
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<tr>
<td>2002</td>
<td><strong>Outer Ring Road</strong> A high-speed outer ring road for buses, goods-carrying vehicles, and personal vehicles was completed.</td>
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<tr>
<td>2005</td>
<td><strong>Karnataka Water and Sanitation Pooled Fund Trust</strong> This trust is a special purpose entity to pool finance for eight urban local bodies. Tax-free municipal bonds contributed 15 percent—100 crores—of the Greater Bangalore Water and Sanitation Project (GBWASP) budget.</td>
</tr>
<tr>
<td>2006–2012</td>
<td><strong>Karnataka Municipal Reform Project</strong> This was a World Bank–financed statewide project to improve municipal services.</td>
</tr>
<tr>
<td>2007</td>
<td><strong>BMP to BBMP expansion</strong> The expansion of the municipal boundary of Bangalore to include 7 city municipal councils, 1 town municipal council, and 111 villages around it, now called the Greater Bangalore Authority or Bruhat Bangalore Mahanagara Palike (BBMP).</td>
</tr>
<tr>
<td>2007–2015</td>
<td><strong>Greater Bangalore Water and Sanitation Project</strong> Project to extend water supply and sanitation services to eight local urban bodies around Bangalore.</td>
</tr>
<tr>
<td>2009</td>
<td><strong>Big10 bus routes</strong> Identification of express bus transit corridors between major activity centers in the metropolitan area such as the IT job centers of Electronic City and Whitefield. The bus routes run radially to include nodes in all directions of the city.</td>
</tr>
<tr>
<td>2009</td>
<td><strong>Peripheral Ring Road</strong> High-speed corridor for buses, goods-carrying vehicles, and run on text rather than breaking after ‘person’.</td>
</tr>
<tr>
<td>2009–ongoing expansion</td>
<td><strong>Tender SURE roads</strong> Civil society prepared a set of guidelines called Tender SURE that enabled the government to implement better road designs. Better-planned street sections have encouraged pedestrian movement in the city through wider footpaths and reduced traffic congestion.</td>
</tr>
<tr>
<td>2011–ongoing expansion</td>
<td><strong>Metro Rail</strong> The Metro Rail mass transit system operates from the north, south, east, and, west of Bangalore.</td>
</tr>
<tr>
<td>2014–2017</td>
<td><strong>BBMP Restructuring Committee</strong> A restructuring committee set up by the chief minister authored a set of reports offering recommendations for more efficient administration and governance of the metropolitan area.</td>
</tr>
<tr>
<td>2017–ongoing</td>
<td><strong>Implementing the BBMP restructuring recommendations</strong> Several recommendations by the BBMP Restructuring Committee are now being implemented. The state government is actively pursuing two others: creating a standard GIS database for Bangalore’s Spatial Information Center and passing the Greater Bangalore Governance Bill.</td>
</tr>
</tbody>
</table>

*Source: World Bank with a team of WRI India experts, 2019.*
within the metropolitan area, was implemented through BWSSB, which was authorized by statute to cover all eight urban local bodies. In another instance, Tender SURE was initially proposed by a civil society alliance. These are a set of specifications that act as guidance for road construction—or upgrading—in a complete streets approach. Tender SURE is now a rapidly scaling program funded and implemented by the state of Karnataka, after its approval by a state technical advisory committee.

Horizontal integration across social, economic, and environmental sectors does not happen at the same time but rather through a series of decisions often taken discontinuously over time. Since the 1800s, Bangalore has responded to crises such as epidemics, job scarcity, population explosion, housing deficit, increasing traffic congestion, and degrading natural ecosystems. These crises have been followed by responsive interventions in housing, commerce, transport, water supply, and sanitation (Table 1). But in responding, the 10-year wait for masterplanning was not always practical. Given the imminent nature of problems, special-purpose vehicles or entities were often established. The Bangalore Metro Rail Corporation Limited and Karnataka Water and Sanitation Pooled Fund Trust (KWSPFT) are two prominent examples of institutions set up outside the masterplanning process to deliver mass transit and water supply and sanitation solutions, respectively. Table 1 shows the chronology of innovative interventions from the 1800s, through attempts at servicing the metropolitan area with water, sewerage, and transportation, to the present when the government is considering recommendations from a committee that was set up by the chief minister to study these efforts and draw lessons for more efficient administration and governance of the metropolitan area. Figure 1 maps these projects showing the cumulative effects in the metropolitan area.

**PROCESSES, ACTORS, FINANCING, AND IMPLEMENTATION MECHANISMS**

Both public and private initiatives have enabled integrated planning in Bangalore. The key processes have included drafting a city development plan coordinating various sectors, formally integrating the water and sanitation sectors under one agency, expanding the municipal boundary, setting up special purpose vehicles (or entities) and ad hoc committees, building and using coalitions, engaging in public advocacy with the government, increasing public participation, obtaining international financing conditionality, and assigning institutional accountability within the public sector.

The implementation of programs included a multi-stakeholder ecosystem of actors, including donors, guarantors, and institutions providing technical support. National actors include the Government of India and its finance commission. Provincial institutions (state agencies) have included the Bangalore...
Figure 4  Strategic projects in Bangalore, 1800–2011
Source: Amartya Deb, based on data from the German Aerospace Center, DLR, Google Maps, Open Street Maps, Bangalore Metro Rail Corporation Limited, and Bangalore Metropolitan Transport Corporation.

Note: Bangalore urban growth epochs

Projects

1800s Petta and fort
1860s Military station
1890s Planned neighborhoods
1950s First PSU (ITI colony)
1960s PSU bloom phase
1980s Electronic city (1978)
1990s Whitefield
2002 Outer ring road
2009 Big 10 bus routes (BRT)
2011 Metro rail
Water Supply and Sewerage Board, Bangalore Electric Supply, and the Karnataka Urban Infrastructure & Development Finance Corporation. At the city level, BBMP and other urban local bodies, nongovernmental bodies, private firms, and citizen groups are important actors.

Civil society organizations and corporations play an important role in decision making within Bangalore, and they have a particularly strong history. The Bangalore Agenda Task Force, set up in the 1990s, includes corporate leaders who helped turn Bangalore into an IT hub. Nair (2005) documents how this task force managed to get commitments from all the public agencies on a common vision. The Public Affairs Centre, a nonprofit, established, citizen report cards, a user feedback mechanism to hold public services accountable. More recently, civil society has shifted from an advisory role to consultation and advocacy. The Tender SURE guidelines, for example, were prepared by civil society organizations before being adopted by the BBMP and the state of Karnataka.

The local public sector has promoted integrated planning through expanding municipal administrative boundaries to include peripheral areas. The expansion from Bangalore Mahanagara Palike (BMP) to Bruhat Bangalore Mahanagara Palike (BBMP) was crucial to increase revenue collection, and it also enabled coordination among agencies for operations and management at the metropolitan level. One senior official at the water supply and sewerage board pointed out a similar integration of zones for delivery of water supply and sanitation services, which occurred through a government order in 1994, to simplify the redressing of complaints. This arrangement later made it possible to implement integrated plans for water and sanitation through initiatives like GBWASP in 2004 and a state trust fund formed in 2005 to help eight local urban bodies finance water and sewer extensions.

TOOLS FOR INTEGRATED PLANNING

Bangalore’s service delivery is largely financed by grants from the public sector and international donors. The GBWASP project is financed by the public sector as well as the World Bank. Tender SURE roads are being built all over Bangalore through direct grants from the state government. Mechanisms such as pooled financing and intergovernmental transfers have encouraged horizontal integration through cross-sectoral and interjurisdictional planning along with intergovernmental coordination. KWSPFT was created to jointly finance eight urban local bodies within Bangalore’s metropolitan area. The fund, which also

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17 P. Kumar, Assistant Controller Finance, BWSSB, interview with A. Deb, Bangalore, August 7, 2019.
The City Railway Station, with links to two metro lines and buses offering connectivity across Bangalore, acts as a focal point for the wider metropolitan region.

Source: Amith Nag Photography/Moment via Getty Images.
accepts central and state government funding, enables the urban local bodies to access market finance without a state guarantee.

Four types of planning and financial tools enabled integrated planning in Bangalore. They include legal tools, agreements and guidelines, financial tools, and rule-setting for financial transfers.

- **Legal tools** include masterplans and government orders.
- **Agreements and guidelines** include memoranda of understanding (MoU), special committee reports, and technical guidelines (such as construction guidelines), which are influential due to their high-level political endorsement and bureaucratic involvement.
- **Financial tools**: grants, loans, and pooled financing, as well as efforts to sell bonds to private investors and user fees for service.
- **Rules that set conditions for financial transfers** include revolving funds like the Mega City Scheme\(^\text{18}\) for slums.

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### Implementation and Financing

**TWO PROJECTS ARE EXAMPLES** of successful cross-sectoral and interjurisdictional integration between government agencies in the Bangalore metropolitan area. One was led by the metropolitan public water authority and the other initiated by private sector to address urban design and walkability. The first program integrated the water and sanitation sector in response to a fragmentation of service delivery in the urban periphery. The second required various service providers to collaborate in setting up utilities like streetlights, drainage, and water piping along with roads and footpaths to build better road infrastructure. The dynamics involved in implementing policies and projects are discussed through these two examples, which represent a microcosm of the rapidly growing city’s integration challenges. This section will analyze the actors involved, the institutional architecture, the sustainability issues, and private participation in these two projects separately along with an analysis of risk management.

**GREATER BANGALORE WATER AND SANITATION PROJECT**

Use of a pooled financing model furthered sectoral integration in a major water and sanitation project across administrative jurisdictions. Although the BWSSB

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\(^\text{18}\) The Mega City Scheme was a central government initiative launched in 1995 for seven cities, of which Bangalore was one. kuidfc.com/ENG/project_megacity.htm.
was already responsible for delivering water and sanitation under one umbrella, extending water and sanitation facilities from the core city to its periphery required coordination among eight urban local bodies.

This $14 million project was needed to service a huge area of recently settled areas in the expanded greater Bangalore region. Figure 3 shows the area of expansion.

Interjurisdictional collaboration helped the urban local bodies access market finance—without a state guarantee—for the first time. National institutions have traditionally obtained financing for urban infrastructure development by borrowing from global funding agencies. Growing pressure on the national government has led state governments to also seek such funding. In this case, eight urban local bodies sought market financing through the node of a state trust fund. These urban local bodies were incorporated as central players into the ecosystem of actors that ranged from the international level including World Bank and the U.S. Agency for International Development (USAID), state bodies such as the development and finance corporation and a specially created trust fund, to the BWSSB. The pooled financing model for Bangalore was adopted by Karnataka from Tamil Nadu.

In 2005, urban local bodies on Bangalore’s metropolitan periphery assumed risks for raising finance for a water supply and sanitation project. Donor agencies such as Indo-USAID and the World Bank provided technical assistance to BWSSB, which was primarily responsible for implementing the project. While neither the Government of India nor the state of Karnataka had a direct role, their policy reforms helped access market finance (Box 1).

BOX 1. HOW EIGHT LOCAL URBAN BODIES IMPROVED THEIR CREDITWORTHINESS TO FLOAT BONDS

To access resources without a state-government guarantee, the urban local bodies together floated tax-free municipal bonds. Their pooled financing allowed them to access market finance to tackle this large-scale project while avoiding costs such as individual documentation and marketing and helping to spread risk among the stakeholders (Government of Karnataka 2016; World Bank 2016).

But to issue tax-free bonds, the bodies needed a single node, created by the state for this purpose, called the Karnataka Water and Sanitation Pooled Fund Trust, which was backed up by a credit guarantee from the United States Agency for International Development (USAID). The Karnataka Urban Infrastructure & Development Finance Corporation (KUIDFC)
served as the nodal agency between the borrowers (urban local bodies) and investors (bond holders).

The local urban bodies needed to prove creditworthiness to attract private investment in their bonds. They needed to prove to investors that they would be able to manage and repay the loans.

In addition to an escrow account for financial risk mitigation, each of the eight urban local bodies maintained a ring-fenced water project account. This account received payments from both urban local bodies and the state government toward debt servicing. KUIDFC acted as the fund manager for the KWSPFT bonds. Because the municipal bonds would benefit from being tax-free, KWSPFT coordinated directly with the central government’s income tax department. Revenue and capital transactions for the GBWASP project were reportedly maintained by BWSSB, under prevailing standards for accounting systems set at the time by the Institute of Chartered Accountants, India.

Factors that played a role in obtaining bond financing were:

- Commitment under the bond requirements for repayment, enhanced by a credit guarantee from USAID of 50 percent
- Setting up a monitored and structured payment mechanism between the urban local bodies and bondholders through an escrow account with 25 percent of borrowed capital
- Improvement in the credit quality of the urban local bodies, due to Karnataka’s tax revenue growth and a reduction of state government expenditure
- Upgrading in bonds’ credit ratings, reflecting the reduction of financing risks for investors due to the increase in the share of fiscal transfers from central government to state government through the Fourteenth Finance Commission.

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a The urban local bodies (represented by BWSSB) transferred payments from revenue sources like taxes and tariffs, and the state government offered annual operating grants for debt servicing.
b The pooled fund trust had several requirements beyond financial reporting. The BWSSB, as the implementing agency, would have to carry out tasks based on the Karnataka government’s directions. BWSSB was to distribute water to the eight councils equitably. The project could cater to industrial demands, but feeder lines were to be laid at BWSSB’s own costs. To lay underground drains and build the water supply infrastructure, roads had to be dug up, and the cost of restoration was borne by respective urban local bodies. Normal operations and management costs of the project, however, were part of the project fund. While a project management unit and several committees were set up by BWSSB, the implementing agency had the liberty to hire two engineers for the implementation of the GBWASP project (KWSPFT 2019, p. 23).
c K. Ramesh, General Manager Finance, KUIDFC, interview with A. Deb, Bangalore, August 20, 2019.
d K. Ramesh, General Manager Finance, KUIDFC, interview with A. Deb, Bangalore, August 20, 2019.
e Compound annual growth rate of 13 percent during 2012–16.
The agencies involved either had pre-existing mandates, were ordered to cooperate, or were created to carry out the task. The key implementing agency, BWSSB, had a mandate to service much of the city of Bangalore and the eight urban local bodies. A government order required the eight urban local bodies to come together to pool financing through bonds. Thereafter, the urban local bodies signed an MoU with BWSSB to implement the GBWASP project.

Karnata’s 2002 state water policy encouraged the private sector to participate in “planning, investigation, design, construction, development and management of water resources project” (Government of Karnataka 2002). The state government felt that introducing private corporate management would enhance project efficiency. Bangalore’s urban local bodies expanded the policy to include the private finance sector, jointly floating bonds to finance the GBWASP (See Figure 3).

Pooled financing was effective in overcoming the limited autonomy that Bangalore’s urban local bodies faced in funding infrastructure. The 74th Constitutional Amendment Act, 1992 had failed to adequately involve urban local bodies in sharing risks with the state government, thus weakening their ability to access market finance individually (Garg 2007).

In the end, the project saw little participation from conventional private investors: four out of the five banks investing in the bonds were public institutions. The reluctance of the private sector to invest in these bonds was credited to water being the commodity in question. Officials at KUIDFC hold that commercialization of core public goods such as water is not feasible, since the municipality is obliged to offer these goods at subsidized rates. Market financing for goods that the poor depend on for basic needs is not deemed to be feasible, given the political pressure on retaining affordable rates of service delivery.

In addition to seeking finance through bonds, the urban local bodies charged a one-time user connection fee to the beneficiaries. At the start of the project, the rate was about $124 (INR 8,500) for domestic users and $248 (INR 17,000) for commercial or industrial users. Planners estimated that if 50 percent of the household and businesses in the area paid for connections, it would bring in $17.4 million (INR 119.4 crores).

GBWASP had previously faced criticism in terms of accountability and efficiency in delivering services (Ranganathan, Kamath, and Baindur 2009). Citizens complained about the having to make upfront payment and to pay penalties for late payments. As a result, the BWSSB revised rates, introduced installments, and waived penalties. After these measures, the model was better received (Ranganathan, Kamath, and Baindur 2009). The government mandated that all users connect to the new system, but it is not clear whether that happened.

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19 All eight urban local bodies—Bommanahalli, Byatarayanapura, Dasarahalli, Krishnarajapuram, Mahadevapura, Rajarajeshwari Nagar, Velahanka, and Kenigari—became part of Bangalore Metropolitan area after the expansion of BMC to BBMP in 2007.
A senior KUIDFC expert pointed out that “estimations in early stages” were made but it was later learned that user fees were, in reality, far higher than expected, as high as 70 percent of the project cost.20 In comparison, total borrowings, including the market funding of $14.6 million (100 crores) in bonds and state loans of $4.4 million (30 crores) did not exceed $21.9 million (150 crores) K. M. Ramesh, general manager of finance for the KUIDFC in charge of the KWSPFT portfolio, made this point:

“The KWSPFT was an experiment for financing future projects, and the minute we said water will be given, beneficiaries’ (urban local bodies’) contribution was much more because they were assured of the water supply. Of course, there were initial hiccups. But since the project covers basic needs of citizens, they were willing to pay – provided agencies implemented them seriously and efficiently.”21

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A. LAND PRESSURE ON THE OUTSKIRTS

Although a relatively low-density area at the periphery of Bangalore, Kengeri is one of the 8 urban local bodies (ULBs) where the KWS pool fund project was targeted. Before and after images between 2004 and 2019 should show the increase in built-up area – signaling the pressure on urban growth over time and increasing demand for service delivery at the peripheral areas of Bangalore metropolitan area. In 2019, one can also find a segment of outer ring road in Bangalore and the effects of urbanization that has occurred, suggestively due to water, sewerage and transit infrastructure.

B. NEW METRO BUILT IN THE HEART OF THE CITY

This is a high density area at the heart of Bangalore city. Between 2005 and 2019 one can find a metro station to come up in this area as well as development of Tender SURE roads. The Tender SURE roads can be thought of as upgradation of existing roads as opposed to new emerging roads. This location could also be chosen for a before-after depiction; since in 2005 there was neither the metro station, nor the Tender SURE roads.

C. URBAN DEVELOPMENT IN THE RIVER BED

D. URBAN SPRAWL AROUND INFOSYS CAMPUS

Figure 6

Then and now, 2015, 2019
**Figure 7** Greater Bangalore water supply and sanitation project: Serviced area, before and after

**Greater Bangalore Water Supply and Sanitation Project (GBWASP)**

**Pooled financing by 8 ULBs**
- Serviced core
- Extended services to 8 ULBs
- BBMP boundary

Integrating peripheral areas by extending services of piped water supply and underground drainage. 8 ULBs in Bangalore raised INR 100 Crores (USD 13.9 million) through tax-free municipal bonds to fund GBWASP; along with central and state government grants, beneficiary contribution and government loans.

Experts at KUIDFC hold that while residents initially tend to resist user fees because they are often misled with “false propaganda” about privatization and higher tariffs, they are reported to have been more willing to pay for receiving better services.22

Figure 7 shows how a multi-stakeholder ecosystem funded the water and sewerage extension to Bangalore’s outer urban bodies. The total cost was calculated to be $14 million with 18 percent supplied by one-time user connection fees, 35 percent from international funds (mainly the World Bank), 22 percent from the urban local bodies’ municipal bonds, 14 percent from grants from the central government, and 11 percent from state grants. In fact, the user connection fees funded 35 percent of the project. The state provided 11 percent – about half of its target. Private finance was only 10 percent of the tax-free municipal bonds, which provided 22 percent of project finance.

**TENDER SURE**

Road construction is typically a complex affair that involves excavation, installing water, sewerage, and electric lines, urban forestry work, and finally street infrastructure, with each carried out by a different public agency. The lack of coordination among these agencies has led to newly tarred roads being dug up for installing underground infrastructure; which leads to a waste of time and funds.

Tender SURE (Specifications for Urban Utilities & Road Execution) brought public agencies together to collaborate on how to build or rebuild roads that are safe and cater to a variety of transport modes including, mass transit, autos, informal transit, cycling, and walking (Box 2).

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22 K. Ramesh, General Manager Finance, KUIDFC, interview with A. Deb, Bangalore, August 20, 2019.
The Tender SURE initiative originated outside government with several civil society organizations who came up with a plan that was later funded by the state and implemented by the city. The project highlighted how to make the already-serviced core area more efficient by addressing critical missing connections between networked infrastructure and city’s physical form. Sadoway and Gopakumar (2017) refer to this as “assemblage urbanism” and point out how implementation requires that civil society be engaged with a range of government and nongovernment actors to form political networks.

The Bangalore City Connect Foundation completed a pilot on one road in 2009, and then worked with the nonprofit Jana Urban Space Foundation to complete a

**BOX 2. WHAT IS TENDER SURE?**

Tender SURE is a multi-crore project aiming to upgrade roads in the Central Business District to international standards. According to Jana Urban Space Foundation (JUSP) that is spearheading the project, Tender SURE (Specifications for Urban Road Extension) road standards mandate the integration of networked services under the road – water, sewage, power, optical fiber cables, gas, and storm water drains.

The design of Tender SURE roads prioritizes the comfort and safety of pedestrians and cyclists, and recognizes the needs of street vendors and hawkers. Tender SURE combines street landscape and hardscape aesthetics with practical considerations of user behavioral change.

All civic agencies are involved in project discussions from the planning stage and their role in the planning, execution and maintenance is finished.

Focus points of Tender SURE are:

- De-incentivize use of private transport
- Uniform lane width
- Pedestrian-friendly footpaths
- Utility ducts on both sides of the roads
- Cycle lanes wherever feasible

Tender SURE roads are pilot or model roads that are planned to last longer than the current conventional lowest-bid contractor-laid roads, that not only need constant maintenance and repair but also keep getting dug up by other service providers. In Tender SURE, the monitoring system in place is supposed to be strict and is expected to ensure that standards are adhered to and the traditional commission system is completely removed from the picture.

Figure 8  Scale up with TenderSURE

Mass transit is integrated with social and economic opportunities as street works and walkability are improved.

Sources: TenderSURE project report by Jana Urban Space; BBMP data.

TenderSURE roads
Completed and ongoing works across the city

TenderSURE actors
The project is an unusual interagency effort in Bangalore that addressed the need to reconfigure electric, water, and sewerage lines for road construction (B.R. 2014). Additional actors included political leaders, public officials, and civil society organizations. For the first phase, Tender SURE received grants from the state government with BBMP as the nodal agency to manage funds and coordinate the agencies involved in implementation.

A bottom-up perspective
Taking a bottom-up perspective on planning, Dhindaw, Ganesan, and Pai (2017) explains how coalitions of institutions in Indian cities outside of the formal public institutional architecture have led to transformative change. The Tender SURE project demonstrates that a bottom-up approach within the system can influence integrated planning in a positive manner and push government actors toward integration. The Tender SURE project demonstrates the potential for new ways of working across sectors for improved service delivery. This project is a good example of how private and civil sector participation in Bangalore has been key to delivering non-networked infrastructure, even without a formal public-private partnership.

The process of preparing and advocating Tender SURE guidelines to upgrade roads was entirely carried out by nongovernmental organizations and private firms without

manual in 2012, which served as the technical guidelines and basis for a state government budget allocation in 2012. After that, Tender SURE projects were implemented by the BBMP with grants from the state government (B.R. 2014).

Sources:
23 BESC OM, BWSSB, and BBMP are the related agencies.
24 S. Ramanathan. Integrated urban planning in Bangalore and tender SURE project, interview with A. Deb, Bangalore, April 22, 2019.
any formal commitment from the public sector at the early stages – thus marking an important turning point for governance in the city. However, once the government was convinced, Jana Urban Space Foundation, one of the key private agencies in advocacy, entered into a design and technical partnership with the city and state governments for project delivery (Bangalore City Connect Foundation 2012).

The sustainability and scaling of the project now rests with the government, which is upgrading 55 roads, of which 12 have been completed across the metropolitan area. Land ownership and authority for road construction, upgrading, and maintenance are vested with the government (Figure 4).

Despite being a landmark of integrated urban planning in Bangalore, Tender SURE has been critiqued for its high cost and lack of flexibility in design (Bharadwaj and Ramani 2014). Some are skeptical about privatization in the construction of roads, while others note the missed opportunity for enhancing the city’s tree cover and groundwater recharge from rainwater runoff because of the hard surfaces and lack of trees in Tender SURE design (Sheshadri and Pai 2016).

**RISK MANAGEMENT**

Projects faced four types of risk: that of delay and disappointment, financial risk, construction risk, and risk of sustaining the project over time.

**Risk of delay and disappointment**

Delay in financial flows between the funding and implementing agencies can hinder projects, pushing their timelines further out, and incurring extra costs. In the case of KWSPFT bonds, this risk was mitigated by a government order that the state of Karnataka must allot sufficient funds in the budget so that the KWSPFT term loans could be paid to the respective agencies in a timely manner. Another common hindrance to timely delivery stems from the need to obtain approvals from multiple government agencies to access market finance. A lesson from Tamil Nadu’s water and sanitation project, a precursor to Bangalore’s project, was to include more explanation in documents and clarify the credit enhancing mechanisms involved (World Bank 2016).

**Financial risk**

Inadequately planned finances put projects at risk during implementation. However, detailed project reports can identify such risks ahead of time. For the water and sanitation program, reports by two private firms revealed that the original project proposals developed by the public sector would not be financially feasible (KWSPFT 2019). This helped the government of Karnataka decide to adopt the alternative financing mechanism of pooled financing to mitigate risks. Although accessing private finance for infrastructure can add a new source of funds, the credit rating and credibility of urban local bodies must be solid. Setting up an
escrow account for KWPST and using bank guarantees helped improve the credit ratings of the pooled fund by mitigating financial risks (see Box 1).

Construction risk
Availability of land is a common problem for implementing projects (Kappan 2019). For example, land is needed to construct pumping stations for water supply and sanitation projects. In addition to lack of land for laying infrastructure, the GBWASP faced the challenge of natural features that posed barriers to constructing a sewerage network. These hurdles, in addition to an incomplete design of the sewerage system, led to dysfunctional infrastructure. As a result, sewage has been let out into drains instead of being properly treated. The BWS-SB has deployed technical teams to identify and resolve the “missing links.”

Sustainability risk
Lack of resources (or revenue) affects a project’s operation and maintenance over time. In the case of the bonds raised for GBWASP, the urban local bodies benefitted through increased intergovernmental transfers (ICRA 2016). Political changes can stall projects or deprioritize them, in effect harming their operation, augmentation, management or maintenance. Making Tender SURE’s implementation was the state government’s responsibility has helped minimize this risk, although it remains to be seen if the roads will be properly maintained as the years pass.

Global and Local Environmental Outcomes

BANGALORE HAS INCREASED global environment benefits through strategic infrastructure projects.

**CHANGES IN TRANSIT PATTERNS REDUCES AIR POLLUTION AND GREENHOUSE GAS EMISSIONS**

Encouraging walkability and reducing congestion within the city core through complete streets can reduce emissions from fossil fuels, stimulate local economies, and help densify the city core. A denser city core is a counterweight to urban sprawl, which is known to encroach into natural landscapes around a city and create automobile-dependent communities that add to carbon emissions (Sudhakaran et al. 2017).

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The community-initiated Tender SURE project has helped encourage accessibility to mass transit and reduce traffic congestion through well-designed streets. A well-designed road infrastructure helps reduce carbon emissions by encouraging walkability as well as shorter travel time (B.R. 2014). However, after implementation of 12 projects under Tender SURE, some local urbanists argue that the lack of consideration for trees and swales in Tender SURE roads will hinder groundwater recharge and discourage biodiversity, which depends on tree cover. More trees would help improve pedestrian comfort by providing shade to counter urban heat island effects and in turn mitigate emission of greenhouse gases (Sheshadri and Pai 2016). Applying this suggestion could enhance the global environmental benefits in the 50 upcoming Tender SURE projects.

For infrastructure projects, mitigation of adverse impacts on the global and local environment should be part of the project design, construction, and operation. While infrastructure provides residents with services and a better quality of life, its construction, if not properly planned, can degrade habitats and generate more carbon emissions through transportation and fossil-fuel based machinery contributing to the acid rain that destroys local natural and cultural resources level and accelerating global climate change (Independent Evaluation Group 2007). By integrating the sewerage and water-supply sectors, the city aims to reduce waste discharge into the surface water bodies in its jurisdiction.

WATER AND SEWERAGE IMPROVEMENTS REDUCE POLLUTION AND IMPROVE HEALTH

Piped water supply has helped reduce groundwater exploitation and mitigated the risks of groundwater contamination. Maintaining a higher water table has been beneficial for flora and fauna in the region, and reducing water pollution has provided direct health benefits and improved livability for Bangalore’s metropolitan population. The Bangalore water supply and sanitation project (BWSSP) was designed to avoid severe impacts on topography, surface water, soil quality, and cultural resources (Infrastructure and Energy Sector Unit 2006). However, moderate impacts—such as a lowering of the ground water table due
to excavation, pollution from suspended particulate matter in the air, and noise due to transportation and the operation of equipment—were unavoidable (Infrastructure and Energy Sector Unit 2006). Careful planning and assessments of GBWASP largely limited these impacts so they were temporary, confined to the construction phase. ☐

Conclusion

BANGALORE’S RAPID GROWTH over the past two decades has presented formidable challenges for urban planning because its planning systems have not been in sync with economic growth and physical expansion. Encumbered by lengthy and time-consuming processes with undefined goals and budgets, along with a lack of capacity and authority, urban local bodies struggle to meet the ever-rising developmental demands that growth placed upon them. Additionally, a multiplicity of organizations and overlapping responsibilities has often resulted in disjointed planning.

Integrated urban planning in Bangalore is thus defined as not only the combination of sectors such as transport, water, sanitation, and others related to service delivery; but also the coordination among different administrative agencies that work toward planning and implementing projects for the sustainable development of the urban agglomeration. The case of Bangalore illustrates the notion that at the metropolitan scale, integrated planning happens through both long-term decision-making processes and interim or midcourse interventions. In addition to the city’s masterplan, which is prepared every 10 years, interim strategic projects are planned and executed in between. The latter are often not a part of the masterplan but have required or led to coordinated efforts among different stakeholders. The GBWASP and Tender SURE projects highlighted in this study are two such initiatives that were not part of the masterplan.

Given the broad-brush planning approach of the masterplan, which often fails to harmonize with local ground realities, those two projects make the case for complementing the masterplan with other plans, projects, and policies that are strategic in nature, with terms that are immediate or at least variable (from the

The case of Bangalore illustrates the notion that at the metropolitan scale, integrated planning happens through both long-term decision-making processes and interim or midcourse interventions.
masterplan) and the implementation of which may start locally. Often, instances of integrated planning in Bangalore have been seeded locally as proof of concept—and Tender SURE is one such example.

**STRENGTHS OF THE MULTI-STAKEHOLDER MODEL**

Engagement with a larger stakeholder community has helped move policy changes. Furthermore, arranging a multi-stakeholder ecosystem model for integrated planning has both made projects cost-effective and better mitigated risks and conflicts in service delivery. The multi-stakeholder model has included citizens as well as private and public actors across sectors and administrative jurisdictions. For instance, urban local bodies in Bangalore accessed funds for GBWASP through a combination of grants, revenues and innovative market finance, thus involving commitments from various actors in both public and private sectors.

Solutions like pooled financing and improved and complete streets required coordination among multiple agencies and administrative units. Although these initiatives in Bangalore were implemented through multi-stakeholder ecosystems including government organizations, civil society organizations, and private businesses, their processes and directives remained largely top-down, both in implementing integrated urban planning solutions and, especially, in addressing challenges of inclusion. Both Tender SURE and GBWASP bear testament to this.

In the case of GBWASP, an overarching agency with the mandate to address both water and sanitation across administrative jurisdictions (BWSSB) proved efficient in delivering integrated solutions. However, an issue that plagued GBWASP was a lack of transparency in the funding, and the costs of operation and maintenance added a lack of clarity concerning coverage for the urban poor.

For Tender SURE, BBMP’s administration of the initiative as a model road project has led to better scale-up. However, this approach also led to discontent among groups of citizens and elected representatives, who maintained that the process was not consultative.

In both cases, given the extensive requirement of facilitating coordination between different actors, the creation of nodal agencies was an effective mechanism. KUIDFC served as the nodal agency for coordinating finance for the GBWASP, which made sense, given the lean structure and capacities of BWSSB at the time, while BBMP was the nodal agency in charge of pilot road selection and implementation for Tender SURE.

**THE FUTURE OF INTEGRATED PLANNING IN BANGALORE**

Given the history of planning efforts in Bangalore juxtaposed against the challenges of its recent expansion and growth, the government realized it needed a more holistic effort to address the root cause of poor resource management,
service delivery, and other inefficiencies. To that end, the BBMP restructuring (BBMPr) process (2014–present) was initiated and remains the only formal effort by the government to envision the future of integrated planning in Bangalore. The BBMPr encompasses both cross-sectoral and spatial integration in service delivery within the Bangalore metropolitan area.

In 2015, with increasing public grievances about how the city was handling its finances and service provision, the government realized the need for an institutional change to deal with the multiplicity of institutions. This resulted in the Bangalore: Way Forward Report and the BBMP restructuring reports.
Initiated by the chief minister of Karnataka, these reports, which were created for the metropolitan area, recommended for the first time several programs and policies to improve coordination and collaboration among different government agencies and help them break out of their silos. Following the submission of this report, the government moved toward implementation of two of the 10 proposed recommendations.

First, a spatial data and information center (Bangalore Spatial Information Centre, or BASIC) responsible for gathering and disseminating GIS-related information for the metropolitan area, is moving forward. Having a single agency responsible for spatial data should reduce the costs of procuring data and make data sets consistent.

Second, by operationalizing the proposed nodal agency, the Greater Bangalore Authority (GBA), the government would bring under one umbrella the various service-providing agencies, such as BBMP, BESCOM, and BWSSB, and BDA, the agency currently in control of land planning processes. This is a good response to the problems of accessing land for public projects following the amendments of the Land Acquisition Act in 2013, which increased the cost of procuring land by government agencies. The GBA is envisaged to have statutory powers; a GBA bill has been proposed, which may later become law. Given that this initiative is only a little over a year old, with its full implementation certain to take time, for now at least the need for integrated urban planning has been acknowledged and is being addressed.

**INSIGHTS FOR THE GLOBAL SOUTH**

The Bangalore case study presents several insights for other cities in the global south facing similar challenges of rapid population growth and urban expansion. The dynamics between the national, provincial, and local governments matter and require close examination. Further, nonimplementation of the 74th Amendment to the Indian Constitution, which looks to devolve power to the local scale, has resulted in weak urban local bodies across most Indian cities. Bangalore’s case shows how cities can overcome this somewhat by aligning their urban development plans and projects with policies and programs at the national and provincial levels. However, the GBWASP financing experience illustrates
how market finance—when that is synonymous with commercialization without a plan for the urban poor—is problematic for supplying public goods that are viewed as basic needs. This project provides a lesson for financing agencies and urban local bodies as to when and how pooled financing for local projects can be appropriate. To sum up, the preconditions for project success are both extrinsic and intrinsic: extrinsically, they include the willingness of investors and beneficiaries, things that are out of a project planner’s control, while intrinsically they include functioning nodal agencies, committees, and mechanisms, all necessary to project implementation.

Integrated urban planning in the Indian context needs a major overhaul. In Bangalore, as in other Indian cities, the power to drive action is held by the state government and, to some extent, by the municipal corporation. But given the rapid growth of the city outside municipal limits and the need to solve problems like waterlogging and waste management at the local level, there is a massive need to decentralize governance and to empower metropolitan and local wards. At the same time, there is a strong need to integrate spatial and economic development plans.

Finally, the continued availability of basic resources is key to ensuring the sustainability and liveability of a metropolitan area. While civil society organizations asking questions and demanding clarity are essential to engaging the government, there is a pressing parallel need to move toward solutions for difficult problems that cannot be solved with further capital investments. Eventually, a resource-secure future will require investing in solutions that look at reducing consumption patterns, making behavioral changes, focusing on renewable resources, and adapting legal frameworks for management, while at the same time providing equitable access to all. Sharing knowledge through live metropolitan labs, technical deep dives, and peer-to-peer learning through platforms such as the Global Platform for Sustainable Cities (GPSC)27 will help raise awareness of potential approaches to address these pressing issues.

The Greater Bangalore Water and Sanitation Project financing experience illustrates how market finance—when that is synonymous with commercialization without a plan for the urban poor—is problematic for supplying public goods that are viewed as basic needs.

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27 GPSC is a partnership and knowledge platform that promotes integrated solutions and cutting-edge support for cities seeking to improve their urban sustainability; www.thegpsc.org/about.
Density

Bangalore’s rapidly expanding metropolitan periphery has a fragmented spatial growth. Multiplicity of stakeholders are involved in service delivery across the various administrative boundaries that form the metropolitan areas. Water supply and sanitation service delivery is an example of sectoral integration that demonstrates how urban local bodies (ULBs) have collaborated across their administrative boundaries with support of state government and private organizations. Another example, of road upgrading, reveals how multiple agencies are delivering tactical urban solutions such as completing street networks.

**Figure 9**

**POPULATION DENSITY, 2000**

<table>
<thead>
<tr>
<th></th>
<th>Municipal Max</th>
<th>Municipal Min</th>
<th>Municipal Avg</th>
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<tbody>
<tr>
<td>Max</td>
<td>63,184 people/km²</td>
<td>351 people/km²</td>
<td>19,564 people/km²</td>
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<tr>
<td>Min</td>
<td>30,715 people/km²</td>
<td>225 people/km²</td>
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</tr>
<tr>
<td>Avg</td>
<td>2,697 people/km²</td>
<td>2,697 people/km²</td>
<td>2,697 people/km²</td>
</tr>
</tbody>
</table>

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Municipal Max

Metro Max
Figure 10
POPULATION DENSITY, 2017

Municipal:
- Maximum: 63,185 people/km²
- Minimum: 205 people/km²
- Average: 24,173 people/km²

Metro:
- Maximum: 28,785 people/km²
- Minimum: 11 people/km²
- Average: 4,440 people/km²
REFERENCES


ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>BASIC</td>
<td>Bangalore Spatial Information Centre</td>
</tr>
<tr>
<td>BBMP</td>
<td>Bruhat Bangalore Mahanagara Palike</td>
</tr>
<tr>
<td>BBMPr</td>
<td>BBMP Restructuring</td>
</tr>
<tr>
<td>BDA</td>
<td>Bangalore Development Authority</td>
</tr>
<tr>
<td>BESCOM</td>
<td>Bangalore Electricity Supply</td>
</tr>
<tr>
<td>BWSSB</td>
<td>Bangalore Water Supply and Sewerage Board</td>
</tr>
<tr>
<td>GBA</td>
<td>Greater Bangalore Authority</td>
</tr>
<tr>
<td>GBWASP</td>
<td>Greater Bangalore Water and Sanitation Project</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>INR</td>
<td>Indian Rupee</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>KIAADB</td>
<td>Karnataka Industrial Area Development Board</td>
</tr>
<tr>
<td>KUIDFC</td>
<td>Karnataka Urban Infrastructure &amp; Development Finance Corporation</td>
</tr>
<tr>
<td>KWSPT</td>
<td>Karnataka Water and Sanitation Pooled Fund Trust</td>
</tr>
<tr>
<td>MoU</td>
<td>Memoranda of Understanding</td>
</tr>
<tr>
<td>Tender SURE</td>
<td>Tender Specifications for Urban Roads Execution</td>
</tr>
<tr>
<td>ULB</td>
<td>Urban Local Bodies</td>
</tr>
<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
</tr>
<tr>
<td>USD</td>
<td>United States Dollar</td>
</tr>
<tr>
<td>WRI</td>
<td>World Resources Institute</td>
</tr>
</tbody>
</table>

Currency exchange rate: 1 USD = INR 68.45 (July 2019).
Dammam, Saudi Arabia
City of Mega-Projects

Antar AbouKorin, Abdulrahman Alsayel, and Hazem Abdelfattah
CASE STUDY 4: METROPOLITAN DAMMAM

City of Mega-Projects

Antar AbouKorin, Abdulrahman Alsayel, and Hazem Abdelfattah


The Synthesis Report offers a range of integrated solutions (Mehrotra 2020).
Decarbonizing by metropolitan densification and national diversification

KEY FINDINGS

1. Housing projects making use of existing arterial roads have increased the spatial integration of Dammam and neighboring Khobar. Large-scale transport infrastructure projects are central to metropolitan spatial and economic integration.

2. Almost all urban infrastructure and public services are funded by central government, although there is a desire to move towards fiscal self-reliance at the municipal level.

3. Infilling between urban centers has positively contributed to the Dammam Metropolitan Area’s sustainability. Increased density has reduced emissions and the rate of fossil fuel consumption, while preserving agriculture land. Urban integration promotes economic agglomeration and sharing of metropolitan-wide water and sewerage infrastructure. Plans for wider public transport coverage may advance spatial integration between housing, jobs and amenities.
IDEA IN BRIEF

In a resource-rich economy, a mosaic of federally or privately funded mega-projects—ports, housing, coastal resorts, defense, education, industrial parks—can be spatially and sectorally integrated with transport infrastructure and can decarbonize by utilizing vacant land for densification and introducing mass transit systems.

City planners in Dammam combined integrated planning with incremental implementation through a series of development plans that set growth priorities and establish future development limits, particularly in the desert context, to prevent high-carbon-intensity sprawl. Concurrent with oil-production-related rapid urban expansion, the integration process began with the identification of growth centers, like neighboring towns, and connecting them along the coast. This metropolitan integration was then scaled up to the province level, and then along the Gulf internationally, utilizing transportation infrastructure and coastal mega-development projects.

To expand global environmental benefits, Dammam has plans to introduce mass transit, and it is incentivizing urban densification to balance the competing demand for fertile agricultural land and sensitive marine ecosystems at the metropolitan level. Nationally, policymakers are decarbonizing by diversifying the economy, growing non-oil segments like cultural heritage and sustainable tourism.
The Metropolitan Context

BACKGROUND

The Dammam metropolitan area (DMA) is the capital of the Eastern Province of the Kingdom of Saudi Arabia. It lies at the heart of Saudi oil production and is the major gateway to the other Gulf Cooperation Council (GCC) countries. The DMA comprises Dammam, Dhahran, and al-Khobar. Although these were originally three small and quite separate fishing villages, they have expanded over the years and merged into the DMA (JLL 2014, 2016; MOMRA-KSA 2008).

The DMA is also the commercial center of the Eastern Province, which has historically been considered the economic powerhouse of the country, accounting for half of its total oil and gas reserves. Saudi Aramco, the world’s largest and most valuable oil company, is based in the DMA.

From the 1960s and more markedly since the 1970s, Dammam has dramatically changed from a small, mainly rural community to a highly urbanized metropolitan area. The economic diversification of the national economy now being sought by Saudi Vision 2030 will inevitably reduce the DMA’s traditional dependence on the hydrocarbon sector over time and will increase the importance of its other distinctive characteristic and its close connectivity with the surrounding GCC nations.

The population of the DMA has grown rapidly since the mid-1970s. Since 1974 it has increased sevenfold, from 263,000 inhabitants (Dammam Urban Observatory 2014) to 1.9 million as of 2019 (Dammam Urban Observatory 2019), so that it is currently the third-largest conurbation in the kingdom. The annual growth rate of the population in the DMA region between 2005 and 2015 reached 2.3 percent (General Authority for Statistics, Saudi Arabia 2017); were that rate to continue the region’s population would be expected to reach 3.05 million in 2040. This would mean an increase of about 1.16 million people over the next 21 years, an increase of 62 percent over today’s population. Such a huge increase in population means that about two-thirds of the current urban area, infrastructure, and services will be needed in the next 21 years. This situation increases concerns over the pressure that will be placed on existing infrastructure and services.
THREE VILLAGES

Damman’s rapid urban expansion has occurred primarily in the low-elevation coastal zone with a high concentration of mega-projects and critical infrastructure that may be at risk of coastal inundation due to storm surge and eventually sea-level rise.
Different drivers of environmental degradation have been identified in this area. On the one hand, unsustainable growth patterns, and inadequate infrastructure are challenging future economic development and compromising existing natural resources. And on the other hand, climate change is a further burden on the environment. This growth is also enhanced by the fact that Dhahran is one of the richest regions in the world in oil and natural gas and in Dammam, there are no permanent waterways, and groundwater can be found located in water bearing rocks which are surface deep.

- More than 485 ha of mangroves have been lost as a result of large scale beach infringement/land reclamation. The coastline is highly polluted and coastal marine life endangered.
- Beach infringement (aprox.) 14000 ha | Mangrove lost (aprox. 485 ha).
- Impacts: water stagnation, degradation of ecosystems and biodiversity threaten to local economy-fisheries, and large investments with limited positive consequences.

**Figure 3**
Then and now, 2005–2019

**KING ABDULAZIZ SEAPORT**

**KING FAHD SUBURB**

**DHRARAN INDUSTRIAL ACTIVITIES**

**BEACH INFRINGEMENT SINCE 1955**

- More than 485 ha of mangroves have been lost as a result of large scale beach infringement/land reclamation. The coastline is highly polluted and coastal marine life endangered.
- Beach infringement (aprox.) 14000 ha | Mangrove lost (aprox. 485 ha).
- Impacts: water stagnation, degradation of ecosystems and biodiversity threaten to local economy-fisheries, and large investments with limited positive consequences.
In terms of transportation, the DMA is highly connected at many levels—local, sub regional, regional, national, and international. Locally, connectivity and integration have continued to increase over time, with both existing and proposed road networks providing high connectivity to all parts of the region. The 2015 street connectivity study carried out by UN-Habitat concluded that street density in DMA reached values relatively close to the standard proposed by UN-Habitat’s City Prosperity Initiative (UN-Habitat 2015).

On a sub-regional level, the DMA is connected to the Qatif and Ras Tanura governorates by several regional roads. Many other regional roads were proposed in the Structural Plan for Metropolitan Dammam and the Governorates of Qatif & Ras Tanura (hereafter, the Structural Plan) approved in 2008. On a regional level, the DMA is connected with the rest of the Eastern Province governorate by several regional roads, and via air transport with the governorates of Al-Ahsa (international airport) and Hafr Al-Batin (domestic airport). Railway lines—both passenger and cargo—also connect the DMA to Al-Ahsa governorate in the south. The Structural Plan proposed many other regional roads that would make DMA more integrated and connected to its region.

On the national level, the DMA is connected to the rest of the country by several national roads. The Dammam–Riyadh–Jeddah road is the country’s main national road. In air transport, King Fahd International Airport connects the DMA to all the country’s major cities. Passenger and cargo railway lines connect the DMA to the national capital, Riyadh. Finally, on an international level, the DMA is connected to the rest of the world in three ways: first, King Fahd International Airport connects the DMA to almost all the world’s international airports; second, the GCC Road connects the DMA with all GCC countries; and third, the King Abdulaziz Seaport connects the DMA with almost all the world’s ports. These mega-projects have shaped the metropolitan area. Figure 3 depicts the “then and now” situation of some large-scale infrastructure, residential, and service projects in the DMA.

From an economic point of view, the Eastern Province is the heart of the Saudi oil production and processing industry. State-owned Saudi Aramco runs the oil and gas sector, covering all stages from prospecting, exploring, and extracting to processing, refining, and finally distributing, shipping, and exporting. Consequently, the economy and physical development of the DMA is mainly dependent on the petroleum industry.

About 15 percent of the population in the entire metropolitan Dammam Metropolitan Area works for either Saudi Aramco or another petroleum-related business. The city also has a thriving manufacturing industry; by the end of 2013, the Eastern Region had 1,492 productive factories, representing about 23.4 percent of the total number in the country (6,364). The number of factory workers in the Eastern Region is about 214,000, representing around 25.8 percent of the country’s total industrial manpower (MOMRA 2008).
**URBAN EXPANSION AND DENSITY LOSS**

Dammam’s location—close to both the sea and the desert—has shaped the way the city expanded and where populations have decided to settle since its foundation. Most of the development is established in the old city centers of Dammam and al-Khobar. It is in these two urban cores where the highest densities occur: from 8,000 persons/km² to 12,000 persons/km² (MOMRA-KSA (2008)). However, with the current rapid development, based on land speculation, occurring on the city’s outskirts, the total density numbers for DMA continue decreasing.

According to the Dammam Urban Observatory, the gross population density in DMA in 2014 was only 2,171 persons/km², a lower density than that found in Riyadh, Jeddah, and Makkah (Dammam Urban Observatory 2019). In the same year population density in built-up areas, 5,300 persons/km², was somewhat higher; nevertheless, it represents an immense drop in density since 1992, when it was 111,000 persons/km² (Map 2) (MOMRA-KSA 2008). Such generally low density means that there are still areas of Dammam where densities can be raised in order to accommodate more inhabitants.

Spatial expansion has been correspondingly rapid. The urban area of the DMA has increased more than tenfold over the course of the last four decades; from just 2,096 hectares in 1973, to 8,762 hectares in 1982, to 16,148 hectares in 2004. Since 2015, urban growth has continued at even a more rapid rate. (As for al-Khobar, it expanded from 5 to 291 to 3,400 hectares during the same period. (MOMRA-KSA 2008).

The growth of the DMA area was contiguous to the existing built-up area. While the initial expansion in these cities occurred along the coast, the last three decades witnessed a great deal of urban expansion through reclamation and filling of the Gulf beach, particularly in Dammam City, while expansion in al-Khobar was largely in the inland direction, as was the case in the cities of Dhahran and Al-Thuqubah, which began expanding after Dammam and al-Khobar. As for the whole DMA area, the current urban area of 20,000 hectares represents 84 percent of the total urban area included in the study area in 1423H, which makes it the main urban form prevailing over the study area.

**LAND USE**

The analysis of Dammam land use for the purposes of this case study, which compared existing with proposed land use plans, suggests that proposed land uses for the development of Dammam may be dangerously exacerbating some of the current problems stemming from its urban structure. Overall, the proposed land use significantly increases the percentage of land destined to become (exclusively) residential areas, expanding that category from 28 to 55 percent of the total urban area—nearly doubling it. This figure speaks to an increased urban sprawl, especially because of the spatial distribution of these new
ROOM TO GROW

Sea and desert have shaped the way Dammam expanded since the foundation of the city in 1934. Most of the development was established in the old city centers of Dammam and Al-Khobar. It is in these two urban cores where the city reaches the highest densities of more than 10,000 people per square kilometer.

To estimate population density, LandScan uses remote sensing imagery analysis to disaggregate census counts within an administrative boundary. As a result, built-up areas such as airports and industry may appear to have a residential population where there isn’t one.
residential areas, together with exacerbating the tendency to expand the city following mono-functional area-planning (Dammam Urban Observatory 2014). Currently, Dammam has only a very small area designated as mixed-use, representing barely 1 percent of the city’s land. The proposed land use does not provide an incremental change to this figure. This lack of consistent and diffused mixed land use risks the overall socioeconomic performance of the city. According to UN-Habitat’s international standards, a prosperous city has to allocate at least 40 percent of floor space for economic and commercial uses, including in residential areas. This stimulates local jobs, promotes local economic opportunities, and helps to reduce social gaps (Dammam Urban Observatory 2014).

Integration

Dammam has only a very small area designated as mixed-use, representing barely 1 percent of the city’s land.

THE DMA STRUCTURAL PLAN IN THE CONTEXT OF OTHER PLANS

THE COUNTRY’S PLANNING SYSTEM, which follows a hierarchy of spatial levels and is predominantly top-down, influences the spatial system of Dammam. The National Spatial Strategy of 2001 is the guiding plan for the country as a whole. Within that overarching plan Dammam is covered by a regional and a local plan. The Strategic Urban Eastern Regional Plan of 2005 (hereafter, the Regional Plan) highlights the pivotal role that Dammam, as the regional capital, can play as the economic engine of the Eastern Province.

At the local level, the Dammam Plan identifies strategic land uses and infrastructure networks within the metropolitan area. It applies urban controls to urban land use and building regulations within the municipal boundary. The Dammam Plan has two components: a strategic component (the Structural Plan for Dammam Metropolitan Area and Governorates of Qatif & Ras Tanura, Saudi Arabia, or “DMA Structural Plan” for short) supported by a regulatory component (known as the Local Plan). The urban growth boundary aims to prevent urban sprawl in the outskirts of cities without adequate urban infrastructure, while the land subdivision plans are the basic building blocks that guide the development of Dammam.

The DMA Structural Plan identifies the strategic land uses of the Dammam Metropolitan Area and Qatif and Ras Tanura governorates and addresses the infrastructure networks serving them within the coverage of the 2028 (1450 ha) urban growth boundary. It is obvious that almost 18 percent of the land within that boundary is allocated for residential uses to accommodate the expected population. The most significant issue is having almost 25 percent of the urban area preserved for oil pipelines, creating barriers between different development areas.
In harmony with the Regional Plan, the DMA Structural Plan highlights different objectives for the different cities that compose the metropolitan area. Dammam remains the administrative and services center, with an improved future focus on strengthening recreation and tourism in the Corniche area. The current agricultural land will be maintained and preserved in Qatif, with new services for fisheries and tourism. The actual industrial pole of Ras Tanura, linked to gas and oil extraction and the refineries, will be preserved. In the south, Azizya and Half-Moon Bay will accommodate the majority of touristic services and recreational activities.

Following the vision of the Regional Plan, which proposes to minimize the primacy of Dammam City through pushing development in second-tier urban centers in the province, the DMA Structural Plan and the Local Plan both enforce the different characteristics of each urban area while reinforcing new subcenters of activity. Additionally, the vision of the Regional Plan and the general structure of Dammam’s metropolitan area differ from the same proposal in the National Spatial Strategy of 2001, suggesting an axial development along the main corridors.

This strategic proposal solution of the National Spatial Strategy has also been selected in order to mitigate the population and densification process in the center of Dammam, in comparison with other metropolitan areas.

Saudi Arabia has established initiatives and projects to build smart cities, such as an e-government initiative that has been implemented in public agencies in which more than 875 e-services are provided. Additionally some cities, including Dammam, have implemented smart city systems and applications such as a data center, fiber connectivity, enterprise GIS, digital mapping, traffic control and management, and digital signage and address, among others.

Land speculation is one of the drivers of accelerated urban expansion, and it influences rising housing prices in Dammam. Land is withheld from development by developers while the demand for land for housing development is on the rise. The national government has decided to introduce a tax on vacant land to curb this phenomenon (JLL 2017).

The government recently issued the White Lands Tax Law, which imposes an annual land tax of 2.5 percent of its value on “white land,” defined as vacant land located in populated areas zoned for residential or for dual residential and commercial use. The aim of this law is to increase the supply of developed land to better address housing shortages and make residential land available at reasonable prices. Furthermore, the White Lands Tax Law aims to combat monopolistic practices. The Ministry of Housing, which is the implementing authority, will implement the law in three cities in its first stage with Dammam Metropolitan Area as one of the three cities (Deloitte 2013).
The urban development vision of the DMA Structural Plan was set aiming to incorporate the DMA into the Eastern Province, the Kingdom, and the Arabian Gulf region. This vision is based on the importance of DMA not only for the Eastern Province but for the entire kingdom. Within this comprehensive framework of the DMA Structural Plan, the process of urban development for this region has two major objectives: to make the region competitive in the provision of educational and health services, not only at the level of the kingdom but at the level of the Arabian Gulf and the Middle East; and to be an advanced center for research and development, especially in the fields of energy, technology, and coastal development.

HOW INTEGRATED PLANNING IS DEFINED AND ADOPTED

Integrated planning and implementation are at the heart of the 2030 Development Agenda and the “New Urban Agenda” adopted in 2016 under Habitat III. The changes needed to adapt and apply inclusive green-economy approaches as a means for achieving sustainable development are universal and interlinked. Transitioning to more inclusive, greener economies as an approach for achieving the sustainable development goals (SDGs) will only succeed if addressed at a systemic, whole-economy, whole-society level (UNDESA 2019; PAGE 2016; UNEP 2015a). This requires moving away from the dominant fragmented style of planning and implementation and toward inclusive processes that bring together sectoral and central government agencies as well as other national stakeholders at all levels (UNEP 2015b). Integrated policy formation underpinned by inclusive stakeholder consultation and analysis of biophysical and socioeconomic systems, capacity, good governance/political will, and sustainable financing are the prerequisites for integrated planning and implementation (UNEP 2015c; German Association of Cities 2011).

In urban studies, integrated planning is widely seen as an effective approach for dealing with the complex nature of cities and as a necessary approach for creating sustainable and resilient settlements (Connective Cities 2019; Urbact 2019; GPSC 2019). Implementing such integrated urban planning is directly connected to the socioeconomic conditions, legal frameworks, technology, and professional and educational potentials of societies, which differ for each country (Milojevic 2018a, 2018b). Thus, it is necessary to constantly work on improving the adopted methodology of integrated planning, education, and the training of planners and stakeholders. Of equal importance is strengthening the institutional and socioeconomic preconditions for its implementation, particularly in rapidly urbanizing developing countries such as Saudi Arabia.

In the case of DMA, integrated urban planning is not explicitly stated as an adopted approach. However, and because of the comprehensive nature of the adopted planning approach, some of integrated planning’s spatial integration objectives have been reached.
DEVELOPMENT OF SPATIAL INTEGRATION IN DMA AND AT BROADER LEVELS

The first signs of spatial integration occurring in DMA date to 1976, but such integration has become more apparent in the last three decades. Before 1976, all available maps and photos affirm that Dammam, al-Khobar, Dhahran, and Qatif were small, isolated villages without any sign of integration.

Early signs of spatial integration on the local level (1976)¹

The main objective of these plans was to manage urban growth for the cities of Dammam, al-Khobar, and Qatif. Concerning the adoption of integrated planning, a review of these plans reveals that there was no explicit statement of “integrated planning” as an adopted planning approach but that, rather, these plans dealt with Dammam and al-Khobar as a unit and with Qatif as a separate unit. Before the 1976 study, Dammam, al-Khobar, and Qatif were separate isolated cities; the study aimed at strengthening interconnections between Dammam and al-Khobar, though it sought much less connection with the Qatif settlements, revealing that this was the earliest stage of DMA formation. Regional spatial integration between Dammam and al-Khobar, on the one hand, and Qatif, on the other, was not the main objective. Dammam and al-Khobar were planned as a joint industrial center, while the Qatif settlements were developed as small, rural, peri-urban settlements. These plans were the first to direct urban growth by land-infill into the Gulf. Although this was largely unsustainable, it fostered linear growth along the coast, connecting al-Khobar, Dammam, and Qatif.

Intensification of spatial integration on the local level (1982)²

The main objective of this 1982 plan was to manage urban growth in the Dammam area (CH2M Hill International and CEG 1982). Although there was no explicit statement about integrated planning as an adopted approach, this plan built on the outlook of the previous plan in looking at Dammam, al-Khobar, and Dhahran as a single entity. It also intensified development in vacant areas between these settlements and along the coast. The plan promoted integrated planning at the local level in the Dammam area but did not look at the DMA region (including the Qatif and Ras Tanura governorates). The Dammam area was then developed in isolation from the rest of the DMA region.

THE DMA STRUCTURAL PLAN, 2008

All previous spatial integration efforts took place at the local level; but spatial integration under the DMA Structural Plan occurs at sub-regional, regional,

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¹ This subsection is based on Candilis-Metra International Consultants (1976).
² This subsection is based on CH2M Hill International and CEG (1982).
national, and even international levels. The plan was the first to promote spatial integration across all levels, through a clearly stated vision. It aimed at two main objectives: first, it aimed to gain the advantages of an “agglomeration economy” by utilizing the diversified economic potentials of the different parts of the region, that is, of the coast, the oil industry, agriculture, and the desert nomadic economy; second, it aimed to benefit from the economic advantages of urban agglomeration, because a large metropolitan area is more economical, in terms of infrastructure and services provision costs, than a set of small, dispersed settlements.

At the sub-regional level

The DMA Structural Plan was the first to promote the spatial integration of DMA with Qatif and Ras Tanura governorates. Qatif and Ras Tanura governorates were included, as integral parts, in the DMA Structural Plan. The structural plan incorporated the DMA urban area into its larger region of Qatif and Ras Tanura governorates. According to this plan, urban expansion should be contiguous in all these areas.

In addition to the proposed improvement of existing roads and the proposed new roads, the DMA Structural Plan proposed a new causeway connecting DMA and Tarout Island in Qatif governorate. The plan has integrated vast hinterlands within the development limit, almost twice the size of the DMA region. New regional services have been added in these areas, including a regional park and reserved areas for regional functions, services, and utilities.

Also, this plan has added another vertical spine of spatial integration along the GCC Road and parallel to the old coastal spine. This new spine has increased spatial integration between DMA and the Qatif and Ras Tanura governorates. It has also directed urban growth to the west of the GCC Road into the desert, instead of promoting land-infill in the Arabian Gulf waters as was practiced previously.

At the regional and national levels

The DMA Structural Plan has promoted spatial integration among all governorates of the Eastern Province through upgrading the level of the GCC and Dammam–Jubail roads to improve connectivity with Eastern Province governorates in the north, and by also upgrading the level of the Dammam–Buqayq–Al-Hofuf Road and proposing a new road to Hofuf to improve connectivity with Al-Ahsa governorate in the south. Development of these three locations as commercial and business centers along the GCC Road for the prov-

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3 This subsection is based on Structural Plan for DMA & its Region 2008, which was prepared by AMCDE & Parsons Brinckerhoff (after 30 years of the previous plan). The 2008 plan was prepared as part of the project, Preparation of Local Plans for Dammam Metropolitan Area and Cities of Qatif & Ras Tanura Governorates.
sion of higher-level regional services is expected to improve sectoral integration of DMA on a regional level. Finally, the role of DMA has also further improved as a provider of regional services for all Eastern Province governorates.

**At the national level**

The DMA Structural Plan has promoted spatial integration with all other regions of the kingdom by increasing the efficiency and capacity of King Fahd International Airport as well as by increasing the efficiency and capacity of the Dammam–Al-Ahsa–Riyadh passenger and freight railway lines. New national roads connecting the DMA to Riyadh, the north governorates, Al-Ahsa, Buraydah, Al Qassim Province, and Northern Border Province have been proposed. In addition, existing regional roads connecting DMA to other regions of the Kingdom were upgraded.

King Fahd International Airport provides connections to all airports in the kingdom, which enhances DMA integration at both the national and international level. Similarly, integrating King Abdulaziz Seaport in Dammam with the cargo line has greatly integrated DMA, spatially and economically, with the country and with the outside world (SAGIA 2010).

**At the international level**

The DMA Structural Plan was the first plan to have a clearly stated vision calling for international integration at the level of Gulf Cooperation Council (GCC) countries. This vision aimed to spatially and functionally integrate DMA, as a regional development hub, with neighboring development centers in the Arabian Gulf. DMA is connected to all GCC countries, via the GCC Road and King Fahd Causeway.

DMA also has huge natural and demographic potential. The area occupied by DMA and its development hinterland together is equivalent to about half the area of Kuwait and Qatar and three times the area of Bahrain. The population of DMA and its region is about equal to the population of Kuwait and larger than the populations of Bahrain and Qatar combined.

To achieve its vision, the plan recommended that DMA should develop (i) a distinctive functional identity, and (ii) an urban identity. It aimed to achieve a distinctive functional identity by promoting the integration of regional functions, namely in regional health, commercial, educational, and recreational centers. To achieve this, the DMA Structural Plan proposed some important integration actions in the transportation and urban development sectors.

In the transportation sector, the DMA Structural Plan proposed increasing the capacity of King Fahd International Airport. This also entails upgrading the GCC Road to international status and increasing the capacity of King Fahd Causeway.
Additionally, a high-speed rail route along the GCC Road was proposed, linking the GCC countries, including the UAE and Kuwait.

In the urban development sector, the DMA Structural Plan proposed the development of the GCC Road as an international development spine. To do so, it proposed the development of three commercial and business centers along the GCC Road to house the proposed large-scale international functions: regional health, commercial, educational, and recreational services. It also proposed the development of unique touristic and recreation activities in the Azizia and Half Moon areas, which are known for their excellent environmental qualities.

**TOOLS AND SECTORS INVOLVED**

“Large-scale projects”, projects with a service range that goes beyond the DMA to cover the GCC region, has been adopted as a strategy for achieving spatial and sectoral integration of DMA at all levels—sub-regional, regional, and national. 

**Large-scale residential projects.** A number of large-scale residential projects emerged in the area between and around Dammam and al-Khobar during the 1980s and 1990s; these were based on the Candilis-Metra plan (1976), and increased the spatial integration of the two cities and formed the early phase of DMA emergence. Many of the projects were of a very large size. For example, the area of the King Fahd Suburb subdivision was 3,613 hectares (ha), while Al-Naseem was 3,339 ha, Subdivision no. 1156 was 2,440 ha, West Dhahran was 2,152 ha, and Al Manar was 1,020 ha, not to mention many smaller subdivisions. These large-scale residential projects pushed urban development into vacant areas between and around Dammam and al-Khobar and thus represented the early stage of spatial integration between Dammam and al-Khobar and the emergence of DMA.

The integration of the DMA at both the international and national level mainly occurred because of the following large-scale infrastructure projects built, and the subsequent development built around them. 

**At international level:** the DMA is connected to the outside world through King Fahd International Airport, the GCC Road, the King Fahd Causeway, and the King Abdul Aziz Port. The airport, in Dammam, established in 1999, is the Kingdom’s eastern air gateway. It is also considered the world’s largest by land area, with 776 square kilometers of land within its zone. The annual passenger handling capacity reached 247,500 in 2018 (Saudi General Authority of Civil Aviation 2019). In 2018, this airport was selected by OAG⁴ as the world’s second-ranked medium-sized airport (Innovation-SA 2019). The GCC Road is an international road that connects the kingdom and DMA with all GCC countries. It connects DMA to Kuwait to the north and to Bahrain and other GCC countries to

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⁴ OAG is an air travel intelligence company based in the United Kingdom.
the south through the King Fahad Causeway. The causeway, established in 1986 to connect the DMA to the Kingdom of Bahrain, is the most obvious example of the DMA’s connectivity to the neighboring Gulf states. According to the King Fahad Causeway Authority, daily traffic through the causeway has reached 70,000 passengers, 28,000 cars, and 1,000 trucks (King Fahd Causeway Authority 2019). The King Abdulaziz Port in Dammam, established in 1949, is the kingdom’s main port in the Arabian Gulf. The port is considered the main gateway through which cargo from all over the world reaches the Eastern and Central provinces. It also provides services for the oil industry and for all other major cities in the east and central regions of the kingdom. The port has four terminals and 42 berths, with a total annual capacity of 105.5 million tons (Saudi Ports Authority 2019).

At national level, the DMA is highly connected with other regions of the Kingdom via air, road, and rail. King Fahd International Airport connects the DMA to all airports in the Kingdom. There are three main regional roads: in the middle, the Dammam–Riyadh Road connects the DMA to Riyadh and Makkah and the western coast of the Kingdom. To the south is the Dammam–Hofuf Road, which connects the DMA to Buqayq and Hofuf in Al-Ahsa governorate. To the north, the GCC Road and Jubail road connect the DMA to the cities of Jubail, Khafji, Nairyah, Qaryat Al Ulya, Hafr Al-Batin, and the Northern Border governorate. In terms of rail, a railway line started service in 1951 between Dammam and Riyadh, and consists of both passenger and cargo lines. The passenger line connects Dammam to Riyadh via Al-Ahsa and Buqayq, and has a total length of 450 kilometers. The cargo line connects King Abdulaziz Seaport in Dammam to Riyadh via Al-Ahsa, Buqayq, and Khajr and has a total length of 570 kilometers. These two railway lines have spatially and economically integrated the DMA with the rest of the country.

In the DMA Structural Plan of 2008, various sectors of urban development were examined; these included housing, economic activities, services, and infrastructure. Because of their substantial role in the integration process, the different forms of infrastructure (energy, water, sewage, transportation, telecommunications) have been examined at the regional level and then at the local level of settlements (local plans were prepared in 2008 for DMA and cities of Qatif and Ras Tanura governorates). Infrastructure requirements have been defined at both levels.

Transportation plan. The transportation plan, prepared as part of the DMA Structural Plan, dealt with the whole region of the DMA, including neighboring cities and villages. The plan enhances the role of the GCC Road by connecting the DMA with all of the GCC. It has also added new regional roads outside localities by connecting cities with each other and with other major facilities. It establishes the role of the King Abdulaziz Seaport and Ras Tanura Port as
national ports while also providing a vision to add the first passenger port on the eastern coast. Finally, the plan also suggests new modes of public transportation for the entire region.

**Integrated Regional Water Network.** The water network has been planned to cover the whole region, including a national water desalination plant and a regional water line along the vertical spine of the DMA region running from the desalination plant in Azizya in the south to Ras Tanura in the north. Such network facilitates integrated coverage of water to all parts of the DMA region.

**Integrated Regional Sewage Network.** A sewage network covers the whole region. However, because of population density, the sewage network coverage is less than the water network coverage.

There are four main parties involved in the urban development process in Saudi Arabia: civil society, the government sector, the private sector, and supporting international agencies.

**Civil society.** Civil society organizations define community needs, set the vision for planning as well as objectives, and engage citizen participation.

**Government sector.** Plan preparation, application, and monitoring are carried out by the Ministry of Municipal and Rural Affairs (MOMRA). Plan financing is handled by the Ministry of Economy and Planning. Infrastructure and housing provision are overseen by the ministries of Energy, Transport, and Housing. Service provision is overseen by the ministries of Health, Education, and Interior, among others.

**Private Sector.** Consultancies and contractors, as well as land developers (which may be either real-estate companies or individuals), are involved.

**Supporting international agencies.** Among the international agencies involved in planning in Dammam are UN-Habitat (Future Saudi Cities Program) and the World Bank.

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**Implementation**

**INSTITUTIONAL ARRANGEMENTS**

According to the Ministry of the Interior’s administrative classification, the Eastern Province is divided into 11 governorates (6 Class A and 5 Class B), 71 Class A sub-governorates, and 36 Class B sub-governorates. Dammam, being the regional capital, is not included in this classification, but instead is governed as a municipality (amanah) headed by a mayor. This delineation is provided for by MOMRA, which gives Dammam the status of a Class A amanah. Given this structure, the amanah has been allocated funds by MOMRA for development.
action and municipal services through an annual line-item budgeting, which is the sole fiscal means available to Dammam (UN-Habitat 2018a).

There are additional institutions in the Eastern Province that manage and regulate the development process. The Emirate (amarah) of the region is headed by the Regional Prince, who, pursuant to the Regional Law, reports to the Ministry of the Interior. The same law mandates the Emirate to oversee all authorities and institutions operating within the Eastern Province. This supervisory role is related to supporting citizens’ welfare as well as mediating the disputes arising between two or more government agencies (Diwan 1993).

The Regional Council is based in the amarah and is required to identify the needs of the region, propose their inclusion in the National Development Plan, and identify beneficial projects for the region and propose them as activities requiring funding from MOMRA.

The Municipal Council is also located in the amarah, with two-thirds of its members elected by citizens’ votes and the rest appointed by the Minister of the Interior. This council supervises the activities of the amarah and municipalities to make sure they conform to the Regional Plan and meet the current needs of the region. It approves the municipal budget, which is sourced from cash allocations from the national government. The Municipal Council also examines residential planning, focusing on whether any procedural violations have occurred, and on the scope of municipal services. Furthermore, expropriation projects are based on the mayor’s priorities, and the budget is constantly revised to respond to those set priorities by the mayor for the Municipal Council.5

The High Commission for the Development of the Eastern Region was established in 2015 to contribute to the comprehensive development of the region.6 The same law establishes a council composed of 14 members that should, among other things, draw up general policies for projects within the region and follow up their implementation in coordination with the Regional Council and the amanah.

**INSTITUTIONAL ARCHITECTURE**

The planning system of Dammam is derived from the de facto planning hierarchy of the kingdom. In other words, the system of spatial planning in the country does not exist by legal right but rather through established practice. In this framework, there are four different levels of spatial plans: national, regional, local, and district.

*Regional planning* represents the second tier of spatial planning in the country, which aims to address the natural, urban, social, and economic regional development aspects. The Strategic Urban Eastern Regional Plan of 2005 was prepared and approved by the Regional Council for the Eastern Region. This

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5 Ministerial Resolution No. 66866 2005
6 Resolution of the Council of Ministers No. 64 of 2015.
plan aimed to take advantage of the region’s strategic location at the Arabian Gulf as a link between the kingdom and the other states in the Gulf Cooperation Council, as well as Southeast Asian countries. It also aimed to enhance the contribution of the region’s non-petroleum resources to national development to achieve balanced growth. The plan concentrated on ways to promote the expansion of projects in diverse industries, particularly those dependent on the region’s non-petroleum resources.

At the local planning level, enhancing the participation of the private sector in providing education and training across the region was a major aim of the Dammam Local Plan, approved in 2006 by the amanah. This local plan also addresses the developmental concentration on the coastal strip to achieve more balanced urban development in the region. Moreover, the plan aimed to support a more balanced pattern of cities in the region.

The development of the Dammam Local Plan is complicated, as there are parallel structures set up by MOMRA and the Ministry of the Interior. While the legal mandate for planning clearly lies in the municipalities (under MOMRA), there are jurisdictional overlaps with the mohafezat (subregional governorates) and markaz (districts), which are set up under the Ministry of the Interior. In other words, the Ministry of the Interior is the oversight entity for regional project implementation, while MOMRA is the central spatial planning institution; but there is no clear coordination mechanism. This frequently leads to decision-making impasses that affect the delivery of technical standards within municipalities such as Dammam.

The Dammam Local Plan has no real mixed land-use strategy, even though such characteristics are still present in a few parts of the city, for example in the city center. However, the plan does not spread commercial activities across the urban tissue; instead, it proposes mixed uses along the main roads to preserve privacy in residential areas. This is one of the factors that engender car dependency and poor-quality public spaces. The plan is obsolete, not reflecting current urban dynamics, and it also includes massive expansion areas (between city footprint and urban boundary), which encourage urban sprawl.

**SUSTAINABILITY**

Although currently, to some extent, sustainable, Dammam can set itself on the right track toward a more sustainable urban development model, as there are potential solutions embedded in the challenges themselves. The DMA Structural Plan proposed four strategies for a sustainable development in DMA. These strategies are aligned with the visions and goals of the New Urban Agenda and achieving the three dimensions of sustainability, as per UN recommendations:

- **Social sustainability**: Securing social equity in the distribution of wealth and social services;
• **Economic sustainability**: Keeping stable economic growth while restructuring the productive system in order to save resources and energy; and
• **Environmental sustainability**: Maintaining safe and comfortable living environments through lower emissions and opting for ecological restoration and complex socioecological infrastructure that can devise basic services innovatively.

Achieving this in Dammam will require a strong political will coupled with a pragmatic approach to Dammam’s socioeconomic and spatial restructuring. It will mean shaping new sustainable consumption/production patterns that can foster an enabling environment for the generation of both business innovation and basic livelihoods, while promoting, in parallel, inclusive urban economies and sustainable industrial development as well as resource-efficient and resilient infrastructure. To enact this vision, which aims to trigger an incremental but radical urban transformation, it is necessary to translate the four conceptual recommendations into a logical and scaffolded system of actions that sets clear priorities and builds on endogenous potential and competitive advantages.

A sustainable city is one where social, ecological, and economic systems are well balanced and mutually supportive of each other. In addition, ecological resources and the preservation of ecosystems become central in any development strategy guiding urban transformations. In Dammam, the different actions proposed in the structural and local plans, along the coastline and on the vacant land, will contribute in many ways to the city’s journey toward sustainable development, as this will reinforce the natural coastal ecosystems and link Dammam with new green infrastructure. Building for coastal resilience will be required as future impacts from climate change, such as rising sea levels, will continue and mitigation strategies will be necessary.

Establishing a positive relationship with natural resources will translate into new economies. For instance, having a healthy coastal ecosystem will be reflected in sustaining fisheries, triggering an increase in local income for coastal communities by providing more economic activities (Colliers International 2012). Additionally, with more tourists visiting the natural areas and reserves proposed on the coast, the local communities will benefit with new employment opportunities. Lastly, the protection of biodiversity, and in particular the protection and increase of mangrove forests and the creation of a buffering, renaturalized urban waterfront, will contribute to the prevention of floods and associated risks, protecting the city from tidal surges, storms, and waves while naturally controlling the regulation of the water quality and sediments.

**PRIVATE PARTICIPATION**

Under the current centralized system, the central government funds most of the urban infrastructure and public services, with municipal governments playing
Metropolitan Dammam has historically focused investment along the coast. Large infrastructure projects have shifted the center of gravity inland, connecting a fragmented region into a more coherent agglomeration.

Credit: iStock.com/ AFZALKHAN M.
a minor role. Despite the concerted effort to improve fiscal health envisioned in the National Transformation Program 2020 (NTP 2020), fiscal self-sustainability at the municipal level will remain a challenge in the context of rising urban populations and unplanned urban development and expansion (Almalki, Fitzgerald, and Clark 2011).

The private sector also plays a vital role in Dammam’s land development projects. For instance, the Saudi Arabian Oil Company (Aramco), while functionally independent from the Ministry of Energy, Industry and Mineral Resources, is directly overseen by the highest levels of government; the Ministers of Energy, Finance, Communication, and Information Technology are on the Board (Gately, Al-Yousef, and Al-Sheikh 2013; Shearman and Sterling 2016). Such large corporations have been criticized for contributing to indiscriminate land development, the rising cost of housing, speculative land markets, and urban sprawl due to their own construction and land-filling activities along ecologically sensitive areas and areas beyond the urban limit.

The transfer of local planning power, authority, and function from MOMRA to the amanah with provision for independent action has left cities without recourse to effectively address community needs. This is supported by the New Urban Agenda, which specifies that territorial urban design and planning processes should be led by subnational and local governments, while their implementation will require coordination with all spheres of government as well as the participation of civil society, the public sector, and other relevant stakeholders (UN-Habitat 2017). The legal framework also needs to preserve an acceptable mode of public participation in public decision making, to foster equality and inclusion. The consolidation of the urban legislation would also give legitimacy to the plans that Dammam relies on (UN-Habitat, DAMMAM City Profile 2018b).

**TYPES OF SOLUTIONS AND PHASING**

**DMA Structural Plan**

The DMA Structural Plan, which aims to identify key spatial structures as those provided for in the Eastern Province Strategic Plan of 2005, was prepared by the amanah. In line with the Eastern Province Strategic Plan of 2005, it highlights different objectives for the different cities located within the metropolitan area. For instance, the city of Dammam remains the administrative and services center, with an improved future focus on strengthening tourism in the Corniche area. However, this DMA Structural Plan differs from the National Spatial Strategy in proposing axial development along main corridors (Dammam–Dhahran–Khobar). In terms of land use, it identifies strategic land uses and
infrastructure networks within the metropolitan area of the 2028 Urban Growth Boundary (UGB) (Alhowaish 2015).

Within this growth boundary, 18 percent of land is allocated for residential use, whereas 25 percent is preserved for oil pipelines. The area allocated for residential purposes could contain double the projected population, because the plan promotes a low-density residential typology. Moreover, the areas now preserved in the DMA Structural Plan as buffers for oil and gas pipelines should in fact be used instead for a green network of open spaces that connect to a hierarchy of parks (city-district-neighborhood), with a link to the waterfront recreational strip. This plan does not promote a clear mixed-land-use strategy, as it encourages a “mono” land-use typology instead. Mixed land use (from commercial to residential) is only proposed along the major corridors. The plan also engenders incompatible building forms by introducing industrial land pockets in the urban cluster.

Dammam Local Plan

The Dammam Local Plan, which represents the other component of the Dammam Plan alongside the DMA Structural Plan, represents the third level of the urban planning system in the kingdom, and is largely focused on those areas of a municipality which are contained within the urban growth boundary with a special focus on housing. The Local Plan contains the Urban Atlas, which details the allowed land uses for every part of the city. It is complemented by a regulations report, which contains specifications on the permissible development rights, such as floor area ratio, street dynamics, building heights, and areas of special building regulations, and so on. The aims of the Local Plan are fourfold:

- To apply urban controls to urban land use and building regulations;
- To provide public services and infrastructure in a cost-effective and integrated manner;
- To set basic requirements for proposed road networks; and
- To help facilitate the development of public- and private-sector housing.

There is no legal framework, per se, to direct the plan’s preparation and implementation. Rather, the plan is prepared by various consultants following the Booklet of the Terms of Reference for the Preparation of the Local Plan, which was formulated by MOMRA. This booklet was updated in 2015, and one key technical change made in that update is the requirement that the lifespan of new plans should be 14 years (for example, 2015–2029) (MOMRA 2005).

Like the DMA Structural Plan, the Dammam Local Plan has no real mixed land-use strategy, even though such characteristics are still present in a few parts of the city, for example in the city center. However, the Local Plan does
not spread commercial activities along the urban tissue, and mixed uses are proposed along main roads to preserve privacy in residential areas. Preserving residential privacy, however, is one of the factors that engender car dependency and poor-quality public spaces. Not only is the plan obsolete and failing to reflect current urban dynamics, it also includes massive expansion areas (between city footprint and urban boundary), which encourage urban sprawl (Aboukorin and Al-Shihri 2015).

**Urban growth boundary**

The urban growth boundary for Dammam, along with the growth boundary for other cities, was set simultaneously by MOMRA through a committee under the Unit of Coordination and Projects. The composition of the committee is not clear but, for instance, it did not involve the municipality of Eastern Province, which is responsible for planning at the city level. There is an understanding that the calculations for determining these boundaries for Dammam were based on factors such as historical growth and expected population growth in the city; however, there are no accurate published criteria on how the size of the boundary was calculated. Spatially, the committee was not guided by existing infrastructure and services, as the boundary was set symmetrically so that “all sides of the city” could benefit.

Although the growth boundary regulations set very clear rules for development not to occur outside the boundaries, there are some exceptions, such as housing projects, that undermine the effectiveness of the law. For example, in Dammam, there is evidence to suggest that the city has expanded outside the urban growth boundary (in locations between Dammam, Buqayq, and Al-Ahsa). This has caused socioecological and economic imbalance (incompatible land uses and land speculation), as well as unbalanced growth and development patterns (sprawl). The disparity between the size of the boundary and the actual demographic dynamics of Dammam, based on the committee’s calculations, undermines the aim of densification. Consequently, based on current population growth projections, the 2030 density will be 642 persons per square kilometer, which is well below any recommended target, including UN-Habitat’s recommendation of 15,000 persons per square kilometer.

**RISK MANAGEMENT**

Shifting the current growth trends so that they incorporate natural features, and incorporating ecosystems dynamics into the planning processes, are both paramount to making better use of existing resources and preventing pollution. Current patterns, however, are harming renewable water resources per capita, which are dropping at an annual rate of 2 percent. In Dammam City, although no
permanent water bodies exist, integrating the various water streams that enter the urban realm would have the potential to replenish water into the aquifers. By contrast, the urban area has been waterproofed through impermeable surfaces and canalizations that have the effect of directing the water out of the city. In this process, water is usually polluted, having a negative impact on the soil and on the sea it flows into. This lack—and misuse—of water prevents green infrastructure growth, such as parks, tree canopies, and green plazas. In the Eastern Province, overgrazing has reduced vegetation cover to such an extent that previously stable fossil dunes have once again become active, having a negative effect on sand balance, and increasing sandstorms towards the Dammam area.

Another potential input increasing the sustainability of public spaces concerns the reuse of gray water from residential consumption. It is important to note that around 28 percent of Dammam (including al-Khobar, Qatif, and Seihat) rely on septic tanks, so disposal is a significant source of environmental pollution. Decentralizing water treatment and recycling at the neighborhood level could help to reduce water consumption, while supporting the creation of consistent green networks across the city.

The rise in sea level due to climate change is a major threat to both natural and urban assets along the coast. Sea-level-rise modelling, particularly for Dammam, was developed for scenarios of 0 to 2 meters, in order to have a rough estimation of affected areas. Under these scenarios, large coastline areas were identified as vulnerable to sea-level rise, dangerously impacting the national and local economy. Likewise, key infrastructure such as ports, airports, and trains are at risk, affecting the flow of products and people, while reclaimed areas are also highly exposed. Therefore, major efforts need to be deployed to develop mitigation strategies along the coastline that will reduce their exposure and vulnerability.

Through reclamation of land toward the Arabian Gulf, development is severely polluting coastal ecosystems. Since 1955, approximately 14,000 hectares of coastal land have been encroached on through backfill operations, leading to water stagnation and threatening marine wildlife (Our World in Data 2017). This also directly harms the local economy, as fisheries are being damaged due to the reduction of catchment areas. New patterns of development directed inland are highly recommended to protect from sea-level rise and to stop polluting the natural ecosystems that support not only fisheries but also tourism (Huber et al. 2017).

In addition, there is an urgent need to implement rehabilitation strategies in affected areas through adopting effective environmental protection measures, such as adequate land use planning. However, policy frameworks need to
be strengthened to promote the preservation and regeneration of the coast. Working on strengthening an appropriate legal framework, and the means for its implementation, is key.

**GLOBAL ENVIRONMENTAL BENEFITS OUTCOMES AND SCALE-UP**

Environmental concerns are taking center stage in Saudi Arabia. The kingdom has made remarkable progress in strengthening sustainability in pursuit of Vision 2030 and targets in the National Transformation Program 2020 (NTP 2020; Saudi Government 2018). However, the environmental challenges remain persistent due to institutional policies that for decades have encouraged increased domestic consumption across sectors such as oil. The prevailing development patterns, characterized by the undermining of sustainability, have driven society toward excessive increases in production and consumption, causing the depletion of natural resources and adversely affecting the socioeconomic environment. For Dammam, all the environmental issues described in both the structural and local planning documents are highly relevant, including the problems of encroachment on agricultural land, the overdevelopment along the coast, and the environmental impact of land reclamation, as well as urban expansion in low-elevation coastal zones that are five meters or more below mean sea level, shown in Map 1.

The proposals within the DMA Structural Plan are for the most part in line with the problem analysis concerning preserving agricultural land in the Qatif area, protecting coastland, and suggesting new policies for the improvement of sewerage systems and utilities for new developments. They also suggest the possibility (although without enough detail) of building a green corridor linking different protected areas, including agricultural land, beaches, and marshes. The proposals also suggest that an inventory be made of the existing natural and environmental resources, which when linked with new environmental regulations could better protect these specific areas.

Furthermore, in the proposed land use plan within the DMA Structural Plan the land designated as “environmental areas” is dramatically reduced, from 19 percent to just 2 percent of the total area of the city. Failing to preserve more land as an ecological buffer to the current natural assets and failing to limit development in ecologically sensitive areas will have severe consequences for water quality, air pollution, the urban heat island effect, and coastal degradation (Ouda 2013).

Nevertheless, for the DMA, an integrated cross-sectoral approach to planning and implementation would be an appropriate approach for achieving the SDGs and for transitioning to more inclusive, greener economies,
While all areas have electricity, some newly developed areas and old areas lack access to potable water and wastewater networks.
reflecting the environmental, social, and economic dimensions of sustainable development and their complex interrelationships and trade-offs. This approach would be effective in addressing inequalities through applying a multi-actor and shared social responsibility approach (UNDESA and UNDP 2012; UNDESA 2015). It also would help in moving away from the dominant fragmented approach to planning and implementation. Integrated policy formation underpinned by inclusive stakeholder consultation and analysis of biophysical and socioeconomic systems, capacity, good governance/political will, and sustainable financing are pre-requirements for integrated planning and implementation. (PAGE 2016)

In the case of the DMA, the integrated planning approach has had many positive impacts. Integrated planning promoted more economic urban development, utilizing the main road connecting Dammam and al-Khobar and the infrastructure lines running along these roads. It effectively utilized the locational advantages of the areas between Dammam and al-Khobar, which, being very close to the coast of the Arabian Gulf, offer better accessibility compared to other locations. Developing areas along the main road connecting Dammam and al-Khobar made accessibility to existing services possible; thus, the need for immediate services was not acute. This accessibility resulted in less urban sprawl than would have occurred had urban development been directed to the vast areas to the west. Thus, spatial integration in the DMA has positively contributed to the area’s sustainability in terms of increasing density and minimizing the rate of fossil fuel consumption and CO₂ emissions.

As part of all of this, the urban integration of Dammam and al-Khobar has also led to several positive outcomes, including the emergence of a large metropolitan DMA that has been shown to be more economically efficient, in terms of infrastructure and services provision costs, than small isolated settlements. Another outcome is the emergence and the economic functioning of high-level services such as universities, specialized hospitals, and commercial and recreational services. The integration has also led to the establishment of a fully equipped urban planning unit and the emergence of the Municipal Council for overseeing civil society’s needs and aspirations in urban development plans. Additionally, the integration has also led to the development of major national infrastructure facilities such as King Fahd International Airport, the Dammam–Riyadh railway, and the King Fahd Causeway. The combined integration of the regions of Qatif and Ras Tanura has established the DMA as a growth pole on the eastern coast of the Kingdom, transmitting development to all areas of the Eastern Province.

In the case of the DMA, there has been significant progress in laying the foundations for a transition to integrated planning for sustainable
development. Significant components of the enabling policy and regulatory framework have been established. There is also evidence of the DMA moving beyond high-level national visions and strategies to the development of mechanisms to execute integrated planning.

However, these processes are almost exclusively at the development stage and need to be supported, tested, and refined over the coming years. Notwithstanding the evident advancements, a significant gap exists between stated commitments to sustainable development and their implementation (UNDESA 2015; UNDESA and UNDP 2012). Recommendations toward this end are discussed in Section.

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**Financing**

**ACCESS TO FINANCIAL RESOURCES**

Although Dammam is one of the highest-ranking cities in Saudi Arabia in terms of own-source revenue generation, only 19 percent of the amanah's budget in 2016 was own-source revenue, while the rest came from intergovernmental transfers and grants. As a result, the DMA and the Eastern Province are heavily reliant on the central government. While the budgeting process takes into account objective indicators such as population, the process whereby powerful governors influence how the budget is allocated is highly political. The Eastern Province therefore has an advantage, with high-profile members such as the Aramco chairman and the Minister of Energy on its municipal board.

Dammam’s budget consists of operation and maintenance/programs and contracts, salaries, and operation expenses. While own-source revenues have increased over the last several years, their share of the total budget has not necessarily grown at the same rate. If the central authority pushes the 40 percent own-source revenue target, as proposed in NTP 2020, and does so without supportive policy incentives and intermediate goals, short-run incentives could push municipalities to promote certain types of land use and development projects that are suboptimal and create negative externalities.

Own-source revenue in the DMA increased from SAR 246 million to SAR 299 million between 2012 and 2016. Most of this has come from government land revenues. The introduction of a 2.5 percent White Land Tax (WLT) is also a testament to the kingdom’s recognition of land as a powerful revenue source. The WLT is expected to provide a significant source of revenue for the Ministry of Housing, curb land speculation, and promote the development of idle land within the urban...
boundary. However, neither land leasing nor the WLT is a silver bullet to solve the challenge of own-source revenue diversification in the country (SAMA 2015). Land sales, rentals, and leasing are the simplest form of land-value financing, but these instruments do not generate enough revenue. A wide spectrum of land-based financing instruments exists beyond the current focus on leasing and WLT. In the age of decreasing oil revenue, Dammam will require greater revenue stability, predictability, and self-sustainability to meet its ever-growing expenditure needs. To this end, Dammam and its amanah must explore a variety of financing instruments and build the capacity of its existing land management system.

COMPOSITE REVENUE RESOURCES

The demand for capital to finance local infrastructure in emerging countries is becoming a priority, especially in cities like Dammam. To fill the financing gap and address these new development challenges, the financing options available to countries like Saudi Arabia have been rapidly expanding. Recent reforms are aiming to improve the Saudi capital market through increased market capitalization. For example, the Capital Market Law, the Securities and Exchange Commission, and a privately owned stock exchange were recently launched in Saudi Arabia with the goal of improving the domestic capital market.

Public finance and sound fiscal management are key to supporting local development goals and establishing a solid financial base that, in turn, will strengthen the public sector’s role in supporting local economic development. Dammam is guided by the National Development Plan, a system that is highly centralized and dependent on intergovernmental transfers (vis-à-vis line item budgeting in the national plan) to fund local development activities and projects. In 2017, the central government allocated 5 percent of the total budget to municipal services, which also covered projects and programs managed by MOMRA. To reduce dependence on intergovernmental transfers and increase the performance of municipal services and activities, the government is exploring alternative means of generating revenue to support its development activities and improve services.
Despite minor setbacks between 2015 and 2016 the reported data show a general growth trend in own-source revenue mobilization, which increased from SAR 246 million to SAR 299 million between 2012 and 2016. A more detailed breakdown of Dammam’s own-source revenue shows the largest own-source revenue contributions come from the revenue collected from government land.

Over the last few decades, Saudi Arabia has engaged in a series of reforms that are now creating competitive and attractive conditions for capital and equity investors. This approach is expected to have wide-ranging impacts on the local economies of cities like Dammam in the future, increasing the availability of capital to fund urban development.

Regarding Saudi Arabia’s debt market, the government began issuing bonds for debt financing in 1988. In the past 15 years the debt market has undergone a series of reforms, which changed the process for issuing bonds, pricing bonds, and setting bond maturity terms. One major purchaser of government bonds is the group Investors in Government Development Bonds (GDBs), which is made up of domestic financial institutions, banks, and foreign investors (Hentov et al. 2017). GDBs are Zakat-deductible for domestic investors and exempt from tax withholdings on income for foreign investors.

The Saudi Arabian capital market is becoming an example of efficient capital allocation driven by strategic reforms and increased market capitalization. Between 2011 and 2016, Saudi equities increased in value from just over 50 percent of GDP to almost 70 percent of GDP. Today, Tadawul is the sole Saudi stock exchange market and the largest equities exchange market in the Arab world (Jadwa Investment 2016). In addition to Tadawul, Saudi Arabia introduced Nomu, an equity market for small and medium-sized enterprises (SMEs). With fewer listing requirements, Nomu is a good option for SMEs that are interested in going public.

In addition to providing traditional banking services, Saudi Arabia’s domestic banks went through a series of mergers and acquisitions, diversified their assets, and began to offer both conventional and Islamic investment products to a diversified investor base.
Conclusion and Replication

EXTERNAL VALIDITY

The approaches and processes adopted to achieve spatial and sectoral integration in the DMA case can be tailored to suit similar urban agglomerations in the Middle East and North Africa. Integrated planning and incremental implementation are two approaches that proved to be effective in achieving spatial and sectoral integration in the DMA.

Integrated planning

Integrated planning objectives have been reached through the three consecutive plans prepared for managing urban development in the DMA and its region. These plans were comprehensive in nature, dealing with urban development as part of an integrated environmental, social, economic, and urban system.

In the case of the DMA, integrated planning enabled the area to promote a more economical urban development process and to utilize the economic advantages of urban agglomeration. This urban agglomeration in turn has enabled the emergence, and the efficient functioning, of national infrastructure facilities. The advantages of urban agglomeration have enabled the DMA to act as a growth pole, transmitting development to all areas in its region.

Incremental implementation

The spatial and sectoral integration in the DMA was incremental and gradual. It first happened at the local level, gradually integrating the urban areas of Dammam and al-Khobar. Second, spatial integration was achieved at the subregional level, integrating the DMA with the neighboring Qatif and Ras Tanura governorates. Third, spatial integration was achieved at the regional level, integrating the DMA with the Eastern Province. Then, spatial integration was pursued at the national and international levels.

Incremental implementation enabled planners and policy makers to review, evaluate, and modify the adopted approaches and methods, making the development process more efficient and economic. This approach was also appropriate regarding the gradual financing of the development process.
Key environmental challenges

The key challenges in the case of the DMA, which should be considered when applying these approaches to other cases, are raising the profile of the environment and achieving more integration among sectors involved in the development process. It is essential to rebalance the approach to development, both in order to reverse the ecological damage that has already been done and to protect and enhance natural assets in the urban context.

Overall, the proposed land use plan for Dammam needs to be reassessed, taking into account the many current and future challenges facing the Dammam Metropolitan Area—which range from protecting it from climate change, building coastal resilience, and addressing the need for ecological corridors to meeting the need for new mixed-use nodes. Modifying the proposed land use plan also presents an opportunity to redefine the Dammam Development Protection Boundary, reducing its extension and increasing the density within the existing urban footprint, by making use of the current vacant land within the 1450 urban growth boundary (Godschalk 2003).

INVENTORY OF SOLUTIONS

Through its different stages, this report has identified five keys areas where support from national and international agencies is needed to address the challenges facing the adoption of integrated approaches across the planning cycle in the DMA and similar cases. To address the challenges and bottlenecks facing the adoption of integrated approaches across the planning cycle in the region, policy support is needed in five key areas, as follows.

Strengthening institutions and governance systems

Although existing institutions, laws, policies, and strategies promoting integration provide an appropriate foundation, some institutions in the DMA are still weak and need support if they are to influence development policy. The development of fledgling institutions is understandably a slow process that entails going through stages of iterative learning and evolution toward
becoming fully integrated and holistic. A major challenge facing integration in the DMA is that planning institutions and processes still work along sectoral lines and no one institution has the mandate and resources to pull all actors together. Also, integrated planning and policy coherence is a new concept in the region; thus, integrated planning needs more efficient coordination mechanisms, budgets for cross-disciplinary work, and skills and incentives for working together. Making the transition to integrated planning and implementation in the DMA requires strengthening institutions and governance systems at all levels.

**Strengthening evidence-based, empirically backed policy options**

The complexity of integrated planning, with its many drivers and actors, makes evidence-based policy making increasingly desirable. However, the assessment of integrated policy options is a challenge in the DMA due to a lack of data availability and sharing arrangements, low institutional capacities across the policy cycle, and insufficient communication between analysts, policy makers, and stakeholders. While better evidence is necessary to support and inform a consultative policy-making process, for such a process to be realized, mechanisms also need to be in place that ensure all parties have a voice in the process, especially the vulnerable sections of society. Support is needed to:

- Develop reliable and complete data;
- Promote appraisal approaches and system analysis tools to ensure that agencies, sectors, and civil society are better informed on the need for integrated policies and how they can be implemented;
- Develop and promote participatory approaches to evidence-building; and
- Build capacity across local government and specialized agencies in the broad range of tools that can inform integrated planning so that local government can independently undertake and periodically update assessments.

**Development of budgeting and financial systems**

The transformative post-2015 development agenda must be underpinned by a credible means of implementation, as explained in the Addis Ababa Action Agenda of 2015 (UN 2015). However, currently all countries, to varying degrees, face shortfalls in the funding required to meet sustainable development objectives, and all need to better leverage their existing funding. Clear lines of resource mobilization, along with realistic financing frameworks and responsibilities, will be imperative if a rapid transition to an inclusive green economy is
to be achieved. Stronger measures are needed to expand the tax base, remove
perverse incentives, encourage private investments, increase efficiency, and
address corruption.

Key areas of support and enabling factors include:

- Ensuring integrated planning goes hand in hand with budgeting, so that
  funds are available for implementation and programs are prioritized
  and phased in despite budget constraints; and
- Identifying and developing effective financing mechanisms to meet
  the costs of achieving the SDGs and transitioning to an inclusive green
economy (UN 2015).

Support for monitoring and evaluation

Monitoring and evaluation (M&E) systems—for social, economic, and urban
development policies, plans and projects—are needed in metropolitan areas.
These systems have to be fully effective and/or tailored or capable of being
applied to integrated approaches and the SDGs. Monitoring and evaluation
results should feed back into planning and policy making, fine-tuning and
adjusting policy design and formulation, programming, and budgeting. There-
fore, integrated planning systems require further support to fully develop the
approaches and assessment methods required to establish program and policy
evaluation processes and to measure progress toward the SDGs.

Capacity development

Capacity constraints limit integrated planning at all stages of the planning
cycle, across all levels of government, localities, and among stakeholders.
Individual and institutional capacity challenges common to the governments
of developing countries include insufficient technical knowledge; weak
assessment abilities; limited research capacity; limited monitoring and eval-
uation capacity; and a lack of public awareness of and support for sustainable
development (UNDESA and UNDP 2012).

In addition, and to meet the objectives of the Addis Ababa Action Agen-
da, capacity building in areas such as public finance and administration,
social and gender responsive budgeting, and financial regulation and
supervision are sorely needed in metropolitan areas. Despite common
challenges, capacity development must be country-driven, address the
specific needs and conditions of metropolitan areas, and address sustain-
able development priorities.

This support needs to be tailored to the needs of individual metropolitan
areas based on their development contexts and priorities, their institutional
structures, and their capacities.
Density

High-population-density areas are concentrated along the coast. Between 2000 and 2017, Dammam’s metropolitan population density has increased to about 590 people per square kilometer, albeit starting from a low level of 430 people per square kilometer.

**Figure 5**

**POPULATION DENSITY, 2000**

- **Municipal**
  - Maximum: 20,166 people/km²
  - Minimum: 1 person/km²
  - Average: 761 people/km²

- **Metro**
  - Maximum: 9,072 people/km²
  - Minimum: 1 person/km²
  - Average: 432 people/km²
Figure 6

POPULATION DENSITY, 2017

Municipal
- Maximum: 24,379 people/km²
- Minimum: 1 person/km²
- Average: 894 people/km²

Metro
- Maximum: 17,205 people/km²
- Minimum: 1 person/km²
- Average: 588 people/km²

Figure 7

Overlay of density levels, 2000–2017
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ABBREVIATIONS

<table>
<thead>
<tr>
<th>DMA</th>
<th>Dammam Metropolitan Area</th>
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<tr>
<td>GCC</td>
<td>Gulf Cooperation Council</td>
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<td>GCC</td>
<td>Cooperative Council Road</td>
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<td>GDB</td>
<td>Government Development Bond</td>
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<td>SDG</td>
<td>Sustainable Development Goal</td>
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<td>SME</td>
<td>Small and Medium-sized Enterprise</td>
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<td>UGB</td>
<td>Urban Growth Boundary</td>
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<td>WLT</td>
<td>White Land Tax</td>
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Dar es Salaam, Tanzania
Participatory River Basin Planning

MaryGrace W. Lugakingira, Amy Faust, and Maria Pomes-Jimenez
Participatory River Basin Planning

MaryGrace W. Lugakingira, Amy Faust, and Maria Pomes-Jimenez


The Synthesis Report offers a range of integrated solutions (Mehrotra 2020).
Participatory watershed-level integrated planning

Figure 1
Integrated planning model
Source: Mehrotra 2020, with inputs from MaryGrace Lugakingira, Amy Faust, and Maria Pomes-Jimenez.

A Authorities identify conservation zones—like forests and floodplains—and direct urban expansion to safer areas by securing public right-of-way for infrastructure, open spaces, and institutions.

B Decision makers can manage urban expansion on the metropolitan periphery by learning from these historic neighborhood-level successful sites and services integrated approach. For policymakers seeking metropolitan integration this serves the twin purpose of preventing sprawl and avoiding laying high cost infrastructure after the built-up area has expanded.

KEY FINDINGS

1 The Dar es Salaam Rapid Transit (DART) system represents the most transformative initiative to reshape the city and strengthen urban mobility. At the river basin scale, integrated and participatory planning is being leveraged to tackle extreme flooding, environmental degradation, and housing for the urban poor. Sites and services neighborhoods established by national government four decades ago are the most vibrant and functional in the city, have preserved natural draining, and have infrastructure right of way.

2 Restrictions on accessing market finance limits opportunity to scale projects beyond donor-funded stages. Higher land values in planned neighborhoods suggest land value capture and property tax could fund cost-recovery for future serviced sites, while BRT experience may be helpful in capitalizing on public-private partnerships, and private investment in real estate development along the river basin.

3 Re-establishing forests and wetlands provide sinks for greenhouse gases, while transit-oriented development linked to existing bus rapid transit could displace private vehicle use.
IDEA IN BRIEF

Policymakers can utilize participatory approaches to integrated planning—such as equity planning—to overcome cross-sectoral challenges of housing, basic service provision, rapid urban expansion, flood management, and watershed conservation, or exclusionary top-down planning.

Dar es Salaam utilized participatory planning to tackle extreme flooding, environmental degradation, and housing for the urban poor at a river-basin level. This model combines the experience of earlier government-led spatially restricted integrated planning, which had been done at sites scattered across the city, with a carefully designed approach to integrate horizontally across sectors while blending bottom-up participatory processes for decision-making.

Urban planners held workshops at the design stage involving key public institutions and civil society, including those directly affected by floods, followed by private-sector consultations at a later stage to avoid land speculation. This participatory process posed challenges to obtaining swift buy-in from national institutions and private-sector actors, given their respective concerns over fiscal allocations and commercial returns on investment. Options to scale up require adopting a nested approach to solutions that combines national policy making with regional programs, reinforces local-area interventions at the project level in the city, and diversifies stakeholder engagement to include a pragmatic view of financing arrangements.
The Metropolitan Context

DAR ES SALAAM, located on the Indian Ocean coast of East Africa, is Tanzania’s largest city and commercial capital. Metropolitan Dar is central to the national economy, contributing 17 percent of Tanzania’s gross domestic product (World Bank 2018b). Jobs in Dar account for more than 33 percent of formal employment in Tanzania (World Bank 2018b). The city’s port infrastructure is a lifeline of the economy, facilitating regional and international trade, and serving as a gateway to Tanzania’s interior as well as five surrounding landlocked countries¹. Although Dar es Salaam houses a larger share of formal employment than anywhere else in the country, the city’s economy is primarily reliant on informal employment, which is oriented toward low-value services rather than production of goods (World Bank 2018b).

Dar es Salaam’s population growth has far exceeded expectations. It was envisioned in its 1948 masterplan to be a city with a population of just 200,000 (Armstrong 1996). In contrast, today Dar is home to about 6 million people and with an annual growth rate of 5.6 percent (NBS 2014), making it one of the fastest-growing cities in the world. By 2030, Dar is expected to be a mega-city—home to over 10 million people. In the colonial era, from the late 1800s until independence in 1961, policies included strict land tenure and zoning regulations restricted people of African descent from residing in urban areas (Armstrong 1996). Urban population growth was limited, as was the growth of informal settlements. Following independence and elimination of racial restriction policies, migration into Dar es Salaam boomed. Over half the residents of contemporary Dar were born in other regions of Tanzania (NBS, 2014).

The decades since independence have been characterized by a constant struggle to service the existing city while catering to its ever-growing number of new residents (Kironde 1994). Urban planning has not kept up with this population growth and urban expansion. An estimated 70 percent of land is unplanned and basic service networks have extremely low coverage, as observed in Table 1 below.

¹ Uganda, Rwanda, Burundi, Democratic Republic of Congo, and Malawi.
The rapidly expanding urban footprint is driven by the continual hunt for affordable land on the city’s fringe, as issues around security of tenure, incentives with current planning regulations and controls, access to finance, and the high demand for low-cost land at the urban periphery all perpetuate the cycle of low-density expansion (World Bank 2018b). While Dar es Salaam’s overall density is relatively low at just 3,686 people/km², housing itself is overcrowded with 28 percent of residents living at least three to a room. Low-rise development predominates and leaves even prime neighborhoods near the CBD with 20,000 people per square kilometer, which is relatively low² (Map 1). For example, by 1980, Jakarta’s CBD was more than double this density, while current densities in Shanghai and other large Asian cities exceed 100,000 people per square kilometer (World Bank 2018b).

² This is comparable with London.

### TABLE 1. BASIC CITY DATA

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<td>6 million</td>
<td>5.6%</td>
<td>3,686 ppl/km²</td>
<td>70%</td>
<td>25%</td>
<td>10–14%</td>
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a Approximate estimate based on NBS reported 5.6% growth rate and 2012 population of 4.36 million (NBS 2014).
b (NBS 2014).
c World Bank calculation using NBS 2014.
d (World Bank 2016a).
e Lall, Henderson, and Venables 2017; AfriArch 2019.
f (AfriArch 2019).
To estimate population density, LandScan uses remote sensing imagery analysis to disaggregate census counts within an administrative boundary. As a result, built-up areas such as airports and industry may appear to have a residential population where there isn’t one.
METROPOLITAN GOVERNANCE

Dar es Salaam has an administratively fragmented system of metropolitan governance. The metropolitan area is classified as a political entity of 1,628 square kilometers, which is organized into five municipal councils—Ilala, Kigamboni, Kinondoni, Temeke, and Ubungo. Dar es Salaam City Council nominally serves as a coordinating body between the five municipalities. In practice the five municipal councils govern local matters autonomously as the Dar City Council has no legal authority over these adjoining jurisdictions. This governance structure lacks coordination, with unclear lines of accountability and responsibility, and is not ideal for a large and rapidly growing metropolitan area (World Bank 2015). Urban development is beginning to expand beyond Dar es Salaam’s regional boundary, into the Mkuranga and Kisarawe districts of Pwani Region. At the sub-national level there is no dedicated agency or formal coordination mechanism between Dar es Salaam and Pwani Region, or between the districts within these regions.

Metropolitan infrastructure service delivery is centralized; the national government leads on metropolitan governance, planning, and infrastructure investment. Services such as communications, electricity, water, sewerage, and regional and district roads are overseen by parastatal authorities that report directly to central government ministries. Management of these services is at the district level, as opposed to metropolitan level. There are no citywide departments for these types of services, nor functions such as tax collection or environmental enforcement. Dar urban planners observe that institutionally, there is no oversight or coordination between basic service network installations, land use, and infrastructure planners such as those overseeing transport systems. As an illustration of Tanzania’s highly centralized approach to urban governance, the Ministry of Lands, Housing and Human Settlements Development—as opposed to Dar es Salaam City Council—is leading the process to update the Dar es Salaam masterplan. Average annual expenditure for metropolitan Dar in the period 2013–2017 was about $145 million⁴, 50 percent of which was recurrent spending and about 5 percent each of which was for roads and drainage, water supply, sewerage and solid waste, and land preparation. Another 25 to 30 percent was for capital spending, with negligible spending on infrastructure maintenance. About 60 percent of this budget is financed through federal transfers, and the remaining 40 percent is own-source revenue.  

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³ Calculated using shapefiles obtained from National Bureau of Statistics.
⁴ Expenditure data is averaged for four fiscal years 2013–2014 to 2016–2017 and is the total for the metropolitan Dar area—Ilala, Kigamboni, Kinondoni, and Temeke municipal councils (areas that are now Kigamboni and Ubungo municipal councils were part of these three original councils during the examined period). Financial flows from international development partner-funded projects are not to included here because such funds tend to be channeled through central government or paid directly to contractors.
⁵ Here and throughout this chapter, all dollar amounts refer to US dollars.

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Figure 3
3D population density distribution
In Dar es Salaam, each sub-ward office serves a population of approximately 10,000 people. These offices are easily accessible to community members and provide a wide range of services. Tanzania’s sub-ward governance structure is a relic of the socialist Ujamaa governance structure established under the first post-independence president Julius Nyerere—ujamaa is Swahili for “extended family”.

While Tanzania’s formal land transaction system requires approval from the Commissioner of Lands at the Ministry of Lands, a parallel and informal land transaction system exists as well. In this informal system, once a buyer and seller of land agree on details and price, they seek out the sub-ward chairman, who signs off as a witness on the transaction. This practice has its challenges, which include the fact that land transactions are often “witnessed” for inappropriate plots, such as those on hazardous land, but the practice does offer a relatively high degree of tenure security even for low-income urban residents.

Over the five decades following independence, urban plan implementation was largely done through a conventional approach of mass land acquisition and compensation, followed by resale of planned and surveyed plots. The high expense associated with this practice, combined with limited available finances, contributed to poor implementation. Some neighborhoods in Dar es Salaam, as well as other Tanzanian cities, have come to accept that an alternative approach to planning and surveying unplanned areas is needed. They have begun entering into profit-sharing or land-sharing agreements, in which existing land owners receive (for example) 60 to 70 percent either of the profit from land sales or of the plots that their landholding has been subdivided into, while the municipality receives the remaining 30 to 40 percent. While this is not currently being used systematically at the metropolitan level, it appears to be a practical approach that could be scaled up. Appropriate precautions should be taken, however, to curb sprawl and discourage the trend of providing for primarily single-family housing on low-density plots, at the cost of other critical land uses (e.g. commercial and industrial) and higher densities.

The establishment of the Dar es Salaam Rapid Transit (DART) system represents the government’s most transformative initiative to improve the quality of public transport, strengthen urban mobility, and shape the city. The first DART line has shown immediate impact, with the annual time saved by a commuter using the line—compared to pre-DART travel times—estimated at about 16 days (World Bank 2018a).
Integration

HOW INTEGRATED PLANNING IS DEFINED AND ADOPTED

DAR ES SALAAM has neither formally defined nor adopted a process of integrated planning at the metropolitan level. The five municipalities plan and budget independently, functions are increasingly centralized to national ministries and agencies, and planning for citywide infrastructure and services is undertaken by central government agencies or sector-specific parastatal institutions. Integration is a challenge in terms of planning and urban management, but there are modest examples of how integration has occurred on a project level.

Dar es Salaam has had three masterplans: the first was approved in 1949 during German colonial rule, a second was adopted in 1968, and the latest was approved and adopted for implementation in 1979 (Armstrong 1996). The Urban Planning Act, which is the principal legislation for urban and rural planning in Tanzania, incorporated a provision for review every five years of such General Planning Schemes—the term used in the Act to refer to a masterplan or interim land use plan. Currently, a draft Dar es Salaam masterplan for 2012–2032 is in a protracted approval process.

The 1979 plan has been invalid since it expired in 1999. Thus, there has not been any masterplan guiding the city’s growth for 20 years. This complicates the land tenure system, as the masterplan is intended to guide Detailed Planning Schemes (DPS), which identify the specific zones or land uses allowed on a plot; these schemes are a precursor for issuance of land titles. The coverage of existing DPS at the neighborhood level is estimated to be around 30 percent of the total urban area, leaving 70 percent of the city unplanned. The creation of new detailed planning schemes is reported by municipal urban planner interviewees to be primarily driven by private land owners with the intention of seeking land title. This uncoordinated approach to DPS development has contributed a patchwork of planned and internally integrated neighborhood fragments embedded largely within the broader unplanned organic urban fabric of the city.

The national-level ministries and parastatals that provide most infrastructure and service delivery in Dar es Salaam have prepared their own sector-specific masterplans and other spatial development plans. City services such as piped water supply networks and, to a much lesser extent, sewerage networks (see Map 2) are uncoordinated with other key infrastructure service coverage and serve a limited area of the metropolitan urban extent (see also Map 3 and Map 4).
In the absence of a city masterplan or metropolitan development authority, these sector and area plans are disconnected from one another and largely serve as investment plans for line ministries to attract and align with future projects from the donors that finance them.

Adopting integrated planning is further challenged by a lack of capacity for urban management and enforcing development controls. Despite laws that allow for some degree of oversight even where plans are not in place, development in unplanned areas generally occurs without any review or approval by municipal offices. For example, the Environmental Management Act, which outlaws construction in environmentally sensitive areas, and the Roads Act, which establishes no-build buffers for all formally classified roads, both have weak enforcement. While sub-ward officers often serve as witnesses on land transactions, they generally do not enforce, report, or educate land owners on national guidelines and legislation on allowable development. Prospective developers may not be informed that building on hazard land, for example, may not be legally recognized by national authorities even though their transaction has been endorsed by sub-ward officials (Huang et al. 2018). Enforcement has thus been insufficient to either prevent encroachment into designated no-build areas or to ensure that growth occurs according to adopted plans.

TOOLS AND SECTORS INVOLVED

Despite the institutional and financial challenges, integrated planning tools and methods have been adopted in Dar es Salaam’s planning and investment processes from the 1970s until the present day through various projects. These have included:

- **Sites and services** approach, deployed in the 1970s and 1980s. This was a supply-based approach to the delivery of planned neighborhoods and housing employed in several countries in the global south (World Bank 1974). The planning process and outcomes were integrated in that they combined planning with the delivery of basic infrastructure, the provision of land titles, and housing finance—for example the National Sites and Services Program, 1974–1984.

- **Urban upgrading**, which aims to improve service delivery in informal areas while minimizing land acquisition. Lower-income communities are targeted for horizontally integrated services including improvements of roads, drainage, streetlights, footpaths, waste management, and water points. Urban upgrading generally involves close consultation with communities to identify priorities. Two examples of such integrated projects are the Community Infrastructure Upgrading Program, 2005–2012 and Dar es Salaam Metropolitan Development Project—Component 2, 2015–present.
• **Participatory planning**, which brings together stakeholders across multiple sectors (horizontal integration) and from grassroots up (vertical integration) to develop broad consensus around technical solutions and implementation strategies for planning issues. Involved sectors included integrated solutions for transportation, land use, water, sanitation, drainage, environment, and waste management. Examples of such integrated solutions in Dar are the BRT Phase 1 Corridor Development Strategy, 2018 and Msimbazi Opportunity Plan, 2019.

These tools have been used on an ad hoc basis through various donor-funded projects. The literature review and interviews for this case study reveal that the sites and services and urban upgrading initiatives were implemented successfully but the approach was not scaled up beyond targeted areas after projects were completed, so impacts of improved service delivery remained at a community level. Participatory planning initiatives that were undertaken in 2017 and 2018 employed new approaches of planning and decision-making, but these plans have not yet been meaningfully implemented, in part due to their complexity and lack of appropriate institutional mechanisms for implementation.

Institutional leadership for integrated planning tools is generally offered either by the Ministry of Lands, Housing and Human Settlements Development or the President’s Office for Regional Administration and Local Government, though Dar es Salaam City Council did later have a lead implementation role for the Community Infrastructure Upgrading Program (2005–2012).

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**Implementation**

FROM THE SAMPLE INTEGRATED PLANNING PROJECTS reviewed for this case study, two were selected for more in-depth review to draw lessons from implementation experiences.

• **The National Sites and Services Program** from 1974 to 1984, which targeted the rapid pace of population growth and unplanned development through providing 7,450 surveyed and serviced plots in three neighborhoods in Dar es Salaam. The program, co-financed between the Government of Tanzania and World Bank, was not continued but decades later provides an early example of how a modest-scale integrated planning effort has affected the city over time.
The Msimbazi Opportunity Plan (MOP), which is a recent initiative that began engaging stakeholders in 2018. The MOP used integrated and participatory planning to tackle extreme flooding, environmental degradation, and housing for the urban poor in the Msimbazi river basin, which is highly populated and prone to extreme flooding. Strategic planning has taken place, but the detailed design and investments have not yet been prepared. Thus, this project review focuses primarily on the initial phases of visioning and planning for an integrated approach to investments.

The rationale for selecting these two projects was to highlight different methods and tools for integrated planning that were used over different time periods to overcome challenges of housing, service provision, environmental degradation, and reducing the negative impacts of urbanization. The sites and services case provides findings from many years post-implementation, and the Msimbazi case, which has not yet been implemented, provides lessons on a different approach to the integrated planning process. These two examples also provide insights into how integrated planning was carried out at time when Dar es Salaam was a small city of 491,000 (World Bank 1974), and in the present context of a rapidly growing metropolis approaching mega-city status.

**THE NATIONAL SITES AND SERVICES PROGRAM**

**Overview**

Tanzania’s post-independence government initially took an authoritarian development control approach to preventing unplanned development, relying on demolition and resettlement as primary tools for managing the growth of informal settlements. By the 1970s, a decade after independence, the government recognized this approach to be too costly and socially disruptive, especially given the rapid pace of squatter settlement development. In 1971, it designed a supply-based approach to the delivery of planned neighborhoods and housing. The planning process and implementation were an integrated approach in that they combined planning with the delivery of basic infrastructure, the provision of land title, and housing finance (World Bank 1974).

The 1970s, when the National Sites and Services Program was initiated, was a period of highly centralized governance in Tanzania. As in most newly independent African countries, the number of well-educated citizens was simply too low to fill the immense capacity needs of the civil workforce. Government
was also under a great deal of pressure to deliver needed services in a context of both abundant development needs and a nascent economy with limited financial resources. Although local government authorities had been in place from pre-independence to the early 1970s, these were abolished by the national government in 1972, and service delivery mandates were formally shifted to central government ministries (Mustafa 2008).

Resources to implement the envisioned program proved to be limited. Tanzania’s second five-year plan called for 5,000 serviced plots, yet only 600 (12 percent of the target) had been provided halfway into the plan’s implementation period. This resource shortage led the government to approach the World Bank for assistance in October 1972 (World Bank 1984). The resulting credit was the Bank’s first urban project in Tanzania. It aimed to provide 7,450 serviced plots in three strategically located neighborhoods in Dar es Salaam (World Bank 1984). As part of the project, government institutions crafted building codes that were friendlier to the urban poor, which were intended to serve as the basis for a complete revision of the national building code (World Bank 1974).

The sites for serviced plots totaled 475 hectares and were selected on the basis of:

- Availability of large tracts of land with soil suitability and drainage that was amenable for development;
- Proximity to employment opportunities; and
- Proximity to public transport and infrastructure networks such as roads, water, and power mains.

**Actors**

In Tanzania in the early 1970s, community participation was not a fundamental planning principle as it is today, so the initiative was very much central government-led and World Bank-guided. The key actor throughout the project’s 10-year implementation period was the Ministry of Lands, Housing and Urban Development rather than the municipal councils. Other key actors included sector authorities, such as the water authority, which installed the water network, the electric authority, which was tasked with the installation of street lighting and the electrification of community facilities, and the Tanzanian Housing Bank, which was responsible for financing construction loans to plot owners as well as to private households who became plot owners and who (at least in theory) led the housing construction piece.

**Institutional architecture**

To support project implementation, a sites and services unit was established within *Ardhi* (Swahili for land)—the Ministry of Lands, Housing and Urban Development. This unit coordinated and oversaw the project until its last year, when the sites and services unit, together with project implementation and over-
sight responsibilities, was transferred to the newly established Prime Minister's Office for Regional Administration and Local Government\textsuperscript{6} (World Bank 1984).

The central government was the only approval authority over the issuance of building permits and initial signoffs on title deeds from the project's commencement in 1974 until 1978, at which point local government authorities were re--established following their abolition in 1972 (World Bank 1984).

The National Housing and Building Research Unit within the Ministry of Lands, Housing and Urban Development led the development of alternative design standards and house prototypes at the outset of the project. The Tanzanian Housing Bank was responsible for providing house construction loans to plot owners, although its effectiveness in doing so was sharply criticized in post-project evaluations. Tanzania Electric Supply Company Limited (TANESCO), the electric authority, was tasked with installing a distribution network and streetlights and with the electrification of community facilities (World Bank 1984). Serviced sites required the cooperative ("systemic") efforts of several institutions for completion and fragmented responsibilities made it difficult to pinpoint and resolve bottlenecks.

**Sustainability**

The short answer to whether Tanzania's sites and services integrated planning approach of the 1970s was sustained is a somewhat disappointing "no." The bulk of the funds in the scale-up project that received World Bank financing in 1976 were spent on squatter upgrading, which inherently yields a higher return than sites and services (World Bank 1984). Sites and services neighborhoods did not produce immediate, highly visible achievements due to the underdelivery of the promised infrastructure as a result of adverse economic conditions during project implementation. They were slow to consolidate, and those households that did manage to complete house construction within the project period were observed to have been relatively high-income and not the target group of the project, which was intended to benefit low-income households (World Bank 1984).

Yet in retrospect, the answer to whether the sites and services integrated planning approach should have been sustained appears to be a qualified "yes." Four decades after project implementation, sites and services neighborhoods are the most vibrant and functional neighborhoods in all of Dar es Salaam (Map 5). Scale-up of the sites and services project would likely have been a highly effective measure toward protecting Dar es Salaam from the proliferation of unplanned development, which has left little room for necessary infrastructure right of way and failed to preserve natural drainage.

\textsuperscript{6} PMO-RALG is the previous name for the current ministry PO-RALG, mentioned earlier.
MAP 5
URBAN MORPHOLOGY
2019

Existing railways
Metrobus (BRT) lines
Existing Metrobus (BRT) stations
Parks and recreation spaces

SOURCES: OpenStreetMap
Contributors

MAP PROJECTION: WEB MERCATOR,
WGS-84 Datum
What in fact happened is that slow consolidation, a low number of project beneficiaries relative to project cost, and difficulties in cost recovery led the Tanzanian government and the World Bank to move away from this approach (World Bank 1987). Globally, the share of sites and services projects—including slum upgrading—in the World Bank’s Shelter Lending total fell from around 70 percent in the 1972–1986 period to around 15 percent in the 1987–2005 period (Buckley and Kalarickal 2006).

In Tanzania, the integrated planning principles of the National Sites and Services Program eroded, and the government moved toward a survey-only approach that did away with housing finance and basic service provision and focused exclusively on plot provision.

The 20,000 Plots Program. In contrast to the National Sites and Services Program, the 20,000 Plots Program provides a clear illustration of a non-integrated planning approach: the program aimed to survey the number of plots needed for future urban expansion, which was estimated at 20,000. Enormous tracts of land were purchased on the urban periphery and subdivided into primarily residential plots of 400–800m. In total, more than 30,000 plots were surveyed and subsequently sold. While this simplified approach to planned and surveyed land was immediately profitable for government, it has been deeply criticized by academics and others as accelerating sprawl and establishing an urban form that is incredibly carbon-intensive and expensive from a service provision perspective.

An urban planner from Ardhi University observed that the 20,000 Plots Program had been touted as a success only because the servicing costs had not yet been realized or were perceived as acceptable externalities, because they were generally on another institution’s bill, such as the water or electric authority. A government policy paper written as part of a since-stalled initiative to prepare an urban development and management policy observes that “Costs incurred by the public for the preparation and delivery of planned and surveyed land to middle- and high-income [households] are not recovered. In other words, the public is heavily subsidizing land delivery for not-poor households” (PMO-RALG 2010).

In taking a more integrated planning approach to accommodate unrelenting population growth in need of new housing, the challenge of delivering global environmental benefits and achieving sustainability hinges on finding a way to balance ideal outcomes. That is to deliver planned, surveyed, and well-serviced compact and mixed land use neighborhoods against a reality of finance and human resource constraints. Nevertheless, it is clear that the early establishment of rights of way and the protection of those rights through strong development control offer immeasurable benefits down the road that can allow integration of urban infrastructure systems and potentially curtail carbon-intensive low-density sprawl.
Types of solutions and phasing

Tanzania’s National Sites and Services Program was implemented over a 10-year period, from 1974 to 1984. Post-project evaluations noted that the implementation period was a very difficult time due to macroeconomic shocks associated with rising international prices in 1974 that coincided with the surge in oil prices, the collapse of the East African Community in early 1977, and the war with Uganda in 1978–79. These events produced widespread shortages of building materials. The project also suffered from major delays in the import of equipment and spare parts, as well as rapid inflation (World Bank 1984).

The sequence of project implementation involved (i) neighborhood layout plan and basic service infrastructure designs conducted by consultants as part of project preparation; (ii) land acquisition financed by the government of Tanzania and managed by the Ministry of Lands, Housing and Urban Development; (iii) surveying of plots; (iv) clearing of road network and surfacing of roads (for non-dirt roads) and construction of drains; (v) construction of community facilities; (vi) installation of basic service networks; (vii) plot sales; (viii) loan provision (or in some cases, provision of construction materials in lieu of cash loan); and (ix) housing construction by plot owners, except in cases where the government provided a “core house,” in which case the phasing was slightly modified, with house construction preceding plot sales.

Over the implementation period, modifications were made to the initial project design. Although the original intent had been for the private individual purchasers of serviced plots to build their own houses with the support of financing from the Tanzania Housing Bank, in some cases the government provided “core houses” or construction materials in lieu of cash loans (Kironde 1994). The government had agreed at the outset of the project that it would relax strict building standards in order to allow for natural and temporary materials that were more affordable to low-income households than the permanent building materials required by conventional building standards; however, local governments continued to enforce conventional standards, thus driving up the cost of housing construction or denying building/occupancy permits to affordable buildings constructed with natural/temporary materials (World Bank 1984).

Partly as a result of the challenges noted above, the consolidation of sites and services neighborhoods was far slower than had been expected at the outset of the project. The sites and services component of the project was in fact deemed to have lower rates of return and to be less successful in general than the project’s squatter settlement upgrading component (World Bank 1984). However, recent research four decades after the project suggests the exact opposite: that sites and services neighborhoods have in fact been more successful and produced more enduring benefits than upgrading neighborhoods. The land
Figure 4
Then and now, 2004, 2019

A. DENSIFICATION OF URBAN CORE

B. SLUMS HAVE REDUCED AND LEFT THE AREAS NEAR THE WATERSHED

C. SUBURBAN AREAS DENSIFY

D. EVEN WITH THE DENSIFICATION OF THE LAND USE, RIVER BEDS REMAIN CLEAR
values per square meter are over five times higher in sites and services neighborhoods than in former upgrading areas, and buildings in sites and services neighborhoods are significantly more likely to be connected to electricity and to have access to roads (Michaels et al. 2018).

ACCESSING FINANCIAL RESOURCES
Tanzanian cities have limited options for financing integrated planning. Dar es Salaam’s municipalities are highly dependent on fiscal transfers from the central government for both recurring and capital expenditures, and their ability to collect own-source revenues, which were already low, has been reduced since major sources were recentralized by the national government. Municipalities accessing external financing has been limited. Borrowing decisions are highly centralized both for local government and sub-national utilities, with approvals of any debt incurred by municipalities required from the Ministry of Finance; and, in the example of water utilities, approval is needed from the Ministry of Water. Tanzania’s Capital Adequacy Regulations require that debt maturities over one year carry a 100 percent risk rate, which is a disincentive for financial intermediaries and potential investors in municipal bonds, and bond issuance is not addressed in Tanzania’s existing legal and regulatory framework. Public-Private Partnerships (PPP) have been used in Tanzanian cities on a modest level—such as pay toilets, markets, and bridges—but as a newly emerging tool PPP has not been a major part of finance for integrated planning (World Bank 2018b).

The integrated planning examples reviewed for Dar es Salaam have all involved co-financing from donors. In the case of the National Sites and Services Program, from the start the government of Tanzania did not have sufficient resources for even a pilot project to implement what had been proposed for surveyed and serviced plots in the national periodic plan. In 1974, the government secured World Bank funds for the first sites and services project, totaling about $16 million at the time (present day $131 million). The World Bank’s investment was primarily for infrastructure costs (66 percent) and 50 percent of housing finance, which was split with the Tanzania Housing Bank. The national government financed 100 percent of land and resettlement costs. The full cost breakdown is shown in Table 3. Municipalities in the Dar metropolitan areas did not access financial resources directly, as the project was implemented by the Ministry of Lands, Housing and Human Settlements Development.
### Table 3. Finance Sources, Sectoral and Thematic Allocations, and Amounts

<table>
<thead>
<tr>
<th>Sector/Theme</th>
<th>Finance Source with Description</th>
<th>Amount(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land</td>
<td>GoT 100%</td>
<td>753,600</td>
</tr>
<tr>
<td>Roads</td>
<td>IDA 66%/GoT 44%</td>
<td>2,107,200</td>
</tr>
<tr>
<td>Water</td>
<td>IDA 66%/GoT 44%</td>
<td>1,422,400</td>
</tr>
<tr>
<td>Sanitation</td>
<td>IDA 66%/GoT 44%</td>
<td>221,600</td>
</tr>
<tr>
<td>Energy</td>
<td>IDA 66%/GoT 44%</td>
<td>230,400</td>
</tr>
<tr>
<td>Parks</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Residential(^c)</td>
<td>50% WB/50% Tanzania Housing Bank</td>
<td>3,575,200</td>
</tr>
<tr>
<td>Social housing</td>
<td>NA</td>
<td>0</td>
</tr>
<tr>
<td>Commercial</td>
<td>IDA 66%/GoT 44%</td>
<td>453,000</td>
</tr>
<tr>
<td>Health</td>
<td>IDA 66%/GoT 44%</td>
<td>645,000</td>
</tr>
<tr>
<td>Education</td>
<td>IDA 66%/GoT 44%</td>
<td>776,222</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>10,184,622</strong></td>
</tr>
</tbody>
</table>

\(^a\) Estimated based on World Bank disbursement for sites and services component in the project completion report.
\(^b\) Average exchange rate for the project period in 1984 $.
\(^c\) Used amount of Tanzania Housing Bank loan to individuals for home construction.


The Tanzania Housing Bank (THB) was established in the early 1970s, at a time when government was encouraging self-construction by providing land and subsidizing homes. The Housing Bank’s establishment also coincided with adoption of the sites and services schemes, and was expected to facilitate integrating housing with infrastructure. While it was expected to play a major role in providing loans for house construction and rehabilitation for program beneficiaries, access to THB finance by prospective home builders proved challenging. Applying for a loan was a lengthy process requiring a land title...
certificate, a 5 percent deposit based on the loan amount and various fees—conditions lower-income households were hard-pressed to meet. In the 1970s only 13 percent of national sites and services beneficiaries had received THB loans (GoT and UN-HABITAT 2003).

The landscape for financing integrated planning has not changed dramatically since the 1970s. As in the past, the current structure for accessing financial resources is highly centralized, with minimal involvement of the private sector or credit markets. With a central government lacking resources as well, this leaves little other option than loans and grants to finance integrated projects, and municipal capital investments more broadly. However, more recent planning initiatives, including the Msimbazi Opportunity Plan and the Corridor Development Strategy for Transit Oriented Development, have recommended a different approach to accessing financial resources, both proposing a combination of loan funds for capital investment, PPP, tax incentives, and encouragement of private investment in real estate development (World Bank 2019a; World Bank 2018b).

As a follow-on activity to the Msimbazi Opportunity Plan, private sector actors are being consulted to assess financial viability of the project, and scope finance sources for the various project activities. However, local urban experts note that while a diverse mix of public and private investment are needed, the Msimbazi Opportunity Plan is “a total novelty to Tanzania” and government lacks an appropriate body to manage this type of comprehensive urban development project.

**COMPOSITE COMBINATION OF REVENUE RESOURCES**

The sites and services example demonstrates the challenge for cost recovery of integrated planning schemes in Dar es Salaam. Land rent was the primary cost recovery mechanism for that initiative and was deemed insufficient. In 1983, non-payment for the first phase was found to vary between 54 and 64 percent, and the second phase between 35 and 80 percent (Rakodi 1991). This was not limited to Tanzania: sites and services projects globally were criticized for their inability to recover costs, one factor that caused the World Bank to halt financing for such projects in the 1980s (GoT & UN-HABITAT 2003).

**EVOLUTION OVER TIME OF THESE RESOURCES**

The National Sites and Services Program provides an example of how implementation of integrated planning was hampered by a fragile national and regional economy but managed to persist (albeit in a scaled-back way) despite serious economic challenges. It also demonstrates the importance of external finance for infrastructure. The project period was unfortunately a time of high inflation and
general financial collapse in Tanzania. Due to the currency devaluation, both the first and the second phases had to scale back their investments to avoid cost overruns (World Bank 1984).

At the same time, the Tanzania Housing Bank was a poorly performing financial intermediary characterized by low capacity, high staff turnover, and poor financial performance. The bank did manage to initiate lending to low-income groups, and for the first time allowed lending for the upgrading of squatter settlements. Phase 2 of the program was particularly problematic for the bank, which was found to have “administrative improprieties” (World Bank 1984). The housing bank eventually collapsed in 1995 when the GoT declared it bankrupt and liquidated it. The GoT itself cites an array of issues leading to Tanzania Housing Bank’s failure, including “a weak capital base, dependency on short-term borrowing to finance long-term assets, poor record keeping, poor collateral, mal-administration and corruption” (GoT and UN-HABITAT 2003).

After the World Bank withdrew funding from the sites and services project, the government continued with a third phase in the mid- to late 1980s. Tanzania’s economic situation continued to deteriorate through the decade, and due to financial shortfalls very little was done in the projects aside from some land acquisition, cadastral surveys, and grading a few local roads (Kironde 1994).

While cost recovery was not immediately evident from the project’s close, and no known analyses have been undertaken, the high property values in these neighborhoods compared to surrounding areas (Michaels et al. 2018) suggests that cost recovery is achievable assuming effective land-value capture and property tax. Future initiatives could improve cost recovery and revenue generation through increased digital record keeping, such as the Local Government Revenue Collection Information System (LGRCIS), which was successfully piloted in eight secondary cities in 2013 and subsequently rolled out to all local government authorities in Tanzania.

**MSIMBAZI OPPORTUNITY PLAN**

**Background**

The Msimbazi river basin covers 271 km2 and is home to an estimated 1.6 million people. The basin stretches from the headwaters in the Pugu forest reserve, which is a natural area but subject to rampant deforestation, then continues eastward along an increasingly urbanized stretch as the river approaches the heart of the city. The lower basin is a wide floodplain in the heart of Dar es Salaam near the city center, once a robust mangrove forest estuary with a small patch remaining near the outlet to the Indian Ocean.
The riverbanks and parts of the lower floodplain are densely populated, despite clear prohibitions on building there. The 1979 masterplan designated the lower valley as no-build hazard land, and the Environmental Management Act prohibits building within 60 m of each riverbank. Environmental degradation in the basin is severe. While both upstream forest reserves in the headwaters and mangroves at the outlet to the sea are legally protected as environmentally sensitive areas, deforestation is rampant, and mangroves are visibly retreating due to a lack of management. Along the river sand mining is uncontrolled, impacting the river hydraulics, and riverbanks are used as dumpsites for solid waste. Industrial pollution and household wastewater is discharged into the river uncontrolled. These factors together have turned a once-thriving ecosystem where interviewees reported fishing in their youth into a dead river devoid of aquatic life and with only seasonal natural flows during the rainy season. During the dry season, the water in the river is almost exclusively wastewater from upstream homes and industry.

Some 50,000 people are exposed to flood risk in the basin, caused by a combination of river floods and under-capacity drainage. Flood modelling estimated that between 8,000 and 10,000 households live in areas with such high exposure that their homes are considered unsafe and unsuitable for human settlement. Many of these settlements have existed for decades, resulting in a complex situation whereby despite living in hazard land, the government has long allowed their settlement and legitimized them through service provision such as observable electricity connections and in some cases issuing temporary land tenure documents and collecting taxes. Jobs in the city center are close by, and land values are low, resulting in cheap rent that is 20 to 40 percent lower in the flood-prone areas than higher ground (Panman 2017).

The flood of 2011 was a wake-up call for the city that drew national attention to the problems in the Msimbazi. In December of that year Dar es Salaam experienced the heaviest rainfall since the Tanzania Meteorological Agency started measuring precipitation in 1961. Approximately 10,000 people were displaced by massive flooding in the lower basin, with at least 40 deaths. Transport networks were paralyzed, people lost homes and possessions, and infrastructure was damaged. While 2011 was a benchmark for extreme flooding, the problem has occurred unabated on nearly an annual basis, becoming more frequent as the city’s population grows (see Figure 1).

Following the 2011 flood the government called for relocation of vulnerable households to a resettlement site of 700 plots on the city’s far fringe. Households were given free plots and buildings materials but, due to distant and isolated
location, many returned to the valley. A demolition exercise was also carried out in January 2016, demolishing over 1,000 structures with ambitious plans for more, but this exercise was halted after strong outcry by residents as well as non-government organizations (NGO) and development partners including the World Bank (World Bank 2016b).

Responsibility for taking action in the Msimbazi Basin is complex and uncoordinated. For decades, the lack of a designated authority or natural leading institution has served as a barrier for the cross-sectoral coordination, cooperation, and communication needed to mitigate flood impacts in the Msimbazi Valley. Despite calls from the president of Tanzania in 2014 to develop a solution, and several planning initiatives, no major action has been taken yet and the situation remains the same. Since 2011 various initiatives to deal with the settlements, degradation, and flooding issues have been proposed, but none have yet been implemented.7

A turning point came through the Tanzania Urban Resilience Program (TURP), a World Bank trust fund with resources from the UK Department for International Development’s (DFID) International Climate Fund, which agreed with the President’s Office for Regional Administration and Local Government to attempt to break through the inertia by using a “charrette” method of stakeholder involvement.7

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7 These plans include a city park plan in the Msimbazi in 2011 by MLHDDS; the Dar es Salaam Rivers Rehabilitation and Management Program (2014), developed by Ardhi University and the National Environmental Management Council; and $1.5 million allocated by the Dar es Salaam Metropolitan Development Project in 2014 for design of drainage systems in the Msimbazi, which has not been utilized.
Dar es Salaam’s fragmented expansion extends well beyond its metropolitan boundary; however, participatory planning and self-built homes may help integrate the city’s urban form. 

Source: Moiz Husein/ 500Px Plus via Getty Images.
engagement and participatory planning to develop an integrated solution and buy-in from communities up to the ministerial level. In addition to the funds to support the planning process, TURP included about $20 million for investments with the potential to leverage additional World Bank investment.

The eventual process that materialized combined science with institutional knowledge and grassroots experience to gain the insights needed to comprehend the complexity of the flooding challenges in the Msimbazi, and to collectively define appropriate solutions. These pieces were often missing in prior plans, which lacked resources for flood modeling, for example, or which did not comprehensively give a voice to all stakeholders. However, these prior plans were heavily drawn from in the planning process.

In the end, eight stakeholder workshops and 49 meetings were held, which involved more than 150 individuals from 59 institutions. Stakeholders came from the highest levels of government and the grassroots of the community, from civil society to private sector (World Bank 2019a).

The outputs from the stakeholder engagement process were packaged as the MOP, which included actions on two levels: (i) a strategic development and management framework, which covered the entire river basin, and (ii) a detailed plan for the lower section of the river valley and floodplain. The detailed plan is intended to be a roadmap for a first phase of capital investment to address the most heavily impacted stretch of the river (Figure 6).

**Figure 6**
Recommended physical interventions, Lower Msimbazi Valley
The resulting MOP identified an integrated course of action that involves a wide range of tools and interventions. Civil engineering works, such as dredging, will increase the water conveyance capacity of the river. Ecological interventions, such as upstream reforestation, will reduce erosion and sedimentation and increase stormwater infiltration. Improved land use planning and enforcement will keep people and assets out of harm’s way, and some of the most hazardous areas can be reclaimed by infill and terracing, which would make them safe for urban development. These are summarized in Figure 7.

As the MOP was approved in 2019, implementation has not yet begun and will require setting up an institutional architecture, processing finance, detailed engineering designs, resettlement planning and assessing environmental and social impacts, and procurement of construction contractors, steps that will likely take several years. The financing for implementation is expected to include a combination of various sources, including donors, private sector, sectoral investments from various parastatals and institutions such as the road, water, electricity agencies, and other government own-source funds.
ACTORS

Stakeholder engagement with 59 different actors was far-reaching, community members were central to the entire planning process, and the Tanzanian government and World Bank worked as deeply engaged partners throughout the process. Rather than a typical expert consultant-led technical assistance to develop solutions, the focus was on a process designed to work with government to facilitate the co-creation of a strategic investment plan both across sectors and vertically from central government to community levels.

Community members were the most vocal actors from the outset of the initiative. Facilitated by a consortium of local NGOs, grassroots community leaders and sub-ward politicians worked to seek out the perspectives of area residents, inform them of workshop proceedings, obtain feedback as inputs to the next meeting, and reassure community members who had concerns that there might be a threat of involuntary relocation without compensation. At first, community and government were visibly hesitant to work together, but the process was facilitated carefully and the working relationship between the various levels went surprisingly smoothly.

The President’s Office for Regional Administration and Local Government (PO-RALG) took a committed and strong leadership role throughout the entire planning process. A dedicated focal person chaired all charrette workshop sessions and carefully managed dialogue with key government stakeholders whenever needed. PO-RALG was also instrumental in establishing the institutional architecture needed to coordinate the various municipal councils and kick-start implementation. The Msimba initiative benefitted from two high-level government champions—a minister at PO-RALG and a former minister from the Vice President’s Office for Union and Environment Affairs. The political leaders shared information with their counterparts in parliament and senior ministers at the highest levels of government.

The technical assistance of experts played an enabling role in interfacing with stakeholders for the iterative development of the Msimba Opportunity Plan. The team included disaster risk management specialists, urban planners, engineers, and environmental specialists, who worked closely together to guide and build upon the inputs of charrette participants. Relevant team leaders and specialists from other sectors—including water, transport, environment, social safeguards, and Public-Private Partnerships (PPP)—were drawn upon.
INSTITUTIONAL ARCHITECTURE

The President’s Office for Regional Administration and Local Government (PO-RALG), the central government ministry that oversees local government and administers World Bank-financed projects in the urban sector, is the government entity that chaired the integrated planning process. Because PO-RALG is not a local authority and the Msimbazi Basin stretches across the jurisdictions of three independent municipal councils in Dar es Salaam, a Msimbazi Project Implementation Unit has been established under the Dar es Salaam City Council. This unit will begin leading the coordination, stakeholder engagement, grant-seeking, oversight, and other activities associated with project implementation.

In practice, this arrangement is expected to be similar to the arrangement for Dar es Salaam Metropolitan Project implementation, in which the municipal councils receive heavy technical support and oversight from project coordinators at PO-RALG. It is thus anticipated that PO-RALG will continue to be involved in the procurement and contract management of the various activities to be implemented under the project, particularly those involving civil works.

Successful implementation will require additional institutional arrangements. The Msimbazi project will need a carefully designed legal designation for the land area, authority over its development, and intensive private-sector engagement. The charrette process intensively discussed such institutional arrangements, drawing from past examples including the institutional framework for Dar es Salaam’s Bus Rapid Transit system.

SUSTAINABILITY

Final outcomes and impacts from the integrated planning process will become clearer once a decision is made on establishing an institutional architecture and preparing an anticipated project. The planning process was successful in that genuine ownership from stakeholders at all levels and sectors was evident.8 However, initial reflections on the experience suggest several overarching lessons and concerns going forward.

Departing from sectoral status-quo urban investments requires deeper political buy-in. Periodic political engagement during the planning process is a must in order to ensure buy-in for the plan as well as the implementation.

8 Examples of this are demonstrated in the following video: https://www.worldbank.org/en/news/feature/2018/10/15/envisioning-urban-resilience-for-tanzania
The Ministry of Finance is unaccustomed to integrated projects that involve an interplay of structural (hard infrastructure) and non-structural (behavioral and nature-based) solutions. The status quo approach is for projects to be sector-based, for example for flooding to be addressed simply by dredging and drainage infrastructure. Embedding issues such as reforestation, housing, real estate development, and green infrastructure in a “drainage” project has never before been attempted in Tanzania.

**Buy-in from communities and engagement with universities are both critical.** Sustaining the buy-in from communities generated through the charrette will be critical. In Tanzania, resettlement action plans are generally a separate exercise from project design, where project-affected people are determined based on the designs, their assets and livelihoods are evaluated, and then cash compensation is paid based on the impacts. Resettlement Action Plans are usually carried out by social development teams managed by engineering design teams, and communities are rarely involved as key stakeholders or decision makers in the design process. The charrette approach was different, giving communities an equal voice; however, the goodwill and empowerment it generated could be lost if the program is allowed to stagnate.

**SEQUENCING PRIVATE-SECTOR PARTICIPATION**

Private-sector representatives were not closely engaged during the initial charrette process, which was an intentional decision due to concerns over potential land speculation and worries that private interests could have dominated the process. However, recognizing the critical role for private investment for cost recovery, operations and maintenance, and development, there is ongoing work to engage the private sector. As was clear through the charrette, sustainability of a large-scale integrated urban development of this type of project hinges on private investment. For example, under the design a significant area of real estate (57 hectares) near the central business district would be opened up for housing, commercial, and recreational development; taken together with the infrastructure and river maintenance, all this would be impossible to sustain with public resources alone.

The details of the institutional arrangements for private-sector investment are being explored through consultations with key real estate developers and a broader public-private sector dialogue. One of the primary concerns of the private sector that has surfaced is the provision of basic service infrastructure that could support high-density development. In this regard, the need for a strong legal framework has been reiterated by private-sector representatives.
RISK MANAGEMENT

One major risk experienced is the government’s delay in seeking project financing for implementation. When using a multi-sector stakeholder process that generates broad ownership over both the process and the resulting plan, such a delay in financing can result in loss of momentum and credibility among the various actors. It also leaves communities and infrastructure exposed to flood risk and disappoints the raised expectations of the stakeholders who participated intensively in the planning process, especially residents of the area who are highly vulnerable to flooding.

Another risk is the return to business as usual, with sector institutions proceeding to act in isolation despite having come together during the planning process. This risk is becoming evident in discussions with the Dar es Salaam Water and Sanitation Authority, which has advanced detailed designs for a wastewater treatment plant to be sited in the Msimbazi River valley, given its flood-prone nature. Discussions are ongoing as of this writing and it is not yet clear what the outcome will be.

The critical need for coordination across sectors and municipalities needed for implementation is at risk due to the state of institutional fragmentation and lack of a metropolitan government. The Project Implementation Unit established in the Dar es Salaam City Council (DCC) is a good first step, but lacks any real authority. This will need to be managed through an institutional architecture that has convening power and strong management capacities.

Another potential implementation risk rests on how resettling vulnerable households is managed. A weakly managed resettlement process could underdeliver on the social and economic benefits agreed to during the planning process, leaving residents in a worse condition than before if the resettlement process isn’t given enough time to work or if it is not carried out well—for example, with a robust participatory process building on the work already done. Resettlement finance is a common cause of project delays, and with the scale of resettlement in the Msimbazi and cost of compensation or alternative housing, the government may be unable to pay adequate compensation or provide assistance to resettled people so as to avoid setting a precedent that households in informal settlements and hazard areas are entitled to compensation.

Lack of effective private sector engagement could occur due to a number of internal and external factors, including the ability to secure land, the current government’s suspicion of the private sector, and lack of know-how in government about working with private real estate development. Gentrification could
occur due to private and public sector interests, combined with weak controls to prevent conversion of affordable housing to market rate housing or to ensure that affordable housing is targeted to qualifying households. Alternatively, to the risk of gentrification, the opposite problem could emerge, namely a lack of private-sector interest in real estate development in the area.

**PLANNING PROCESSES, FINANCING, AND IMPLEMENTATION MECHANISMS**

Processes that have enabled integrated planning in Dar es Salaam have primarily been facilitated by donor-financed projects through grants and loans.

Integrated planning requires substantial resources and technical capacity to undertake. A review of recent examples where integrated plans were prepared in Dar es Salaam showed that international consulting firms were needed given the lack of expertise on integrated planning among Tanzanian firms and the lack of expertise and relevant past experience in government implementing agencies. The cost of these consulting services ranged from $500,000 to over $1 million⁹, and required donor supported for technical oversight. The planning stage in each of these cases was financed by loan funds (e.g. Dar es Salaam Metropolitan Project) or grants (e.g. the Tanzania Urban Resilience Program trust fund, Nordic Development Fund).

Implementation mechanisms differ by project. Integrated plans that are more strategic in nature did not tend to rely on an existing implementation mechanism; instead, the plan itself would make recommendations for an institutional framework that may or may not be implemented. For example, the Japan International Cooperation Agency-financed transport masterplan includes a full chapter on establishing the Dar es Salaam Urban Transport Authority, which would involve having 13 cross-sectoral institutions on its board including lands and municipalities, but to date there has been no action taken to establish this

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authority. For infrastructure projects the typical implementation mechanism is through Project Implementation Units (PIU) set up either within a national ministry or within municipalities, which handle procurement, managing construction contractors and interagency coordination.

Institutional capacity to implement plans is a challenge, as human resource constraints complicate the ability of all levels of government to plan, enforce, and provide services in line with constantly increasing demand. The systems and staffing levels at ministries and local government offices are often insufficient, particularly in the face of rapid urban growth that is overwhelming land management systems and causing unprecedented demand for provision of basic service infrastructure and land administration services. Dar es Salaam City Council, for example, currently has only one permanent urban planner on staff; municipal council offices have between three and seven, averaging less than one planner per 250,000 Dar es Salaam residents. Municipal offices further lack tools such as GIS databases, which would enable efficient monitoring and enforcement of unplanned development (Huang et al. 2018).

Capacity building and training to prepare and implement integrated planning is needed at all levels. At ward and sub-ward level there is a need to build officers’ capacity for planning, managing accounts, and reporting, as evidenced by desk research and interviews with government officials. Interviews with government representatives at both the ministerial level and the local level of government have found that, while qualifications and capacity are stronger at the district and municipal council levels, community engagement and responsiveness to the needs and input of lower levels of government are limited (World Bank 2018b). In the preparation of a Development Control and Urban Planning Strengthening Program under the Dar es Salaam Metropolitan Development Project, ministerial and municipal government officials self-identified a range of capacity building needs that included training in tools and protocols for monitoring and enforcing development that is consistent with plans and standards.
Global Environmental Benefits, Outcomes, and Scale-Up

The Global Environmental Benefits (GEB) most relevant for the case of Dar es Salaam are biodiversity, climate change mitigation, land degradation, and sustainable forest management.

Dar es Salaam’s GEB are slowly eroding, in large part due to urban sprawl and associated environmental degradation. Biodiversity and forest cover in the Msimbazi ecosystem have been significantly degraded, with forest cover in protected forest areas decreasing by 30 percent from 1995 to 2005 (World Bank 2016a). The Msimbazi Opportunity Plan has GEB at its core and it relies on a “room for the river” approach to flood control and on restoring the basin’s ecosystem services, including reducing land degradation—due to encroachment and sand mining—and reforestation as the most technically feasible and cost-effective solutions to flooding.

Using a green urban development approach in the Msimbazi that combined forest and riparian rehabilitation in the catchment and floodplain rehabilitation was found to have the highest return on investment among four tested development scenarios. Such comparison of alternate solutions provides promising...
evidence to convince decision makers that restoring ecosystem services pays off, as the benefits of this nature-based solutions scenario exceeded the costs in just 1.2 years, the shortest time period of all scenarios (Turpie et al. 2017). These climate adaptation efforts also provide mitigation co-benefits, as forests and wetlands are sinks for greenhouse gases.

Had the sites and services approach been significantly scaled up through to the present day as a citywide initiative, it is possible that some of the current sprawl and associated land degradation could have been avoided. However, to deliver such benefits the program would need to be coupled with strong enforcement of development controls to curtail encroachment and degradation of river valleys and wetlands. Climate mitigation benefits could be enhanced through transit-oriented development as well, linking sites and services areas with transport networks such as the BRT and promoting walkability to displace private vehicle use, which is rapidly expanding in Dar es Salaam.11

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11 A United Nations Environment Programme analysis in Dar es Salaam’s City Environmental Outlook (2011) projected that the number of vehicles would rise from about 200,000 in 2013 to about 1,000,000 by 2030.
Conclusion

Dar es Salaam has faced challenges with integrated planning since independence, and they are growing more complex as the city rapidly expands. As this case study shows, despite attempts from at least the 1970s to the present day, Dar es Salaam does not have a definition for integrated planning, nor institutional and financial frameworks that are well prepared to adopt it. An enabling framework for integrated planning is critical in the face of Dar es Salaam’s rapid population expansion, yet recent policy developments are instead intensifying institutional fragmentation and shortfalls in municipal finances.

With a highly fragmented institutional environment, low own-source revenues, and the absence of any valid masterplan, the city’s development is largely funded through donor projects on a sector level. Projects tend to be uncoordinated both between government agencies and between donors, and do not follow any larger development vision for the city as a whole. Without the direction of a citywide masterplan or oversight of a metropolitan government, donors finance sector masterplans with ministries that enable investments from their specific sectors in isolation.

Impacts of integrated planning in Dar es Salaam have been positive but limited. The initiatives examined in this case study show that where an integrated approach is used, it can deliver, but the benefits take time to manifest. In the sites and services example, early establishment of rights of way, and protection of them via strong development control, benefitted landowners and the overall city by providing the foundation for well-connected and well-serviced neighborhoods. While these initiatives seem to contain the elements for integrated planning success, they have not been taken to scale or sustained: high institutional fragmentation, economic downturns, and resource constraints contributed to this inertia, and this situation has not greatly improved over the 40-year period that this case study examines.

Integrated urban planning takes significant time, financial resources, and technical expertise, which may not be readily available in countries with similar levels of development to Tanzania, especially without external aid or financing. The Msimbazi Opportunity Plan, for example, has involved over $500,000 in international consulting services since early 2018 for the planning
stage alone. The Msimbazi Opportunity Plan relied on grant funding from a World Bank trust fund, as government would not have had adequate resources or experience to effectively undertake such a planning initiative without external support.

The newer wave of integrated planning initiatives is promising but is facing tension with the traditional sector-based approach to urban infrastructure. With no clear authority and diminishing municipal resources, the current context suggests that only central government could take on such projects as the Msimbazi Opportunity Plan or a mass-scale sites and services initiative. Sector ministries tend to lead and control major planning and investments projects and, as integration requires relinquishing control over planning and financial resources, these institutions may not have a great incentive to take on integrated planning projects. Ministerial officials and donors alike are under great pressure to deliver results on the ground, and the added time and coordination required for integrated planning may be a hindrance to securing needed buy-in.

Recent efforts at centralization of municipal functions and the absence of a metropolitan authority offer a new institutional context for integrated planning. Since 2016, several municipal functions including several sources of revenue collection—property tax—and urban planning have reverted to the central government. If local government’s ability to collect own-source revenues continues to be restricted and sufficient funds are not transferred back by the central government, municipalities will be starved of needed resources. To date, there are no known plans to establish a metropolitan body for Dar es Salaam with authority over the autonomous municipalities. The continued absence of an apex authority will perpetuate the business-as-usual scenario of planning and budgeting by five separate local governments. The Msimbazi Opportunity Plan, if implemented, could be an important crossroads for Dar es Salaam’s governance: in one scenario, the central government could allow Dar es Salaam to establish a governance framework and provide the necessary resources for the city to carry out this plan; in another scenario, the government could lead from the center and commit to taking a large-scale integrated project to scale into the long term. ☢️
Density

Dar es Salaam’s municipal or core city density has more than doubled from 1,000 to 2,700 people per square kilometer between 2000 and 2017. Remote sensing-based urban population estimates are relatively new and remain work in progress. Accordingly, it is important to cross-reference these population density estimates with data from other sources.

Figure 8
POPULATION DENSITY, 2000

Municipal
- Maximum: 55,435 people/km²
- Minimum: 1 person/km²
- Average: 1,062 people/km²
Municipal Max

Maximum: 67,948 people/km²
Minimum: 1 person/km²
Average: 2,690 people/km²

Figure 9
POPULATION DENSITY, 2017

Figure 10
Overlay of density levels, 2000–2017
REFERENCES


Currency exchange rate: 1 USD = 2,315 TZS (June 2020).
Medellin, Colombia
Somos 10—Integrating Ten Municipalities into One Metropolis
Andrea Restrepo-Mieth, Jorge Pérez-Jaramillo, and Felipe Montoya Pino
CASE STUDY 6: METROPOLITAN MEDELLÍN

Somos10—Integrating Ten Municipalities into One Metropolis

Andrea Restrepo-Mieth, Jorge Pérez-Jaramillo, and Felipe Montoya Pino


The Synthesis Report offers a range of integrated solutions (Mehrotra 2020).
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Pooled financing and citizen-led street design for density and decarbonized mobility

**The Solution**

Mobility enhancements alongside slum upgrading and major public space interventions laid the foundation for using integrated planning to achieve continuity in investment into the city’s poorest areas. The approach, which Metropolitan Medellin (AMVA) has been sharing with municipalities beyond Medellin, integrates urban design and architecture with civic participation.

**Key Findings**

1. Mobility enhancements alongside slum upgrading and major public space interventions laid the foundation for using integrated planning to achieve continuity in investment into the city’s poorest areas. The approach, which Metropolitan Medellin (AMVA) has been sharing with municipalities beyond Medellin, integrates urban design and architecture with civic participation.

2. As the largest economy, Medellin is the main contributor to AMVA, which effectively transfers financial resources to other municipalities. Transfers from Medellin-owned utilities company Grupo EPM, along with local taxes, generate the bulk of Medellin’s income.

3. Integrated slum upgrading supported by participatory processes and metro enhancements improved social and economic inclusion through education amenities and greater job accessibility for men and women. It has also reduced carbon emissions.
Cities can decarbonize by utilizing renewable energy supply and electrifying urban systems while scaling up neighborhood integrated solutions to benefit neighboring towns within the metropolitan cluster.

Medellin's model of metropolitan integration offers policymakers examples of how successful integrated solutions replicated at the neighborhood level can be extended to the metropolitan scale. Medellin's power and water supplies both depend on dammed reservoirs with hydroelectric plants (locally known as EPM—Empresas Publicas de Medellin), and because the city owns the utility it has been able to finance urban innovation with the EPM dividends paid by EPM of about 80 to 100 million dollars each year.

Medellin offers a rare insight into how a metropolitan agglomeration can decarbonize urbanization utilizing renewable energy supply, electrifying urban systems such as light rail and gondolas, and seeking efficiency in urban systems, ranging from building energy efficiency to compact urban development. This model illustrates the possibility of decarbonizing the entire energy supply chain, not just electrifying or making efficiency improvements in a city's energy use.
The Metropolitan Context

MEDELLIN, COLOMBIA’S SECOND LARGEST CITY, has garnered worldwide attention for its innovative and comprehensive approaches to integrated planning. Equally important, though less well known, are the integrated planning efforts carried out within its metropolitan area. Like many other cities around the world, twenty-first-century Medellin spills over its urban borders to encompass a metropolitan area whose extent exceeds the original city’s administrative boundaries. Metropolitan Medellin, formally known as the Metropolitan Area of the Aburra Valley (AMVA), consists of 10 municipalities.1 Mountain ranges to the east and west create natural limits to the expansion of the metropolitan area’s urban footprint. The Medellin River runs through the valley, creating a natural structuring element.

GEOGRAPHY AND DEMOGRAPHICS

Medellin is the capital of the Department of Antioquia and is located in Colombia’s north-west. The city’s tropical climate averages a temperature of 24 degrees Celsius (Alcaldía de Medellin 2016). Located in the central Andes mountains at an average altitude of 1,479 meters above sea level, it has a rugged terrain, just over half its territory sloping at more than 15 degrees (AMVA 2016). The highest point in the metropolitan area is Serrania de Las Baldias at 3,120 meters above sea level, while the lowest is the Medellin–Aburra River’s edge at 1,130 meters above sea level (AMVA 2016). This broad range in elevation creates a variety of microclimates, as well as waterfalls. The slopes, combined with tectonic faults and a high number of ravines, also create a complex terrain, which in turn impacts approaches to building infrastructure and housing.

The 10 municipalities that make up metropolitan Medellin began to have diffused borders in the 1960s. Industrialization and rural-urban migration led to increases in population that put pressure on the existing boundaries, resulting in a conurbation (Map 1). As Table 1 shows, in the nine years between 1964 and 1973 Medellin’s population grew by 47 percent while that of the metropolitan area grew by 45 percent. In the span of 54 years Medellin’s population has grown by 300 percent while the metropolitan population has grown by 335 percent.

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1 Barbosa, Girardota, Copacabana, and Bello to the north; Medellin in the center; and Itagui, Envigado, La Estrella, Sabaneta, and Caldas to the south.
According to the 2018 census, metropolitan Medellín is home to 3,725,682 people distributed across an area of 1,166.91 square kilometers. This means the Aburra Valley hosts 62.36 percent of Antioquia’s population (5,974,788 people) in just 1.83 percent of the department’s land (63,612 km²). Medellín, with 2,376,337 inhabitants and an area of 380.64 square kilometers, is the largest of the 10 municipalities. Barbosa, with 44,676 people, is the smallest municipality by population, and Sabaneta, with only 15 square kilometers, is the smallest by area. The primate city’s density of 6,243 people per square kilometer is almost twice the metropolitan area’s average density of 3,193 people per square kilometer (Map 2). Table 2 provides a breakdown of the population by municipality according to the 2018 census.

**Table 1. Population of Medellín and Metropolitan Area, 1964–2018**

<table>
<thead>
<tr>
<th>Year</th>
<th>Medellín</th>
<th>Metropolitan Area of the Aburra Valley</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>791,589</td>
<td>1,110,908</td>
</tr>
<tr>
<td>1973</td>
<td>1,163,868</td>
<td>1,613,910</td>
</tr>
<tr>
<td>1985</td>
<td>1,480,382</td>
<td>2,121,174</td>
</tr>
<tr>
<td>1993</td>
<td>1,834,881</td>
<td>2,689,798</td>
</tr>
<tr>
<td>2005</td>
<td>2,216,830</td>
<td>3,306,490</td>
</tr>
<tr>
<td>2018</td>
<td>2,376,337</td>
<td>3,725,682</td>
</tr>
</tbody>
</table>


**Table 2. Population by Municipality, 2018 Census**

<table>
<thead>
<tr>
<th>Municipality</th>
<th>Population</th>
<th>Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medellín</td>
<td>2,376,337</td>
<td>815,447</td>
</tr>
<tr>
<td>Barbosa</td>
<td>44,676</td>
<td>16,092</td>
</tr>
<tr>
<td>Bello</td>
<td>478,602</td>
<td>161,622</td>
</tr>
<tr>
<td>Caldas</td>
<td>76,242</td>
<td>24,471</td>
</tr>
<tr>
<td>Copacabana</td>
<td>76,451</td>
<td>25,104</td>
</tr>
<tr>
<td>Envigado</td>
<td>212,365</td>
<td>74,454</td>
</tr>
<tr>
<td>Girardota</td>
<td>49,006</td>
<td>15,333</td>
</tr>
<tr>
<td>Itagui</td>
<td>262,190</td>
<td>85,341</td>
</tr>
<tr>
<td>La Estrella</td>
<td>68,016</td>
<td>21,969</td>
</tr>
<tr>
<td>Sabaneta</td>
<td>81,797</td>
<td>29,595</td>
</tr>
</tbody>
</table>

Source: DANE 2019a.
To estimate population density, LandScan uses remote sensing imagery analysis to disaggregate census counts within an administrative boundary. As a result, built-up areas such as airports and industry may appear to have a residential population where there isn’t one.

MAP 2

POPULATION DENSITY 2017
Population per square kilometer

Area Metropolitana and Town of Medellín Municipal boundary
Primary road

SOURCES: LANDSCAN, NASA SRTM 30m, OpenStreetMap Contributors

MAP PROJECTION: UTM ZONE 18N, WGS-84 DATUM

10 KILOMETERS
According to the most recent statistics, between 2017 and 2018 income per capita in the metropolitan area grew by 2 percent, from COP 995,928 to COP 1,015,796\(^2\). The Gini coefficient for 2018 was 0.47. Nevertheless, metropolitan Medellin is tied with Bogota as the city with the second-largest proportion of middle-class citizens in Colombia (Medellin Como Vamos 2019).

Integration

Medellin in the 1980s and 1990s was in a profound socioeconomic crisis. The city’s once-vibrant industrial economy continued to decline while an illicit economy tied to drug trafficking blossomed. This resulted in increased unemployment, poverty, inequality, and violence. Colombia was also going through economic and political turmoil, the latter leading to significant political reforms.

Chief among the political changes was the drafting of a new constitution in 1991 that introduced requirements for participatory democracy and decentralized municipal governance. This social, economic, and political context led the national government to put together what became known as the Presidential Council for Medellin and its Metropolitan Area. This council brought together people from all walks of life to discuss the origins of the city’s problems, its manifestations, and, most important of all, pathways to address them. A new social contract was negotiated between business elites, community-based organizations, civil society groups, and academia.

The new dynamics generated in the city led to two important reforms: the development of a Strategic Plan for Medellin and the Aburra Valley and a new Municipal System of Planning (Corburn et al. 2019). These new navigation tools, combined with direct mayoral elections and increased opportunities for citizen participation, spelled the beginning of Medellin’s transformation. Key spatial interventions took place in the 1990s that would generate blueprints and lessons learned for the twenty-first century.

These included PRIMED, an integrated slum upgrading program that took place between 1993 and 2000; public space interventions such as Parque San Antonio (1993) and Parque de las Esculturas (2000); and the metro (1995).

\(^2\) At an exchange rate of USD 1 = COP 2,977.
What is key is what came next: building on these social, political, and technical processes, a concerted effort was made by technocrats and politicians, with support from non-state actors, to integrate planning, to focus multi-sectoral actions in the city’s poorest areas, and to pursue institutionalization strategies to achieve a continuity of efforts (Restrepo-Mieth 2019).

**METRO**

An important step towards integrating Medellin and the metropolitan area was the construction of the city’s metro. Built between 1984 and 1995, the metro became a visible representation of the need to connect the city from north to south and to extend connectivity to other municipalities. Only two lines were developed, due to the city’s topography and the costs of building a metro system. To overcome this apparent shortcoming and extend access to the mass transportation system, Medellin pioneered the use of aerial cables for public transport.

**METROCABLE**

One of the first key interventions that would transform Medellin’s public transport into a multi-modal system was the first Metrocable. Built to connect the Acevedo metro station with neighborhoods up the mountain across the city’s impoverished north-eastern area, the first cable car, inaugurated in 2004, represented an innovative use for this existing technology. The mode quickly gained acceptance among users as it connected people in Santo Domingo—the uppermost portion of the hill—to the metro in just nine minutes. The service represented an opportunity to improve accessibility to employment centers and important urban amenities. Its success was replicated several times with cable cars servicing other areas of the city: in 2008 in Nuevo Occidente/La Aurora, in 2010 in Arvi, in 2016 in Villa Sierra, and in 2019 in 13 de Noviembre. An additional cable line (Picacho/El Progreso) is currently under construction.

While Metrocable answered the question of how best to move people up hills, areas of the city with flat or minimal slopes were also in need of mass transportation systems. Taking a lesson from Bogota, the country’s capital, and its world-famous Transmilenio, in 2011 Medellin inaugurated its Bus Rapid Transit (BRT) system. That was followed in 2013 by feeder buses and in 2016 by a tram. Complementing all of this is EnCicla, a public bike-sharing system. The Metro and EnCicla reach other municipalities in the metropolitan area, extending this multi-modal system beyond Medellin (Map 3).
INTEGRATED URBAN PROJECTS AND NEIGHBORHOOD UPGRAADING

While the first Metrocable broke the mold on transportation, it is what came next that helped put Medellin on the global urban planning radar. The city had experimented in the early 1990s with strategies to promote citizen participation in planning and to upgrade informal settlements. The results of these efforts were two programs: Nucleos de Vida Ciudadana (Citizen Life Nuclei) and PRIMED (Programa Integral de Mejoramiento de Barrios Subnormales or Integral Program for the Upgrading of Informal Neighborhoods). The programs sought to improve public spaces, urban amenities, and housing while mobilizing citizen input and involving neighborhood residents in different stages of the interventions. These two short-lived but impactful programs showed technocrats and citizens that different ways of city-making were possible.

Using the Metrocable as an axis along which to incorporate urban amenities, and recalling upgrading lessons from Nucleos de Vida Ciudadana and PRIMED, the city developed two new methodologies to upgrade neighborhoods: integrated urban projects (Proyectos Urbanos Integrales or PUIs) and integrated neighborhood upgrading (Mejoramiento Integral de Barrios or MIB). Integrated urban projects were characterized by a project management style, in which a project director would coordinate different government agencies to ensure a timely and efficient intervention in the territory. This approach helped avoid the common problem of lack of coordination among government agencies, a problem that often occurs when designing interventions that require action from different government departments.

For example, the first integrated urban project, undertaken in the north-eastern area of the city, brought together planning, infrastructure, education, and economic development agencies, among others, and engaged in interventions that included large public libraries hosting a variety of citizen services, upgraded or new schools, sports fields and ball courts, and early childhood education centers. By contrast, integrated neighborhood upgrading projects were to be housing-centric while incorporating other interventions, such as improved pedestrian access and risk mitigation through soil stabilization. Juan Bobo (an informal settlement bordering a ravine) and Moravia (a high-density poor neighborhood located around a former solid waste disposal site) are two emblematic examples of the latter neighborhood-level upgrading approach.

Juan Bobo became an example of how to conduct upgrading without relocating households and incorporated community participation.

AMVA has been working with municipalities to incorporate integrated neighborhood upgrading beyond Medellin. A 2011 study showed 77 neighborhoods in the metropolitan areas could benefit from integrated neighborhood upgrading, with 19 neighborhoods prioritized due to existing
conditions (Perez Jaramillo 2011). However, a project in the municipality of Caldas is the only current example from outside Medellin. An important aspect of this approach is that it integrates urban design and architecture with civic participation (Sotomayor 2015). Community input is sought through workshops and citizen committees, with design and architecture meant to incorporate the community’s hopes and vision. To achieve this, the city puts together teams of professionals from different fields, including architects, social workers, lawyers, and civil and environmental engineers. Participatory planning and local development plans are instituted to scale community input beyond particular interventions into longer-term instruments. The integrated urban project methodology was incorporated into Medellin’s land use plan in an effort to give this valuable instrument continuity.

These and other interventions carried out in Medellin have some institutional components in common. First, the city has not gone about building infrastructure for its own sake but, rather, has been careful to pair it with the appropriate agencies that can guarantee a successful offering of programs, activities, and services. This pairing of spatial interventions and services opens opportunities for long-marginalized communities to access employment centers throughout the metropolitan area as well as educational, training, cultural, and recreational facilities in their area. The implications for quality of life must not be overlooked.

Second, for the most part, citizen and stakeholder participation has been a key component of the city’s actions. This participation is important, as it not only helps guide the design of infrastructure and services to ensure that they meet a community’s wants and needs, but also helps bring the community onboard as a partner and not just a recipient.

Third, many of these interventions have maintained continuity despite the coming into office of different mayors from different political parties. For example, the water lifeline program is currently operating under its third mayor.

Lastly, the city has taken planning seriously: in recent decades, plans have acknowledged the “informal city” and have designed interventions to address the needs of all. Parallel to this last point is metropolitan planning. Medellin has become more cognizant of the need to acknowledge interrelations with the municipalities that make up the metropolitan area as well as with the region beyond it. As such, it has been an active player in the development of key metropolitan plans, such as the Metropolitan Land Use Directives (2006) and Plan Bio2030 (2011). These plans complement each other, and in their planning for the metropolitan area they take into account land use, densities, strategic urbanism projects, and integrated mobility.
Figure 4
Then and now, 2001, 2019

A. SLUM DEVELOPMENT ON THE HILLS

B. URBAN DEVELOPMENT ALONG THE CABLE CAR LINE

C. HIGH-RISE BUILDINGS NEAR THE CENTER

D. AIR POLLUTION AND LAND PRICES PUSH URBAN DEVELOPMENT IN THE NORTHERN PART OF THE CITY
FINANCING INNOVATIONS

The multiplicity of projects and programs carried out in Medellin in the last decades have been financed following the structures set up after the adoption of Colombia’s 1991 constitution. Decentralization created a fiscal structure in which Medellin sees the bulk of its budget coming from local taxes and a sizable contribution from Grupo EPM’s transfers. Government transfers complement the city’s inflows. Land and property taxes, together with industry and commerce taxes, have become increasingly important sources of income. Furthermore, land-use plans have been structured so that mechanisms to capture land-use value can help to co-finance public works. These mechanisms include plusvalía (capital gains), valorizacion (improved appraisal value), and obligaciones urbanísticas (a payment mechanism to help balance pressures created by new developments on existing public spaces, such as roads, public services, and urban facilities). More recently and with the support of the World Bank, the city has been exploring the use of other land-value capture instruments to finance urban redevelopment of blighted areas and key assets linked to transport infrastructure, such as tax-increment financing and transfer of development rights.

Another source of financing that has proved important for the city is international cooperation. Medellin received $107.72 million\(^4\) between 2004 and 2018 from efforts led by the city’s International Cooperation Agency (ACI 2019). The ability to raise funds through local taxation, boost finances thanks to Grupo EPM’s contributions (which are approximately 20 percent of the city’s budget), and attract foreign assistance is particularly important when it comes to financing the expansion and maintenance of key infrastructure. For example, while national legislation calls for the national government to co-finance between 40 and 70 percent of the cost of urban mass public transport systems, the reality is that most of the recent interventions carried out in Medellin’s system have been borne by the city, with little to no resources coming from the national or departmental governments. Figure 5 illustrates the historical evolution of the system’s financing.

\(^3\) A multi-sector infrastructure utility that is an autonomous parastatal owned by the city of Medellin and contributes 30% of its annual financial surplus (about USD 400 million in 2018) towards the city’s social development investments.

\(^4\) Here and throughout this chapter, all dollar amounts refer to US dollars.
### Metro system

**Metro (1995):** National government pays for 60% of the total construction cost USD 2,174 million while Metro Company pays for 40%. Debt being paid through a 10% gas surcharge in the 10 metropolitan municipalities and 40% of taxes collected in Antioquia on cigarettes and tobacco.

**Ayacucho tram (2016) and cable cars H, M (2016, 2019):** Medellin undertook a twenty-year loan with AFD for USD 250 million. No national government guarantee and a five-year grace period. Four rates based on disbursement dates: Libor 180 +1.7%, and fixed rates of 3.97%, 4.98% and 4.04%.

**Picacho cable car (under construction):** 91.62% financed with investment funds from Medellin, including inflows from EPM’s sale of stocks it held in Isagen, and 8.38% funding from Antioquia. The project is estimated to cost COP 298,000,000,000.

**Other cable cars:** Lines K (2004) and J (2008) were fully financed by Medellin and Metro. Line L (2010) was financed by Medellin, Metro, Antioquia, and the National government.

### Metroplus

Agreement Conpes had national government paying 61% of the initial construction costs (COP 636,476 million) and the remainder covered by Medellin (22.9%), Envigado (8%) and Itagui (8.2%).

### EnCicla

As of 2018 the investment in the system was around COP 12,000 million (for stations, bicycles, and adaptation works). Recent expansion cost COP 1,879 million. Fully funded by AMVA.

### Take away

The metropolitan area has designed a multi-modal mobility strategy emphasizing accessibility, affordability, equity, environmental sustainability, and connectivity. Implementation has been slow due to the city’s inability to access funds from the national government, who has delayed payments promised to the city for Metroplus and Cable Picacho.

Recent projects financed by the city and the mass transportation company, Metro, have gone forward without support from other government levels. These include Metrocable lines K and J, the metro’s extension towards the southern area, and the tram. A challenge to emerge from the current fiscal set-up is that the national government limits the city’s ability to incur further debt but at the same time does not contribute investment funds. This dynamic has slowed municipal and metropolitan plans to expand the multi-modal mobility system, limiting its ability to meet the needs and priorities of the city. The tide is expected to turn after years of lobbying by several mayors. Financial assistance from the national government to expand the mass transportation system is expected to materialize in the coming years, after the national government agreed in March 2020 to co-finance 70 percent of a third metro line for Medellin estimated to cost $1.2 billion.

INTEGRATION AND METROPOLITAN PLANNING

THE IMMINENT CONURBATION OF THE MUNICIPALITIES that make up metropolitan Medellin became clear in the second half of the twentieth century. Territorial, economic, social, and environmental dynamics then created interrelations among the 10 municipalities that persist today: workers travel daily from the north to employment hubs in the center and south, health and educational offerings bring people from the metropolitan area to Medellin, and environmental challenges such as air and water deterioration disregard administrative boundaries. As the population and urban footprint of the municipalities continued to grow, it became more apparent that coordination among them was merited to secure the sustainable development of the city. Four major challenges that led to integration were socio-spatial segregation, air quality deterioration, water quality deterioration, and the socially and spatially fragmented built environment.

Multi-sectoral integrated planning tackling mobility, public space, and public services, among others, has led to seminal interventions and innovations to confront these challenges. Key interventions include multi-modal mobility to address socio-spatial segregation as well as air pollution; the construction of water treatment plants that double as state-of-the-art recreational and cultural facilities; and the creation of a green belt that provides much-needed public space while reducing airborne contamination.

Building efforts across jurisdictions has required confronting political and economic power disparities among the municipalities: Medellin, as the capital of Antioquia and largest economy of the metropolitan area, has unmatched regional power. The adjoining municipality of Envigado negotiates a position of economic growth with its powerful next-door neighbor. Similar dynamics exist from Barbosa in the north to Caldas in the south. The integration process has been slow, has faced setbacks, and continues to be a work in progress, but the persistence by different actors through the years and their willingness to compromise have started to show results. Envigado’s decision to join AMVA in July 2016 means all the municipalities that make up the Aburra valley metropolitan cluster are now part of the entity. Its incorporation into the existing metropolitan framework was the result of a democratic exercise that its citizens chose to join in with. This led to the metropolitan organization’s current slogan: somos10 (we are ten).
UNPACKING INTEGRATED METROPOLITAN PLANNING

Integration in the AMVA has centered on four sectors: the environment, transportation, and security (all under AMVA), as well as utilities (under EPM). The integration of environmental planning is the strongest of all of AMVA’s sectors given that AMVA has been assigned both the authority and the means to finance action on this front. Environmental surcharges are to be used exclusively toward this end. Environmental actions include monitoring, managing, and planning to ensure sustainable water availability through the Ravines Plan and the Plan for the Use and Management of the Aburra River Basin (POMCA); working with municipalities to ensure the increase and protection of green areas for ecosystem services through initiatives such as the metropolitan green belt and metropolitan parks; and fostering sustainable production and consumption practices by optimizing resource use.

Transportation is another sector where AMVA has been mandated to take the lead, namely on matters of inter-municipal transportation and mass transportation. To this end, the entity builds infrastructure such as bridges to improve mobility and oversees the metropolitan mass transportation system, which currently consists of EnCicla, the bus system, and the Integrated Transportation System of the Aburra Valley (SITVA).

Security is the most recent sector to gain integration under AMVA. Efforts have centered on strengthening public order through the use of cameras networked across jurisdictions and drafting Colombia’s first security and coexistence strategic plan at a metropolitan level to help guide municipal expenditures. Utilities have also experienced metropolitan integration. Grupo EPM provides water, sewage, networked gas, and electricity services to all 10 municipalities, ensuring access to these services. The Medellin-owned company has played an important role in improving the built environment and increasing accessibility to these services by extending its utilities networks throughout the metropolitan area.

AMVA defines integration and sustainability as the two pillars for metropolitan spatial development. Its stated objective is to achieve an integrated and sustainable territory. Key aspects of integration are: “to join capabilities and strengths, to work together, to manage the territory, to harmonize planning, [strengthening] city-rural and regional linkages, social inclusion and equity, collective well-being, and economic development” (AMVA 2018b). Sustainability for AMVA’s purposes is defined as having “greater territorial efficiency, a reduction in the ecological footprint and an increase in social benefits for the entire territory” (AMVA 2018b).
The three stages of planning

While each plan varies, AMVA’s most recent plan-making process is divided into three stages: citizen input, diagnosis, and formulation. Integrated planning in AMVA brings together a wide range of experts who are expected to contribute to the plan-making process from their respective areas of knowledge. Teams usually include architects, planners, engineers, communicators, social workers, lawyers, geologists, and biologists, among others, who draw on their professional and technical expertise and seek inputs from stakeholders in the 10 municipalities. Stakeholders usually include experts and social actors, namely municipal, metropolitan, departmental, and national officials; citizens; interest groups such as environmental collectives and chambers of commerce; and public entities such as Grupo EPM.

The most recent metropolitan planning effort is the 2019–2030 Metropolitan Strategic Land Use Plan (PEMOT—Plan Estratégico Metropolitano de Ordenamiento Territorial). In 2013, the Colombian government passed Law 1625 mandating that every metropolitan authority create a PEMOT, a planning instrument for developing the spatial component of the Integral Metropolitan Development Plan (PIDM—Plan Integral de Desarrollo Metropolitano). The PEMOT currently under review started by incorporating a citizen input process, which was termed “Citizen dialogues and metropolitan development: Conversations around the city as a project.” The “communication, conversation, and consensus strategy” sought to “build technical agreements about the fundamental metropolitan projects among a group of experts and social actors” (AMVA 2018c). It included 25 workshops and plenaries; the first to introduce the initiative took place in October 2017, while the last to share results was held in March 2018 (AMVA 2018c).

Altogether, the PEMOT input process had 470 participants and a total of 723 inputs (421 during the diagnosis phase and 302 during the formulation phase). Participants included municipal cabinets, environmental groups, city councils, spatial planning councils, media, public entities including Grupo EPM, Metro, and Corantioquia, academia, the Antioquia governor’s office, ANDI (the national business association of Colombia), AMVA officials, and the Metropolitan Planning Council (AMVA 2018b). The plan’s “citizen dialogues” strategy, which is based on technical, legal, social, and communication inputs, aims to promote citizen buy-in throughout the metropolitan area. To this end, participants were sought from throughout the 10 municipalities; the final breakdown of those who participated was 34 percent from the northern municipalities, 37 percent from the main administrative city, and 29 percent from the southern municipalities (AMVA 2018b).

If the PEMOT is adopted, municipalities will be expected to integrate its general strategies for metropolitan planning into their respective land use plans (Plan de Ordenamiento Territorial or POT for large municipalities and PBOT for smaller ones).
With inputs from the first stage in mind, the second stage, diagnosis, begins. It consists of four steps. The first step is the presentation of criteria for developing PEMOT by themes. These include regional themes like integrated water management, large-scale infrastructure, food security, and safety, as well as key topics in metropolitan agglomeration including public spaces, mobility, and housing systems; housing density; rural interventions; and rural and urban land uses. The second step in the diagnosis consists of asking questions about the territory, such as, What is the potential metropolitan public space available? Which are the water catchment areas for the metropolitan area and what is their use intensity?

The third step in the diagnosis is the consideration of the strategic themes prioritized in Metropolitan Facts (Hechos Metropolitanos) as well as the minimum requirements for a PEMOT as set forth by Law 1625. Metropolitan Facts are, in effect, those phenomena that due to their magnitude must be addressed at a supra-municipal scale. They are identified in a set of statements made by the metropolitan board “regarding economic, social, technological, environmental, physical, cultural, territorial, political or administrative phenomena that affect or impact two or more municipalities simultaneously.” These facts are formally recorded in Metropolitan Agreements, and the rules for addressing them are set up by the metropolitan area director. They must then be incorporated into future PIDMs and PEMOTs. For example, AMVA is the first metropolitan area in Colombia to announce a Metropolitan Fact regarding metropolitan security.

The fourth and last component of the diagnosis stage is the review of existing metropolitan planning documents to understand proposed occupation models. For PEMOT this meant taking into account and understanding the metropolitan guidelines, Bio2030, the 10 municipal land use plans (both BOTs and PBOTs), and the current spatial situation.

The diagnosis stage is followed by a formulation stage, which has three steps. The first step is to develop strategies, drafting an objective for each problem identified. The second step is proposing actions: these must be in accordance with existing Metropolitan Facts, legal mandates, and AMVA’s general guidelines. The third and final step is to develop a strategic metropolitan spatial development model—locally referred to as a spatial occupation model—that has four elements: a management model, a system of indicators, a metropolitan case file (an instrument to monitor the PEMOT’s implementation), and recommendations to be incorporated in the next PIDM review. The finalized plan is discussed by the metropolitan board, which decides whether or not to adopt it.

Different plans have different ways of soliciting input. For example, AMVA is
currently developing an updated mobility plan. A key input to it is an origin-destination survey, which allows technicians to better understand people’s travel behavior. Focus groups are carried out in the development of the updated plan, and virtual platforms are also employed to give citizens the opportunity to participate. Input is solicited to ensure the transportation network is developed to meet people’s travel needs and minimize the need for transfers. AMVA has found, based on such input, that people in the area are not only looking for a way to get to the metro, so it is pursuing an integrated system that must offer the services they need.

**Shortcomings**

The work carried out in plan-making processes requires technical tools to enable integration. These include guidelines, masterplans, strategic plans, and sectoral plans. Due to the current institutional set-up, these technical tools are not binding, and implementation is up to each municipality. The strongest sector is environmental planning, where national mandates to metropolitan authorities make AMVA’s resolutions binding. Mobility planning, including both infrastructure and operations, is also strong, but it faces limitations due to the multiplicity of special interests and political pressures on the sector.

Many of the plans developed to date by AMVA have not been systematically implemented, and some have not even been taken into account by state or non-state actors when planning within the territory. Furthermore, many of these plans lacked collective buy-in beyond the entity. Exceptions to this include the Strategic Plans for Aburra Norte and Sur, which brought together the municipalities, AMVA, and other entities under the leadership of Fundacion Social in a broadly participatory process from 2004 to 2008.

Reflecting on the average plan-making process, Jorge Coronel Lopez, head of the Aburra Sur Como Vamos program, shared this thought:

> Social organizations have not taken part in planning efforts, have not had spaces for substantive participation where they could have a say. This has occurred historically, and it is a mistake in the process that later has consequences given that social organizations do not take on something from which they have been excluded.⁷

The PEMOT and other recent planning efforts have sought to address these shortcomings by building on, and complementing, existing plans as well as by opening spaces for wider participation by both state and non-state actors.  

⁷ Interview by Andrea Restrepo-Mieth on August 21, 2019.
Implementation

MEDELLIN CONURBATION HAS IN MANY WAYS bound together the destinies of the Aburra Valley municipalities. However, the politico-administrative set-up is one that encourages municipal autonomy. As such, the coming together of the 10 municipalities that make up metropolitan Medellin has required a strong showing of political will and the determination of state and non-state actors. The desire by municipalities to retain as much of their autonomy as possible is evidenced by the fact that planning, systems, and initiatives implemented at the metropolitan scale center mainly on transportation and urban environmental matters (both the purview of AMVA) and on utilities and the protection of resources needed for their production (with Grupo EPM playing a dominant market role). However, AMVA and Grupo EPM do not act alone, and, as this section shows, state and non-state actors from the local to the national level play different roles in hindering or making possible metropolitan integration.

The idea of planning at the metropolitan scale dates back to the 1950s. The first set of interventions to cover the entirety of the metropolitan area was carried out by Grupo EPM, who found in these territories a market for its water, sewage, and electricity services. Interventions to connect the territories and address existing and emerging challenges began in the 1970s with viability studies for the metro, the first initiative in what would become SITVA and plans by Grupo EPM to clean up the Medellin River.

In the 1980s there were discussions to protect green areas, which were later incorporated into plans through key interventions and innovations that would only start being executed in the twenty-first century. These include the official declaration of the first protected urban area in 2009 and the inauguration of Jardin Circunvalar (Bypass Garden) as part of the metropolitan green belt in 2015, the same year the river parks began construction. The river clean-up program, started in the 1970s, strengthened with the introduction of the Plan for the Use and Management of the Aburra River Basin (POMCA) in 2007 and the Ravines Plan in 2015. The program also led to innovative initiatives such as the repurposing of sewage treatment plants to include multipurpose public spaces.

An air quality crisis between March and April 2016 showed the importance of the early warning system, SIATA, which had come into operation in 2013. The episode led to the development of integrated air-quality-improvement plans—PIGECA and POECA—in 2017 to tackle air pollution issues in the short, medium, and long term, and it also served as an incentive to expand EnCicla, the public bicycle and biking route system started in 2011 and currently integrated with SITVA, the integrated metropolitan transport system.

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8 Operational Plan to face Air Pollution Episodes in the Metropolitan Area.
ACTORS AND ORGANIZATIONAL ARRANGEMENTS

The main actors in the integration process have been municipal leaders, both mayors and councils. Mayors make up most of AMVA’s Metropolitan Board, which is the main decision-making body in the metropolitan area. Most importantly, given the autonomy granted to municipalities in the Colombian context, it is mayors and councils who have the ultimate say in the actual implementation of AMVA’s metropolitan plans.

Political parties and political complexity

Every four years the political landscape of those in power is sure to change: while city councilors can be re-elected, mayors serve a single term (mayors can be re-elected but not for consecutive terms).

Furthermore, given Colombia’s fragmented multi-party system, the number of political parties in power in the metropolitan area can easily be over a dozen during any given four-year administrative period. This means that many different agendas must be negotiated for metropolitan plans to get implemented. For example, in the 2016–19 governing period, the municipalities that make up the metropolitan area have elected officials from the Conservative and Liberal parties (the two historic political parties), as well as from national parties such as Cambio Radical, Centro Democratico, Alianza Verde, Partido de la U, MAIS and Polo Democratico; and from local parties such as Creemos, Consenso, Lista Civica Renovacion, and Movimiento soy Sabaneta.

Municipal politics greatly impact AMVA’s leadership every four years given that the key actors within the entity come to it through a political process rather than through direct election. Mayors and councilors representing their municipalities’ interests appoint individuals to key AMVA positions (director and seven deputy-director areas). Other actors, such as the private sector and civil society organizations, lack representation in the entity. The political negotiation for AMVA positions significantly impacts its management agenda, institutional priorities, and the assignment among municipalities of budgetary investments. This is reflected in how much the four-year plan under a new director may or may not reflect the priorities of Medellin, the metropolitan area and the wider region.

Medellin’s representational strength, due to its position as primate administrative city (given its budget and population size), translates into political complexity where city leaders must be willing to work with others instead of taking unilateral action. In other words, while Medellin has the resources and clout to act independently, its leaders must devote time and resources to negotiate plans and interventions with other municipalities. As a result, AMVA requires members to reach agreements to set an agenda in pursuit of metropolitan territorial equity and co-responsibility.
Division of roles between AMVA and other entities

AMVA’s role from a budgetary perspective is key. The entity serves as a tool to build and develop common-interest agendas. By financing studies, plans, programs, and metropolitan and municipal-scale works, AMVA helps balance the territory through common-interest solutions such as mobility infrastructure and environmental conservation. The entity provides a mechanism for Medellin, its main contributor, to transfer financial resources to other municipalities. For smaller ones, AMVA’s investments in infrastructure and environmental projects are often many times larger than their own.

None of the plans or interventions carried out in the metropolitan area has been the product of a single actor. AMVA, as the entity grouping the 10 municipalities, plays a role in all the plans and interventions that affect the area, but private, public, and societal actors from the local to the national scale also merit attention. Important organizations at the metropolitan level include Grupo EPM, Isagen (a privately owned electricity generation and commercialization firm), Metro (which operates the metro, Metrocable, tram, and feeder buses), and Metroplus (BRT). These entities, together with municipal waste management companies, smaller utility providers, and municipal and inter-municipal buses, ensure that citizens across the territory have access to key services.

In the case of utilities, this has meant that the 10 municipalities collectively have 99.5 percent electricity coverage, 97.3 percent aqueduct coverage, 95.4 percent sewage coverage, and 77.4 percent gas coverage, while waste management stands at 98.2 percent (DANE 2019b). Taken together, SITVA (which is made up of Metro and Metroplus) and the other public transport systems cover approximately 86 percent of the metropolitan area’s occupied territory. While transportation coverage is high, the systems are not fully integrated.

Corantioquia and Cornare are two environmental agencies that impact the Aburra Valley. Corantioquia, established by Law 99 in 1993, is the environmental authority for the metropolitan area’s rural territory—AMVA is the environmental authority for the metropolitan urban areas only. Cornare, which is the environmental authority for the region east of the metropolitan area, is an important partner when it comes to securing water resources to meet current and future needs.

Departmental and national actors

Other important players in Antioquia include the governor’s office and the Departmental Assembly. These entities sit higher in the administrative hierarchy (Figure 6), impacting policy formulation at the regional scale as well as the flow of resources. The departmental government of Antioquia has been an important partner for metropolitan projects such as the metro, of which it owns 50 percent.
Further impact on the metropolitan area is expected after the department’s decision in 2016 to create the Antioquia Railroad (Ferrocarril de Antioquia). The new railroad is expected to be multipurpose, with trains carrying solid waste, goods, and passengers.

Other stakeholders with direct influence over the territorial development of the metropolitan area are national actors. These include Invias, the agency in charge of maintaining, regulating, and supervising the construction of highways and roads, the environment and sustainable development ministry, and the national planning agency. Economic and civil society interests also participate in planning processes, although there is room to improve involvement by the latter. Strategic actors on this front include Medellin Como Vamos and Aburra Sur Como Vamos, private institutional alliances that monitor the implementation of public policies in the central and southern portions of the metropolitan area. They also include the chambers of commerce of Medellin and Aburra Sur, as well as business associations—Pro Aburra Norte, Corporacion Pro Sur, Proantioquia, Camacol, and Comite Intergremial de Antioquia. National business associations Andi and Fenalco complement the list.

**Non-governmental and community-based organizations**

Local academia is another participant, particularly the loosely grouped “G8” members: Universidad de Antioquia, Universidad Nacional, Universidad Pontificia Bolivariana, Universidad Eafit, Universidad CES, Universidad de Medellin, Universidad la Sallista, and Escuela de Ingenieria de Antioquia.

Last but not least are regular citizens, community-based organizations, non-governmental organizations, citizen collectives, and environmental groups such as Con-Vivamos, Nuestra Gente, Corporacion Region, and La Ciudad Verde. These are active from the neighborhood level all the way to the metropolitan scale. Citizens also affect the implementation of metropolitan initiatives. For example, technicians from the early warning system SIATA developed a set of small, cloud-shaped measuring devices to read ozone, PM2.5 ⁹, carbon dioxide, and nitrogen monoxide throughout the area, thus complementing their 18 large-scale measuring devices. SIATA, an effort by AMVA in partnership with Grupo EPM, the office of the mayor of Medellin, and Isagen, then developed a program called Scientific Citizens that installed 102 of these devices at residences that volunteered to have one. Volunteering requires both powering the device and connecting it to the residence’s Wi-Fi so that it can transmit data back to SIATA in real time (AMVA 2017c).

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⁹ PM2.5 is a microscopic particle that causes air pollution-related adverse health impacts. Measuring its concentration and understanding its sources is key to formulating policies to control its presence in the air people breathe.
**Figure 6** Division of responsibilities among the four levels of government

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<td>National university</td>
<td>Police</td>
<td>Social welfare</td>
</tr>
</tbody>
</table>

**National Government**

**Department Government**

<table>
<thead>
<tr>
<th>Regional development</th>
<th>Environmental protection</th>
<th>Electricity</th>
<th>Dept. university financing</th>
<th>Natural risk management</th>
<th>Social welfare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxation</td>
<td>Environmental authority (rural)</td>
<td>Public works</td>
<td>Art. sport and culture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Metropolitan Government**

<table>
<thead>
<tr>
<th>Environmental authority (urban)</th>
<th>Transportation authority</th>
<th>Coordinate safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinate planning</td>
<td>Coordinate infrastructure</td>
<td>Coordinate coexistence</td>
</tr>
</tbody>
</table>

**Municipal Government**

<table>
<thead>
<tr>
<th>Local economic development</th>
<th>Housing</th>
<th>Utilities services</th>
<th>Education infrastructure</th>
<th>Emergency services</th>
<th>Promote citizen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxation</td>
<td>Spatial planning and regulation</td>
<td>Public works</td>
<td>Teacher training</td>
<td>Manage security</td>
<td>Social welfare</td>
</tr>
<tr>
<td></td>
<td>Public space</td>
<td>Transportation</td>
<td>Art, sport and culture</td>
<td></td>
<td>Health services</td>
</tr>
</tbody>
</table>

**INSTITUTIONAL ARCHITECTURE**

Law 1454 of 2011, which promotes associations within a territory, and Law 1625 of 2013, which covers metropolitan areas, constitute the building blocks for the legal architecture that currently enables integrated urban development in Colombia. AMVA is the organizational manifestation of the objectives of those laws, and it has been legally tasked by its 10 members to carry out the functions prescribed by the law over the Aburra Valley. Both urban and rural areas come under its purview, as do variously sized urban settlements.
The problem with the existing institutional architecture when it comes to metropolitan areas is that “neither legislation nor public policy recognize clearly and completely this [metropolitan] reality [...] the state’s prevailing territorial model in Colombia is built on the notion of municipalities” (Bustamante Perez 2014). The same author, who recently headed the citizen dialogues carried out across metropolitan Medellin, goes on to add that “despite the existing institutions, for most matters there are just ten municipalities carrying out dispersed and disjointed management” (Bustamante Perez 2014).

Consider, for example, AMVA’s environmental role. National environmental legislation and Law 1625 give AMVA environmental authority over its metropolitan urban area. Metropolitan rural areas are under the authority of Corantioquia, an autonomous regional-scale environmental corporation covering the central territory of Antioquia. Corantioquia can determine land occupancy guidelines and building densities on an individual basis with each municipality, thus limiting AMVA’s reach in these two key spatial planning areas.

This fragmentation has highly confusing results: AMVA carries out general management, including planning processes and works inside Corantioquia’s jurisdiction. But agreements on the spatial plans of the 10 municipalities require two separate processes, one with Corantioquia, the other with AMVA, as both are environmental authorities. Then, an additional agreement must be reached with AMVA when it comes to metropolitan matters. The legal order creates complexities as both entities manage territorial aspects in very different ways. The enforcement of the Plan for the Use and Management of the Aburra River Basin (POMCA) is complicated by this legal and institutional fragmentation, despite having been formulated between both environmental authorities. Such fragmentation creates inefficiencies and ineffectiveness in metropolitan management. POMCA and the wider environmental authority sector highlight how an inadequate legal framework can hamper important efforts.

There is also a multiplicity of providers and authorities overseeing public services such as water, electricity, waste management, and bus services. AMVA is tasked with coordinating the provision of these services within its territory, but it does not control their actual provision. Entities protecting the level of autonomy legally assigned to them but also requiring coordination in order to carry out their functions in the metropolitan area include the Antioquia government, Corantioquia, Invias, and Grupo EPM. Other key sectors, such as food provision, do not have any authority managing them.

A key takeaway is that AMVA has a diverse set of purviews and a wide scope, but these are shared through a complex web of national, departmental, metropolitan, and municipal jurisdictions. This reality complicates management and the extent to which results are achieved. In other words, the simultaneous and superimposed management by diverse entities over the same territory calls for a high level of productive interaction, but this has been difficult to achieve.
SUSTAINABILITY

Metropolitan land-use management has benefited from AMVA’s leadership through studies, plans, and regulations to arrange and coordinate urbanization in the 10 municipalities (to the extent possible, given on-the-ground realities where municipalities function with autonomy). Some of these undertakings have been the entity’s initiative rather than efforts mandated by laws. Even before Envigado joined AMVA, it was always included in planning efforts as a way of acknowledging its importance for the wider territorial development. AMVA’s work has guided municipalities’ local planning decisions with positive results such as the incorporation of the Metropolitan Land Use Directives into municipalities’ land use plans, thus institutionalizing the directives.

Due to the prevailing municipal autonomy to define and ultimately decide urban regulations and land use, AMVA’s reach and control is limited and diffused. For example, awareness of the challenges associated with the implementation and sustainability of planning efforts was front and center in the formulation of the most recent planning instrument, the Metropolitan Strategic Land Use Plan (PEMOT). The actors charged with developing this plan attempted to address the problem by bringing together a wide range of actors in hopes of better reflecting social and institutional requirements. In addition, the plan includes an implementation component that identifies concrete programs and projects that help turn the strategic objectives into actionable steps. This component includes a timeline and a budget for the financial resources needed.

PRIVATE PARTICIPATION

Distinguishing between territorial entities (municipalities) and administrative entities (AMVA) is key to understanding opportunities for private participation in metropolitan areas in Colombia. Given the distribution of powers granted by the constitution among these entities, Maximizing Finance for Development (MFD) activities—that gather private finance for development—are carried out at the municipal scale. As a legally constituted administrative entity, AMVA can sign agreements with both public and private actors to carry out studies, projects, and plans, and to construct physical infrastructure. An important caveat is that while this is generally permitted under the law, it is only possible if and when municipal authorities take the leadership or delegate these functions to AMVA. The entity could, if delegated, take advantage of Public-Private Partnership legislation and concessions, and even provide public services.

AMVA’s main interaction with the private sector comes from its role as urban environmental authority. Through this responsibility the entity collects environmental fees and works with manufacturers (such as textiles and plastics), industries such as food processing, the construction sector, and the hospitality
sector to reduce their environmental footprint. Work on this front is nevertheless still fragmented, and currently sustainable production and consumption activities to improve resource efficiency and reduce negative externalities are mostly self-driven. As Carlos Fernando Cadavid Restrepo, a sustainability expert working closely with the private sector, states, “the work is still being done in silos, efforts are not cross-sectorial. Having several sectors working together on this front and partnering with the government is still seldom happening”.

**TYPES OF SOLUTIONS AND PHASING**

Despite the limitations discussed, it is important to understand the administrative architecture through which AMVA designs and adopts spatial and strategic plans to guide interventions in the metropolitan area. AMVA has been at the forefront of metropolitan-scale planning in Colombia, and its desire to improve the quality of life of its residents often pushes the national government to improve or write new legislation.

The plan-creation process starts with AMVA entering into a contract with an external agent to carry out any studies needed for the plan and to draft it. Studies usually include environmental, cartographic, economic, and legal analyses. Contractors are usually universities with the ability to assemble a team of experts in a short timeframe. Recent examples of plan contractors include: the Urban Studies Institute (IEU) at National University in Bogota (for the PEMOT) and the Center for Urban and Environmental Studies (Urbam) at Eafit University in Medellin (for Bio2030). The contractor maintains an open dialogue with relevant departments within AMVA during the analysis and formulation stages, and upon completion hands the spatial, strategic, or sectoral plan to AMVA.

The plan is then given to the Metropolitan Board, which discusses it. If the plan is deemed to meet the interests of the organization, the Metropolitan Board proceeds to adopt it through an administrative act known as a Metropolitan Agreement. Plans adopted in this manner include the Metropolitan Land Use Directives (2006), Plan Bio2030 (2011), and the PEMOT (in final stages of approval). Sectoral plans such as the Mobility Master Plan (2005–2020) are also adopted through agreements. While such agreements are said to be binding, in reality they are only followed so long as they remain at a higher level and respect municipal autonomy. Ultimately, municipalities have the last word in most spatial planning matters, and they have often implemented their own plans with elements that contradict the metropolitan models promoted at AMVA. Some plans within AMVA are adopted using a resolution by the environmental authority. These resolutions are binding, given the entity’s powers for urban environmental matters.

Plans usually describe strategic interventions in order to help achieve their

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10 Interview by Andrea Restrepo-Mieth on August 23, 2019
objectives, basing the suggestions on discussions where strategic and technical appropriateness have already been determined. The first phase in the implementation of a solution is its structuring by either AMVA or a municipality’s planning department. Additional, more detailed studies may be carried out at this time. For example, a study analyzing a terrain’s conditions or the environmental impacts of an intervention can be commissioned at this stage.

Besides coming up with designs, the planning stage also includes drafting legal documents to contract implementation, initiating risk-management efforts such as hedging financial risks, and estimating costs and needed time-to-completion. Interventions meant to provide metropolitan-scale solutions are therefore always found in plans such as the Directives or Bio2030 and do not arise suddenly. Furthermore, an intervention’s lines must be traceable to the metropolitan area’s PIDM (integral plan) as this is AMVA’s institutional agenda.

Resource allocation is based on being part of integral planning strategies. The next stage is to contract via public tender or agreement, and then to commence construction or program rollout. Upon completion, the final product is handed to AMVA or to one of the 10 constituent municipalities.

The following cases briefly illustrate key interventions carried out in the metropolitan area, from planning to implementation.

**Mobility solutions: SITVA, EnCicla, and the move to integrate a large territory in more sustainable ways**

SITVA is the first multi-modal public transport system in Colombia to combine high-, medium-, and low-capacity modes, incorporating everything from metro to tram to public bicycles. In combination with conventional buses, SITVA covers approximately 86 percent of the metropolitan area’s occupied territory. The first intervention completed to create this system was the metro, which started with the establishment in May 1979 by Medellin and Antioquia of a public company appropriately called Metro de Medellin. The city and the Department of Antioquia have equal ownership. Metro carried out technical and economic feasibility studies, presented the project to the national government (given the high levels of debt Metro would have to incur and the national government’s required support), and in 1982 received the green light to proceed. Construction started in 1984 and was finalized in 1995 for Line A of what is, to date, still Colombia’s only metro.

SITVA’s 73.52 kilometers incorporate two metro lines, five cable cars, two BRT lines, and one tram line. Its total capacity is 69,923 passengers per hour in any one direction. Each mode is meant to complement the territory it serves. For example, the cable cars are suitable for moving people up and down steep slopes, while the BRT brings mass transportation to densely built but mostly flat areas. Smooth transfers among modes are achieved through carefully planned stations and the use of a single
card to pay for the different services. EnCicla, a free public bicycle system, helps expand the coverage area by maintaining docking stations close to SITVA’s strategic stops. Together, SITVA and EnCicla help address chronic air pollution problems by providing alternatives to private vehicle use while improving territorial equity.

The most recent mobility innovation to help with air quality concerns has been the introduction of electric buses. A pilot of this mode was implemented in 2018 with a fully electric articulated bus running on one of the feeder bus routes in Medellin. The 18-meter-long bus had a capacity to carry 160 passengers and cost COP 1,900 million ($638,226), which was paid by Metro and EPM (Metro 2018). The pilot was followed by the purchase of 64 electric buses for the BRT system Metroplus. These buses when fully operational are expected to annually prevent the emission of 3,666 tons of CO₂ and 88 kilograms of PM2.5 (Restrepo 2019).

Mobility achievements have been the result of integrated planning and implementation efforts by the city of Medellin, AMVA, and public transport companies Metro and Metroplus. AMVA drafts mobility plans and regulates service providers, while municipalities design the projects to keep the system moving. Current plans to expand the systems are incorporated in the Mobility Master Plan 2005–2020 and the Bicycle Metropolitan Master Plan 2030. Table 3 summarizes key events in the metropolitan area’s pursuit of integration through mobility.

<table>
<thead>
<tr>
<th>TIMELINE</th>
<th>KEY EVENTS</th>
</tr>
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<tbody>
<tr>
<td>1977–1979</td>
<td>Creation of a public company to carry out technical and economic feasibility studies to build the metro.</td>
</tr>
<tr>
<td>2004</td>
<td>First cable car, Line K, begins operation. The cable links the metro, which runs parallel to the river, to the upper portion of the north-eastern hills. Five additional cable-car lines built between 2008 and 2019.</td>
</tr>
<tr>
<td>2007</td>
<td>Introduction of Civica, a contactless smart card to pay fares.</td>
</tr>
<tr>
<td>2011</td>
<td>BRT comes into operation.</td>
</tr>
<tr>
<td>2013</td>
<td>Feeder buses added to the public transit system.</td>
</tr>
<tr>
<td>2016</td>
<td>Tramway built to compliment multi-modal system.</td>
</tr>
<tr>
<td>2019</td>
<td>Ten lines, with capacities per mode ranging from 10 passengers (gondola) to 300 (metro car), have the ability to transport 77,705 passengers per hour per trip. The network has direct access to six municipalities: Bello, Medellin, Itagui, Envigado, La Estrella, and Sabaneta.</td>
</tr>
</tbody>
</table>

Source: Expert knowledge combined with dates/numbers from https://www.metrodemedellin.gov.co.
Medellin’s Metrocable is illustrative of the metropolitan enhancements that, with slum upgrading and major public space interventions, laid the foundation for using integrated planning in the city’s poorest areas. Shown here are cable cars gliding above Medellin’s Santo Domingo district.

Source: Panos Pictures/Samuel Aranda.
Protecting strategic water ecosystems and related services

Integral water management for the metropolitan area requires coordinated efforts by AMVA, utility services providers such as Grupo EPM, and regional partners such as Corantioquia and Cornare. Approximately 85 percent of the water consumed in the metropolitan area is captured outside its perimeter. Water providers include Grupo EPM (with a 93.83 percent market share), community aqueducts (5.52 percent), and underground water (0.65 percent). Two dammed reservoirs account for over 80 percent of the metropolitan area’s water needs: La Fe for 54.1 percent of the area’s water (58 percent of EPM’s system) and Riogrande II for 30.8 percent (33 percent EPM). In addition, these dams generate electricity at three different stations: Niquia, La Tasajera, and La Ayura (AMVA 2017b).

In consultation with key stakeholders, AMVA developed plans such as POMCA in 2007 and the Ravines Plan (Plan Quebradas) in 2015. POMCA addresses the management of the Medellin River (also known as the Aburra River), while the Ravines Plan seeks to restore water sources within the metropolitan area. Only Medellin and Envigado acknowledge within their strategic plans their dependence on water sources outside their jurisdiction and the need to carry out actions with other actors to protect future availability. To balance this, AMVA, Grupo EPM, the Department of Antioquia, the nonprofit Science and Technology Center of Antioquia (CTA), and Public-Private Partnerships such as Fondo Cuenca Verde have partnered to conserve, protect, and restore strategic ecosystems and, in that way, to help secure the future availability of water and electricity. For example, the Ravines Plan identified 19 ravines for intervention: six in the north, six in Medellin, and seven in the south. Technical and conservation activities carried out between 2017 and 2018 include tours to assess the condition of each microbasin and the development (in partnership with the municipalities) of an integral program to improve each basin, in addition to planting 27,000 trees.

POMCA has also become a contributor to the visioning of the metropolitan area’s public space system by planning for the consolidation of a metropolitan green belt that would complement the existing Medellin green belt. Discussions to conserve the upper portion of Medellin’s hillsides go back to 1981 (Alcaldia de Medellin 2011), and the other municipalities have subsequently joined the effort, with the idea of creating a metropolitan green belt. The green belt is considered a strategy to protect ecosystem services, particularly those associated with water. Nevertheless, the only project implemented toward this end has been a portion of Medellin’s green belt known as Jardin Circunvalar. Table 4 summarizes these and other key undertakings to protect the metropolitan area’s water ecosystems.
TABLE 4. KEY UNDERTAKINGS TO PROTECT THE METROPOLITAN AREA’S WATER ECOSYSTEMS

<table>
<thead>
<tr>
<th>TIMELINE</th>
<th>KEY EVENTS</th>
</tr>
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<tbody>
<tr>
<td>1970s</td>
<td>Medellin River clean-up program: For almost 50 years EPM has worked towards reversing the negative impact of industries and informal urbanization on the Medellin River.</td>
</tr>
<tr>
<td>1992</td>
<td>Creation of Mi Rio, an institute for the integral management of the Medellin River Basin. Responsibilities included spatial planning studies as well as the design and construction of hydraulic works, land risk mitigation, and reforestation.</td>
</tr>
<tr>
<td>2004</td>
<td>Creation of joint committee for the Plan for the Use and Management of the Aburra River Basin (POMCA).</td>
</tr>
<tr>
<td>2007</td>
<td>POMCA is approved.</td>
</tr>
<tr>
<td>2014</td>
<td>Creation of water fund Cuenca Verde as a joint public-private effort to help protect and manage the water supply basins for the Aburra Valley.</td>
</tr>
<tr>
<td>2015</td>
<td>Inauguration of Jardin Circunvalar, a portion of which is expected to be Medellin’s green belt. Besides hosting activities for the public in an area with little public space it also doubles as a source to protect water ecosystems.</td>
</tr>
<tr>
<td>2015</td>
<td>Plan Quebradas identifies 19 ravines for intervention: six in the north, six in Medellin, and seven in the south.</td>
</tr>
<tr>
<td>2017–2018</td>
<td>Implementation of Plan Quebradas has led to technical and conservation activities such as tours to assess the condition of each microbasin and the development in partnership with the municipalities of an integral program to improve each, in addition to planting 27,000 trees.</td>
</tr>
<tr>
<td>2018</td>
<td>Between 2014 and 2018 Cuenca Verde helped conserve 4,445.9 hectares and impact 13,975.9 hectares, meaning 44 percent of the area it wants to help protect for Riogrande II dam and 12 percent for La Fe dam (Cuenca Verde 2019).</td>
</tr>
</tbody>
</table>

Source: Expert knowledge combined with dates/numbers from https://www.metropol.gov.co/Ambiental.

RISK MANAGEMENT

Legislation on risk management mandates that different government levels carry out risk and threat assessments following the Sendai framework for disaster risk reduction and meeting sustainable development goals. To this end, current norms require municipal land use plans to be updated to include risk studies. These mandates impact both municipal and metropolitan land use management. Both are directed to analyze their territories in detail and to incorporate in their plans and norms a sectoral map specifying risk levels. AMVA and Corantioquia help municipalities analyze and manage physical risks due to land movements, avalanches, rising water levels, and other adverse conditions that can impact lives and communities. The legal obligations for government employees and organizations lead to rigorous risk management actions being prioritized over urbanization processes. However, the accumulated level of informal urbanization creates important challenges going forward, as communities that inhabit high-risk territories must be resettled.

11 For more on the United Nation’s Sendai framework for disaster risk reduction see https://www.undrr.org/implementing-sendai-framework/what-sf
ACHIEVING GLOBAL ENVIRONMENTAL BENEFITS

Broadly speaking, the efforts carried out in the metropolitan area to achieve global environmental benefits can be categorized as actions to moderate emissions, manage day-to-day conditions, and conserve ecosystems.

The main actions to moderate emissions include improving access to services and urban amenities at the neighborhood level, increasing access to public transportation to improve connectivity and reduce private vehicle demand, and promoting clean production programs. Medellin has received considerable contributions to finance integrated urban planning projects and programs from Grupo EPM, which is primarily a renewable energy-based utility. The bulk of Grupo EPM’s electricity generation comes from hydroelectric plants (25 out of 27 plants, the others being one thermal and one wind). Many of these integrated urban planning programs have enabled the development of high-density mixed-land use development neighborhoods and offer enhanced social inclusion and economic opportunity for people living in low-income communities through well-serviced neighborhoods that have last-mile connectivity to mass transit systems. Additionally, attempts to reduce the use of private vehicles by promoting the use of mass transportation and bicycles have curtailed the carbon output of metropolitan mobility. Efforts through Metro, Metroplus, and EnCicla make up part of this category, as do recent moves to switch portions of the vehicle fleet from fossil fuel-dependent buses to electric ones. This electrification of high-capacity buses is significant because metropolitan power supply is mostly from renewable energy sources.

Another effort on this front is the clean production program carried out by the private sector in areas such as construction and the industrial production of textiles and chemicals, among others. Practices to reduce emissions have already shown their scale-up potential. For example, the networked public transport system has been in constant expansion over the past 20 years, providing more users with clean mobility solutions. Another example is the public bicycle system, which is being extended to more municipalities in the metropolitan area. Clean production can also be expanded to include more sectors. As the construction, plastics, and textiles sectors show, efforts can be expanded to better align with circular economy models.

A second set of initiatives seeks to manage harmful natural events such as extreme precipitation, which increases the risks for landslides on hillsides, as well as episodes of air quality deterioration due to black carbon, which
increase health impacts for vulnerable populations. The Medellin metropolitan area is the only one in the country with early warning systems for air pollution, extreme weather, flooding, and land movements. SIATA, together with plans PIGECA and POECA, also aim to give policy makers and citizens the tools to address atmospheric pollution episodes. Open access to SIATA’s portal allows citizens to see prevailing and expected weather conditions and plan their day accordingly. Government officials use SIATA to decide when to impose special measures such as suspending government-sponsored outdoor recreational activities when the air quality deteriorates significantly. AMVA recently launched an app, area 24/7, to facilitate access to SIATA and help users plan trips on public transport, among other uses. SIATA-like systems will become increasingly important as cities face climate change, creating opportunities to expand the technology to other places. The municipality of Escazu in Costa Rica is one such place; in partnership with AMVA, the municipality is adopting SIATA.

Finally, there are ongoing efforts to preserve ecosystems—such as the metropolitan green belt, the river clean-up program, and efforts to protect ravines and water basins. Two other initiatives merit consideration: protected urban areas and wildlife protection. In 2009, AMVA began to issue declarations identifying selected places as protected urban areas as a conservation and environmental education strategy. Declaring a place to be a protected urban area means that the municipality cannot change its land use to another purpose, thus protecting key urban ecosystems from housing, industrial, or other built-environment impacts. The ultimate objective is to create a metropolitan system of protected areas to conserve biological diversity, ecosystem services, and socio-cultural values associated with the areas (Alvarez Perez 2017). The first two areas so designated were El Volador and Nutibara, two hills located in Medellin. These were followed in 2011 by two other hill neighborhoods: Asomadera in Medellin and Piamonte in Bello. In 2019 two more areas were added to the list: wetland El Trianon and lineal park La Heliodora in Envigado, and wetland Ditaires in Itagui. AMVA had to innovate the legal instruments to achieve this, because the national environmental ministry did not recognize the protected urban area approach. These efforts have significant opportunity for scale-up, as other municipalities and metropolitan areas looking to design similar policies can now look at AMVA’s policies and replicate them to meet local urban ecosystem and wildlife protection needs.
Financing

The bulk of expenditures in programs, infrastructure, planning, and similar undertakings that impact the metropolitan scale are usually carried out by AMVA, either by itself or in partnership with its municipalities, with Antioquia, with the national government, with state-owned companies such as Grupo EPM or Metro, or with autonomous regional corporations such as Corantioquia. AMVA’s financing is mostly limited to contributions made by its members and mandatory environmental surcharges. Nevertheless, the entity has been active in the past decade in securing funding for initiatives, by working with the Department of Antioquia, the national government, and foreign governments and international organizations (including the United Nations Environment Programme and the European Union).

Municipalities, the Department of Antioquia, and the nation carry out a smaller number of interventions that impact the metropolitan area without AMVA’s financial involvement. Examples of these include the metro and a current partnership between the national government and the municipalities to upgrade 38 educational institutions. Co-financing initiatives have led to increased activity in the metropolitan area by allowing municipalities that otherwise could not cover the full costs to propose or request interventions in which they provide in-kind contributions (land, demolitions, and so on) while other actors shoulder the additional costs.

Budgets are drawn up every four years when a new AMVA director and metropolitan board take office. The budget is part of a four-year management plan that outlines the strategic interventions and the plans to be executed. Table 5 outlines AMVA’s income and expenditures over the current administrative period.
As shown in Table 5, AMVA has two main sources for current income: environmental surcharges on property taxes and contributions by its constituent municipalities. In 2018, these accounted for 37.8 percent and 17.8 percent of its income, respectively. Environmental surcharges guarantee environmental authorities will have a certain level of income to meet their mandates. This provides AMVA with some stability, as member contributions are subject to change, should municipal councils redefine them. Simultaneously, it means the entity must emphasize environmental investments.

Member contributions have continued to grow over the years, as the municipalities value AMVA’s role in promoting metropolitan development. The remainder of the current income comes from fees (remuneration rates to improve water resources) and fines (for example for landscape deterioration, pollutants emissions, and environmental norm violations); sales of services
(related to recreational services at the Metropolitan Water Park); licenses and permits for transportation and environmental services (for example, issuance of permits for the BRT and other mass public transit procedures); and other non-tributary income (such as leases).

The complement to current income is capital income. The board of directors can authorize AMVA to borrow funds to cover costs for infrastructure projects. Historically, the organization has been reluctant to expand its level of debt, although this has begun to change with the current administration as the board has just entered into a loan with a national development bank, Findeter. That decision was the product of a desire to begin the construction of infrastructure works, such as the Calle 77 Sur road exchange for Sabaneta and La Estrella and a sustainable mobility project emphasizing sidewalks and bike lanes in La Picacha (Medellin), Envigado, Copacabana, Bello, Barbosa, and Girardota.

Furthermore, for the first time in Colombian history, a metropolitan authority has been directly offered a loan by an international agency. It is still unclear whether AMVA will take this loan, which was offered by the Inter-American Development Bank to further expand AMVA’s zero-emissions metropolitan mobility through EnCicla. In addition to the funds received through the Findeter credit, AMVA also has income from portfolio recovery (environmental surcharges and municipal contributions owed from previous years), and financial surpluses and returns from financial operations, the product of liquidity management through bank accounts (AMVA 2019).

Considering the potential for other sources of income, AMVA’s management plan for 2016–19 calls for the use of complementary financial instruments, such as Public-Private Partnerships (PPP). Another proposed instrument is to capture a portion of the value added from metropolitan infrastructure through impact fees and to invest those funds into other infrastructure projects. Currently there are no interventions or initiatives by the private sector to advance metropolitan integrated planning. In June 2019, Fitch Ratings increased AMVA’s long-term credit rating from AA+(col) to AAA(col) and maintained its F1+(col) short-term credit rating (Fitch 2019). The improved rating reflects the credit agency’s perception that AMVA has a medium-to-low risk profile, a product of solid income sources, a sustainable debt level, and a flexible expenditure structure.

The bulk of AMVA’s expenditures go to investments (86.96 percent), with the remainder distributed among operational expenses (10.37 percent) and debt servicing (2.68 percent). Another way to look at the components under the annual investment operational plan category is by strategic line. Allocations of expenditures under AMVA’s six strategic categories for 2018 were as follows: 19.82 percent for planning and managing for equity; 25.88 percent for environmental quality and sustainable development; 43.15 percent for sustainable, safe, and friendly mobility; 4.26 percent for safety, coexistence, and peace;
4.05 percent for institutional support, management, and cooperation; and 2.83 percent for public communication and social mobilization (AMVA 2019).

Percentage allocations between the three main expenditure categories—investments, operational expenditures, and debt servicing—remain relatively constant. There is a significant nominal increase in expenditures for 2017 and 2018 that is consistent with the increase in capital income from the Findeter credit. Another area that sees a notable nominal increase is environmental surcharges on property taxes, despite decreasing in the percentage of participation in overall income. The bulk of this nominal increase comes from efforts by municipalities to update their property valuation records, which in turn increases the fees going to AMVA. The entity has provided technical support on this front to municipalities.

A good illustration of the commitment by AMVA’s members to fund interventions that can help balance urban growth and development between lagging and leading municipalities within the metropolitan territory is found in the return on the investment of resources transferred. Medellin, the dominant actor among the municipalities, was responsible between 2016 and 2018 for 76.24 percent of municipalities’ contributions and environmental surcharges. During the same period, its return was just 35.6 percent. This is in stark contrast with other municipalities, such as Barbosa, which contributed 0.43 percent and had a return of 779.5 percent (AMVA 2019).

Two important conclusions can be drawn from these data: first, that metropolitan development cannot be understood using return-on-investment metrics. By such accounting, Medellin is not getting a good deal. However, municipal leaders understand that investments impacting their neighboring municipalities contribute indirectly to their own future, for example by putting less pressure on Medellin as a central node and by securing ecosystem services. Second, the numbers illustrate the importance of metropolitan entities such as AMVA, which can help funnel resources to smaller municipalities, and thus contribute to their institutional and physical development.

**Replication**

To speak of Medellin today is to speak of a 10-municipality conurbation. Geographic conditions present from its inception, combined with urbanization trends from the 1960s to date, have made the Aburra Valley a continuous city.
late 1980s gave municipalities a lot of power. As a result, current administrative institutions incentivize municipal autonomy rather than integration. Despite this, the AMVA has become an essential administrative instrument for linking key regional sectors, such as mobility and the environment.

AMVA was the first metropolitan regional institution created in Colombia, and it continues to be a pioneer. While it faces limitations to both its scope and function, AMVA has shown that it is possible for complex territories and fragmented political interests to reach agreements and implement strategic and structural steps to address common challenges and seize opportunities. Under the leadership of AMVA, Medellin and the Aburra Valley have pioneered strategies and projects that illustrate to other Colombian regions how to conduct fruitful metropolitan planning and governance. Through the years, it has led the way by piloting strategies for the evolution of the country’s metropolitan institutions. Examples of its achievements range from leading the way in planning instruments such as the 2006 Metropolitan Land Use Directives and the PEMOT, currently under discussion, to being the first metropolitan area in Colombia with integrated mass transportation and public bicycle systems, SITVA and EnCicla. Table 6 summarizes some of the most significant solutions implemented to date.

### TABLE 6. INVENTORY OF SOLUTIONS—A PORTFOLIO OF POLICIES, PROGRAMS, AND PROJECTS

<table>
<thead>
<tr>
<th>SOLUTIONS</th>
<th>MECHANISM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-modal mobility</td>
<td>Tailor solutions to the territory</td>
<td>Network composed of modes appropriate for flat terrains and steep slopes</td>
</tr>
<tr>
<td></td>
<td>Incorporate the entire city into the network</td>
<td>Extend multi-modal network to all income levels</td>
</tr>
<tr>
<td>Metropolitan planning</td>
<td>Creation of a dedicated agency</td>
<td>Coordinate among 10 municipalities to harmonize land use plans</td>
</tr>
<tr>
<td></td>
<td>Draft and implement environmental sustainability plans</td>
<td>Exercise urban environmental authority in the metropolitan area</td>
</tr>
<tr>
<td></td>
<td>Integrate territory through multi-modal mobility</td>
<td>Build common-interest transportation infrastructure. Work with municipalities to integrate transportation networks</td>
</tr>
<tr>
<td>Integrated planning</td>
<td>Intervene in territories holistically through integrated urban projects</td>
<td>Design interventions that incorporate mobility, public space, educational facilities, public services, and other key urban facilities. Coordinate among agencies to ensure efficiencies and incorporate community in the planning process</td>
</tr>
</tbody>
</table>

Source: World Bank, compiled from Colombian government data.
A gradual accumulation of know-how and a willingness to work together has led metropolitan Medellin to formulate land-use planning frameworks that allow it to have strategic metropolitan urbanism projects, management instruments, and guidelines to negotiate municipal spatial plans in an integrated fashion. Ultimately this has allowed the metropolitan area to carry out common-interest projects and to have a long-term vision centered on integration and sustainability, its two pillars for future development. While the majority of plans issued by AMVA are non-binding, the institutional reality in Colombia is that even seemingly binding instruments are often moved from paper to practice only through the willingness of elected leaders. In other words, many formal institutions are characterized by institutional weakness. Great achievements often require social and political compromise. AMVA is therefore tasked with getting private and public interests across its municipalities to commit to a metropolitan purpose. This requires continuing to define that common purpose, generating trust among its members, and opening spaces for dialogue and negotiation.

The current legal framework makes most metropolitan management efforts in Colombia non-binding, hampering progress on this front. There is a need for legal frameworks to strike a balance between municipal spatial planning autonomy and the interlinked vision of metropolitan territories. Municipalities and the institutional frameworks that guide them must acknowledge that in reality municipal autonomy has limits due to metropolitan interdependence. The relationships that develop between municipalities and the wider regions that provide goods and services, such as water, electricity, and food, need to succeed. Metropolitan areas are the cities of the twenty-first century. Without proper institutions, metropolitan areas will continue to be just municipalities experiencing conurbation.

**REPLICATION**

Metropolitan Medellin offers many attributes that are replicable in other metropolitan areas. First, it is important to design governance arrangements that clarify rules of engagement for metropolitan actors and can help balance socio-spatial inequalities. Metropolitan Medellin has found this through AMVA—despite its imperfections. Second, metropolitan areas require integrated multi-modal public transport solutions that respond to user needs and the conditions of the territory. SITVA and EnCicla have not only physically connected users across the metropolitan area, but have also aided environmental efforts. Third and last, AMVA, EPM, Corantioquia, and Cornare show the importance of developing multi-party mechanisms to work with regional actors beyond the metropolitan area to protect ecosystems needed to secure future ecosystem services availability.
Density

Figure 7

**POPULATION DENSITY, 2000**

- **Municipal**
  - Maximum: 47,894 people/km²
  - Minimum: 1 person/km²
  - Average: 3,860 people/km²

- **Metro**
  - Maximum: 45,718 people/km²
  - Minimum: 1 person/km²
  - Average: 646 people/km²
MEDELLIN: SOMOS10—INTEGRATING TEN MUNICIPALITIES INTO ONE METROPOLIS

Population Density, 2017

**Municipal**
- Maximum: 54,040 people/km²
- Minimum: 1 person/km²
- Average: 5,511 people/km²

**Metro**
- Maximum: 77,026 people/km²
- Minimum: 1 person/km²
- Average: 1,474 people/km²

Figure 8
**Population Density, 2017**

Figure 9
Overlay of density levels, 2000–2017
MEDELLÍN: SOMOS10—INTEGRATING TEN MUNICIPALITIES INTO ONE METROPOLIS

ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMVA</td>
<td>Metropolitan Area of the Aburra Valley</td>
</tr>
<tr>
<td>BRT</td>
<td>Bus Rapid Transit</td>
</tr>
<tr>
<td>CONPES</td>
<td>National Economic and Social Policy Council</td>
</tr>
<tr>
<td>Grupo EPM</td>
<td>Empresas Publicas de Medellín</td>
</tr>
<tr>
<td>IEU</td>
<td>Institute for Urban Studies</td>
</tr>
<tr>
<td>MIB</td>
<td>Integrated Neighborhood Upgrading</td>
</tr>
<tr>
<td>PBOT</td>
<td>Basic Territorial Plan</td>
</tr>
<tr>
<td>PEMOT</td>
<td>Metropolitan Strategic Land Use Plan</td>
</tr>
<tr>
<td>PIDM</td>
<td>Integrated Metropolitan Development Plan</td>
</tr>
<tr>
<td>PIGECA</td>
<td>Integrated Plan for Air Quality Management</td>
</tr>
<tr>
<td>POMCA</td>
<td>Plan for the Use and Management of the Aburra River Basin</td>
</tr>
<tr>
<td>POT</td>
<td>Territorial Plan</td>
</tr>
<tr>
<td>PPP</td>
<td>Public-Private Partnerships</td>
</tr>
<tr>
<td>SITVA</td>
<td>Integrated Transportation System of the Aburra Valley</td>
</tr>
</tbody>
</table>

Currency exchange rate: 1 USD = 2,977 COP (2018)
Megalopolitan Integration to Combat Black Carbon

Natalia Garcia, Beth Olberding, and Jorge Macías


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

Megalopolitan integration to combat black carbon

Figure 1
Integrated planning model

KEY FINDINGS

1. The urgency and universality of Mexico City’s air quality crisis; being adequately funded for over two decades; its integrated planning approach across jurisdictions and sectors in the metropolitan area; and its incremental scaling up were central to the Metropolitan Environmental Commission’s successes.

2. The commission has been funded through federal, state and municipal contributions, fuel taxes, and supplemental resources from multilateral banks and international cooperation. An Environmental Trust Fund has provided financial stability and continuity since inception.

3. In the last 25 years, lead, sulfur dioxide, carbon dioxide, and PM10 air pollution has decreased substantially. Strengthening data collection and monitoring transparency confirms the significant reduction in airborne pollutants. This has provided the evidence base for adopting emissions standards nationally and expanding similar programs to other Mexican cities.
The crisis of the commons can unite deeply divided urban authorities, and even fragmented metropolitan areas may have been well integrated in the past.

In recent decades, two common threats—the crisis of air pollution and the risk of earthquakes—led Mexico City to devise an integrated, multi-sectoral, cross-jurisdictional megalopolitan response. Historically, metropolitan Mexico City planned integration in anticipation of built-area expansion as the lake city was drained by canals and linked with bridges, light rail was installed, and the urban grid expanded. Eventually, rapid sprawl gave way to fragmented urbanization.

Severe air pollution has led urban authorities across the megalopolitan region to take joint action in collaboration with the federal government, successfully integrating policy and planning to build and sustain environmental regulations through a programmatic approach locally known as ProAire, which is now in its fourth phase. The diversity of measures introduced in phases included regulating toxic industrial pollutants, restricting car use, expanding light rail, and building Latin America’s longest Bus Rapid Transit systems. Phase four of ProAire (2011–2020) implemented 89 measures with 116 actions clustered in eight strategies, ranging from science-to-policy support and advocacy to urban energy efficiency, electrification of public transport, installation of more than 150,000 catalytic converters, bike-sharing, reforestation, and expansion of public open spaces.

These efforts have improved urban air quality and reduced carbon dioxide emissions from urban transport by millions of tons. A dedicated metropolitan fund, which started with federal grants, was followed by a gasoline tax, among other experiments with taxes, fees, and grants. The fund is overseen by an independent technical commission and incentivizes collaboration between agencies and across administrative boundaries.
The Metropolitan Context

In the 1300s, the Aztec Empire established its capital, known as Tenochtitlan, on an island in Lake Texcoco, which is now the core of Mexico City. When the Spanish colonized the city, they noted the Aztecs’ well-planned land and water routes through the city (Atkinson 2016). Mexico City was legally founded in 1521, when the Spanish overthrew the Aztec indigenous people residing there. The Spanish conquerors subsequently drained the lakes and built roads over what were once canals (Almandoz Marte 2002). More than a third of Mexico City’s sprawling urban footprint exists on ancient lakebeds that were drained to make room for urban expansion.

An analysis of historical planning maps of Mexico City from the late 1700s through the mid-1900s shows that Mexico City was spatially integrated. As early as the late 1770s growth was planned within the administrative boundary of Mexico City, demonstrating that early planning took place within a jurisdictional area. In 1821, Mexico gained its independence from Spain, and went through numerous regime changes with Mexico City enduring as the country’s economic and political center. From 1850 to 1900, Mexico City doubled in both population and area (Almandoz Marte 2002). The city planned for growth toward the south and west. By 1922, railroads connected the city to settlements on the outskirts, providing spatial integration as Mexico City expanded.

Throughout the 1900s, the population continued to expand forming the largest urban agglomeration in Latin America with a population exceeding 21 million in 2018 (Kim and Zangerling 2016; United Nations 2018a). During the mid-1900s the population and land area expanded too rapidly for the government to keep pace with services. The metropolitan region is still challenged in providing urban amenities.

Even though the population has increased exponentially since the 1950s, the topography of the region limits growth. The population density of Mexico City is concentrated in the center and diminishes toward the periphery. Lower population density coincides with protected areas and mountains that surround the Valley of Mexico City, thus the topography limits urban settlement and options for housing. The area of the urban expansion is called the Mexico Valley Metropolitan Area (Zona Metropolitana del Valle de Mexico; ZMVM).

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To estimate population density, LandScan uses remote-sensing imagery analysis to disaggregate census counts within an administrative boundary. As a result, built-up areas such as airports and industry may appear to have a residential population where there isn’t one.

Sources: LandScan; NASA SRTM 30m; SEDENA.GOB.MX; OpenStreetMap Contributors

Map projection: UTM Zone 14N, WGS-84 Datum
Population growth in the ZMVM increased rapidly during the second half of the 20th century, paralleling Mexico City’s economic growth (Diaz Barriga 1995). Mexico City’s metropolitan urban footprint expanded approximately 13 times from 1940 to 1990 (Molina and Molina 2002). As both the population and economy burgeoned, the city sprawled outward. Map 2 demonstrates that most of Mexico City’s urbanization occurred prior to the 1980s but has also expanded in recent decades. Currently, annual population growth has slowed to 0.8 percent, but this is still a significant increase in numbers based on the ZMVM population (UNDESA 2018a). This chapter focuses on integration of the metropolitan area of Mexico City including the jurisdictions of the City of Mexico, the state of Mexico and the state of Hidalgo—the area included in the ZMVM.

In 2013, as will be described later, the scope of integration to improve air quality expanded to include the greater megalopolitan area, including municipalities in the states of Morelos, Puebla, and Tlaxcala, and, in 2017, Queretaro.

The metropolitan area is fragmented into 76 municipalities within Mexico City, the state of Mexico and the state of Hidalgo (Map 3) with no formal metropolitan authority for efficient governance, coordinated decision making, or integrated planning. Achieving an integrated governance and planning system

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1 Based on World Bank calculations of population data from UNDESA 2018b.
2 The megalopolitan area of Mexico City, as defined by CAMe, comprises 189 municipalities, including 91 municipalities in the state of Mexico, 16 in the state of Morelos, 16 in the state of Hidalgo, 29 in the state of Puebla, 37 in the state of Tlaxcala, 16 districts in Mexico City, and 18 districts in the state of Queretaro.
3 The state of Queretaro informally joined CAMe in 2017 and has since adopted CAMe programming and policies (Barbosa 2017). To become a formal member of CAMe, all states that comprise CAMe need to sign an amendment, which was pending as of October 2019 (Banda 2019).
 BOX 1. WATER IN MEXICO CITY: SANITATION AND FLOODING

Mexico City’s unique topography creates resiliency challenges in terms of flooding and a consistent access to water supply. The city was founded on an island in Lake Texcoco, one of several lakes that was later drained. The existence of these lake basins underlying the city complicates access to water. Mexico City’s main water challenges relate to a diminishing groundwater supply, issues with leakage from infrastructure pipes, lack of infrastructure in informal settlements, and the quality of the water delivered (Tortajada 2008).

Urbanization has taken a toll on Mexico City’s access to freshwater by putting a high demand on declining groundwater levels (Barker et al. 2000). Overextraction of groundwater has caused the land underlying Mexico City to slowly sink. Although policies limit use of groundwater, enforcement has historically been weak resulting in a rate of use higher than the rate of the recharge (Barker et al. 2000, Tortajada 2008). This suggests that water shortage is an imminent challenge for the ZMVM.

The National Water Commission has estimated almost 40 percent of the water can be lost from pipes in some places (NRC 1995). Inadequate water infrastructure in the ZMVM has hindered water delivery; about 14 percent of Mexico City’s population lacks access to water in their homes. A portion of the population resides in informal settlements that lack the infrastructure to receive water (Eakin et al. 2016). Some areas import water by tank trucks or access to local wells and springs (NRC 1995). The city has a higher level of service than periphery settlements in state of Mexico (NRC 1995).

Poor quality drinking water is also a challenge, partly because rapid urbanization and the proliferation of paved (impervious) surfaces have increased flooding during the rainy season. Flooding occurs in Mexico City because impervious paved surfaces and the lack of green infrastructure diverts rainwater from the underlying lake basin that historically collected rainwater and absorbed it into the groundwater table. This also contributes to the city’s water scarcity. Flooding can have devastating impacts in informal settlements during the rainy season (Tortajada 2008).

The Metropolitan Agency for the Mexico Valley Water Basin is organized under Conagua, a federal water agency. Although water is of major concern for the sprawling Mexico City, it has not been a priority for collaboration among the state of Mexico, Mexico City and the federal government (Tortajada 2008). As Mexico City has sprawled, water accessibility and conflicts have increased. For example, Tortajada (2008) reported on a lawsuit in which the state of Mexico sued Mexico City and the federal government because the city was extracting water from the state’s Lerma River without providing compensation. Not only did the state sue for almost $2.5 billion, but it asked that any major water infrastructure built in the state be operated by the federal government to avoid conflict over access to water (Tortajada 2008). As the city has sprawled and overexploitation of water has increased, conflicts over water have become more contentious, indicating a lack of integration across state lines and among jurisdictions.
in the ZMVM required the coordination of federal, state, city, and local governments. The metropolitan delineation exists only for statistical purposes, not for actual metropolitan governance (Diaz Aldret 2018).

The ways in which the ZMVM has worked at the metropolitan scale and in what capacity are shown in Table 1.

<table>
<thead>
<tr>
<th>TABLE 1. URBAN INNOVATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INNOVATION CHRONOLOGY</strong></td>
</tr>
<tr>
<td><strong>1976</strong></td>
</tr>
<tr>
<td>Commission for the Conurbation of the Center of Country (Comision de Conurbacion del Centro del Pais)</td>
</tr>
<tr>
<td><strong>1988</strong></td>
</tr>
<tr>
<td>Metropolitan Area Council (el Consejo del area Metropolitan)</td>
</tr>
<tr>
<td><strong>1994</strong></td>
</tr>
<tr>
<td><strong>1995-2000</strong></td>
</tr>
<tr>
<td>National Urban Development Program (Programa Nacional de Desarrollo Urbano)</td>
</tr>
<tr>
<td><strong>2001-10</strong></td>
</tr>
<tr>
<td>ProAire and Air Quality Monitoring</td>
</tr>
</tbody>
</table>
| **2006** | First metropolitan funding mechanism that requires cross-governmental collaboration and joint proposals to access funding. Its initial budget was $52.3 million. 

$^a$ All currency is in U.S. dollars. 1 US$ = 19.4 Mexican pesos as of October, 2019. |
| Metropolitan Fund (Fondo Metropolitan) | |
| **2006** | Public-private investment model in high connectivity, intermodal transit stations in Mexico City. Developed mixed-use spaces above transit stations. Created nodes of economic activity that allow for a high return on investment on the infrastructure improvement and commercial development on the site, benefiting public and private investors. |
| Intermodal Transfer Centers (Centros de Transferencia Modal) | |
| **2009-present** | Private, not-for-profit, grassroots initiative that installs rudimentary rainwater capture systems in residential areas. |
| Urban Island (Isla Urbana) | |
| **2012** | Established as a continuation of the Commission of Metropolitan Coordination (Cenizal, 2015). |
| Management Program for the Metropolitan Area of the Mexico Valley (Programa de Ordenacion de la Zona Metropolitana del Valle de Mexico) | |
| Source: World Bank with a team of WRI Mexico experts, 2019 |
HISTORICAL ATTEMPTS AT METROPOLITAN COORDINATION IN ZMVM

INTEGRATED PLANNING REFERS to holistic planning for service provision with a vision for future growth and across sectoral and jurisdictional entities. In ZMVM, integration was challenging because settlements were established outside of the Federal District. Starting in the 1950s, the city expanded rapidly without structured, coherent regional planning. Mexico City absorbed unprecedented rural–urban migration and industrialization. As sprawl extended across administrative boundaries, integrated planning became more challenging.

Although there was a history of attempts to coordinate territorial planning in the ZMVM, many lacked clear achievements. The Commission for the Conurbation of Central Mexico (Comision de Conurbacion del Centro del Pais), created in 1976, was the country’s first attempt to coordinate metropolitan governance between the state of Mexico and Mexico City in response to the increasing urban sprawl. At the time, planning was managed at the federal level (Diaz Aldret 2018). The Commission for the Conurbation of Central Mexico ultimately failed because of lack of participation of key actors from the state and city governments (Cenizal 2015). Following this attempt, the Metropolitan Area Council was created in 1988, with no clear outcomes produced.

In 1994, there was a second wave of coordination, this time through sectoral agencies. Multiple metropolitan governance bodies for transportation, environment, housing, water, and public safety, were created simultaneously through a formal agreement between the state of Mexico and Mexico City. These bodies lacked independent governance with their members responding to local, rather than metropolitan interests. As a result, commissions were ineffective. They also lacked decision-making authority, regulatory powers and financial capacity (Cenizal 2015). Later, the state of Mexico formed the General Coordination of Metropolitan Issues, a state entity charged with coordinating across metropolitan initiatives, which failed to reflect metropolitan interests and priorities.

Dynamics between the federal government and the city changed in 1997, when the Federal District (DF) gained independence from the federal government: the mayor was elected rather than appointed by the President of Mexico and the city became a city-state with legislative powers. In 1998, the first effort to integrate planning of Mexico City and Mexico on a broader scale, the Executive Commission for Metropolitan Coordination for the Mexico Valley, was established (Gonzalez 2009). The commission operated for a few years, was suspended from 2000 to 2005, and then re-established, according to political priorities.

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In 2001, the General Coordination of Metropolitan Issues was upgraded to Ministry of Metropolitan Development for Mexico State (Edomex). The same law enabled the creation of an institution for metropolitan and intersectoral coordination but did not mandate coordination with Mexico City (Cenizal 2015). In 1998, Mexico City created a similar organization to promote metropolitan coordination, the Executive Commission of Metropolitan Coordination. While the state of Mexico and Mexico City institutionalized metropolitan efforts incrementally, the new entities existed independently within the state and city governments. In this context, Aguilar and Lopez (2018) have argued that integrated regional planning in the Mexico City metropolitan area is limited without a real institutional change at the metropolitan level to facilitate it.

In contrast to these failed attempts, this case study will focus on the success of one metropolitan entity, the Metropolitan Environmental Commission (Comision Ambiental Metropolitana: CAM) formed to address environmental issues and air quality. This commission implemented an integrated planning approach across jurisdictions and sectors in the ZMVM. CAM, which was created to respond to an immediate environmental crisis—in 1992 Mexico City was considered the most polluted city in the world (WHO and UNEP 1992)—has been adequately funded for over two decades, an important factor in its success.

**Processes, Financing, and Implementation Mechanisms**

To create financial incentives for coordination, the federal government created the Metropolitan Fund in 2006. The fund provides a one-to-one matching incentive from the federal government for each peso invested by the states in metropolitan projects (Rivas Tovar 2008). In the ZMVM’s first year, the trust accumulated $104.6 million, which was used to enhance the ZMVM’s vehicle fleet. During its second year, the fund added $52.3 million.

The Metropolitan Fund was established to encourage metropolitan coordination of state and municipal actors to promote sustainable urban development. For municipalities to access the fund, state and local actors must create a metropolitan development council to lead project implementation. While the fund incentivizes metropolitan cooperation, in practice, the governments of Mexico City and state of Mexico developed proposals independently. Even though the Metropolitan Fund created opportunities for integration by incentivizing common projects, it has not resulted in long-term planning coordination (Diaz Aldret 2018).

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5 All currency is in U.S. dollars. 1 US$ = 19.4 Mexican pesos as of October, 2019.
TOOLS AND SECTORS INVOLVED IN AIR QUALITY MANAGEMENT

In the ZMVM financial tools and new institutions were used to create and operate projects. The Metropolitan Fund incentivizes collaboration, while metropolitan institutions coordinate policy and projects across jurisdictional lines. During the mid-1990s the federal government, Mexico City, and the state of Mexico created a number of sectoral metropolitan commissions: CAM, Metropolitan Commission for Water and Drainage, Metropolitan Commission for Transportation and Roads, Metropolitan Commission for Public Safety and Justice, Metropolitan Commission on Human Settlements and Metropolitan Commission for Civil Protection (Table 1).

These commissions were meant to coordinate service provision across the ZMVM but, due to their weak capacity, failed to do so. The inefficacy of most of these institutions has been well documented—the commissions lacked governing authority because they were created as special interest commissions without legitimacy to enforce regulations in their respective sectors (Gonzalez 2009). The exception was CAM (Aguilar and Lopez 2018).

BOX 2. LACK OF INTEGRATED METROPOLITAN PLANNING GAVE RISE TO THE AIR QUALITY CRISIS

Lack of connectivity and access to quality transportation services is one of the biggest factors increasing the use of private vehicles in ZMVM, and one of the main contributors to poor air quality (Molina and Molina 2004). Particularly, for those living on the periphery, connectivity and access is a prevalent problem. Some studies have found that low-income populations living in the periphery commute up to four more hours per work week than those living in the urban center (Kim and Zangerling 2016). A spatial mismatch between jobs and housing, coupled with lack of access to good quality mass transit in the periphery, is a main contributor to congestion and poor air quality (Janoschka and Salinas 2017). Mass transit is concentrated within DF’s administrative boundaries (Map 5), with some exceptions where the metro crosses jurisdictional boundaries. But transportation options are not well integrated between Mexico City and the state of Mexico (Jiron 2013).

Despite the formation of metropolitan institutions to address transportation across state boundaries, there is no evidence of successful projects that can be linked to these entities (Cenizal 2015). A new metropolitan body, the Metropolitan Commission for Public Security and Justice Procurement, was created in the 1990s but lacked metropolitan authority (Cenizal 2015). Many of its constraints were budgetary, resulting in weak institutions (Cenizal 2015).
The lack of regional and metropolitan cooperation is demonstrated by the inefficiency of Mexico City’s metro system. The metro system was not extended to the state of Mexico until the 1990s despite the expansion of Mexico City’s urban footprint into the state decades earlier (Cenizal 2015). Even though the metro system extends across state lines, daily commutes from the state to Mexico City can be as long as five hours, suggesting inefficient service provision (Varela 2015).

Cooperative metropolitan governance of transportation in the ZMVM has occurred, in isolated instances, such as construction of the metro’s Linea B, the Tren Suburbano, Mexibus Linea and the Interurban Mexico–Toluca Railway (Gobierno del Mexico 2019).

ZMVM’s transportation challenges are tied to economic opportunity and housing policies in both Mexico City and the state of Mexico. Lack of accessibility in the ZMVM is strongly linked to fragmented urban sprawl because housing and transportation planning and policy have not been integrated. The metropolitan area’s housing policies did not prioritize development in areas well connected by transport.

In the mid-1900s, the city was unable to provide services or enforce planning ordinances where its population was expanding. This led to the establishment of informal settlements. As of 2013, approximately 28 percent of the city’s population resided in informal settlements (Almandoz Marte 2002; SEDUVI 2013). The existence of informal settlements in the periphery is largely a result of ineffective metropolitan and sectoral coordination between urban planning and social housing (Janoschka and Salinas 2017). National housing policy, from the National Institute for Incentivizing Housing for Workers (INFONAVIT) and the Housing Fund of the Social Security and Services Institute for State Workers (FOVISSSTE) increased subsidies for housing without stating preferences for the location of the housing, thus inadvertently incentivizing relocation of tenants to the periphery, where land and rents were cheaper (Janoschka and Salinas 2017; Kim and Zangerling 2016).

More recently, integration has occurred through national policy instruments. For example, the 2013–18 National Development Plan (Plan Nacional de Desarrollo, PND) sought to encourage dense, compact growth; reduce the number of informal settlements; and increase the affordable housing stock (Kim and Zangerling 2016) by coordinating across municipalities and through horizontal integration of transportation and urban slum upgrading.

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a The Interurban Mexico–Toluca Railway has experienced serious delays with construction partly because of coordination issues between the state, federal, and city governments; it is projected to be finished in 2022.
The ZMVM is now considered a leader in air quality management. CAM’s air quality policies and programs have integrated multiple components: health, transport, and mobility; land use and urban development; energy; and social development. Although ZMVM’s experience with air quality improvement has been well documented, its land use and governance components have not been emphasized. Some factors that contributed to Mexico City’s success with air quality management are its institutional arrangements and coordinated actions among different levels of jurisdictions. The ZMVM’s integrated approach to air quality included directly responding to an urgent and universal crisis. This makes air quality different from ZMVM’s other challenges, such as water, housing, and transportation, which have varying impacts on a multitude of actors rather than an equal impact on everyone across the metropolitan area.

The air quality management strategy incorporated an integrated, intersectorial approach with participation from different sectors (horizontal coordination), and different levels of government (vertical coordination). The initiatives to control air pollution focused on mobility, land use, and institutional coordination. Policies included restricting the number of personal vehicles in operation and establishing vehicles emission controls. Relocating industrial activities away from residential areas helped reduce direct health impacts from emissions. Air quality management required mandates by the federal government for cooperation among jurisdictions to address a transboundary issue.

The ZMVM has modified transportation patterns and some land use regulations that negatively impacted the metropolitan region’s air quality. Without the coordinated and integrated action of Mexico City and its surrounding states in the ZMVM, the positive trends in air quality would not have been achieved.

Implementation

HISTORY OF MEXICO CITY’S AIR QUALITY CRISIS

In Mexico City, air pollution is related to urban morphology and commuting patterns, as well as the city’s topography. The evolution of urban land use has impacted the type and amount of air pollutants, such as sulfur dioxide, carbon monoxide, ozone and particulate matter, emitted over time. These pollutants emanate from the combustion of fossil fuels through individual car use and industrial factories. Vehicle miles travelled as well as the mode of transport and
the origin–destination matrix influence the level of pollution in certain areas of the city. Unsurprisingly, the areas with the highest air pollution concentrations have a high density of roads (Map 6). Moreover, many fixed sources of emissions such as industries, open-air factories, and others contribute to pollution that creates health problems. Many of these sources are located near residential areas.

The lack of coordination across land use, water use, housing location, and transportation services has created an urban morphology that is highly disconnected, economically inequitable, and sprawling, which in turn has contributed to further increases in private vehicle usage and air pollution. To understand the emergence of air quality management initiatives, it is important to examine its history. In the early 1970s, air quality in Mexico City deteriorated to the point that it became part of the national political agenda. In the 1980s, the air quality situation worsened, and by 1992, Mexico City was declared the most polluted urban area in the world (WHO and UNEP 1992). Air pollution was a real crisis that affected people of all social strata. Children who grew up at that time could not play outside for extended periods of time and rarely experienced blue skies (McDonnell 2016).

The city’s physical morphology as a valley traps air thereby lengthening the time air pollutants linger in the city (Burdett 2006). The type of fuel used, industrial factories, and lack of integrated land use and transportation planning were chief drivers of the air pollution crisis.

In the early 1970s, the political agenda centered on the growing atmospheric pollution. In 1979, the federal government first attempted a coordinated approach to improve air quality (Coordinated Program to Improve Air Quality in the Valley of Mexico [PCMCA]), which was not implemented (Molina and Molina 2002). Due to Mexico’s poor air quality, the federal government created a new institution, the Sub-Secretary of Environmental Improvement, part of the Ministry of Health (Ministerio de Salud), to address pollution, smog, smoke, vapor, and other evident contaminants (SEMAR NAT 2018).

In the 1980s Mexico City operated under the purview of the federal government. Consequently, the federal government became the lead actor mitigating the metropolitan air quality crisis. Consensus for action was not necessary from Mexico City and the state of Mexico because actions were primarily mandated by the federal government (Cardenas 2019). Indeed, the national government contributed to the expedient response to the air quality crisis. Municipal capacity was limited at the time of the crisis, with most of the environmental authority residing at the state level and no local environmental leadership.

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6 Beatriz Cardenas, Air Quality main topics, interview by Natalia Garcia, April 9, 2019.
Only 40 percent of the metropolitan urban agglomeration lives in Mexico City. Sprawl significantly increases the challenge of metropolitan integrated planning.

Source: Dan Fairchild Photography/Moment via Getty Images.
In 1980, around 1.2 million vehicles circulated in the Mexico City urban area without emissions controls. The federal government implemented two programs in the late 1980s—a vehicle verification program and Hoy No Circula. The vehicle verification program aimed to reduce pollutant emissions by establishing a monitoring framework. Hoy No Circula placed restrictions on the number of cars that could enter the city based on their emissions and vehicle efficiency (Molina and Molina 2002). Additionally, the government provided incentives to the private sector and individuals to improve vehicle emissions to avoid circulation restrictions in Mexico City. This program required coordination with the states of Mexico and Hidalgo, which were the origin of many of the trips in Mexico City region, as it restricted trips to Mexico City.

In the late 1980s and early 1990s, the air quality situation in the ZMVM degraded. In 1988, the Mexican government passed new legislation, the General Law for Ecological Equilibrium and Environmental Protection (Ley General del Equilibrio Ecologico y la Proteccion al Ambiente; LGEEPA) that mandated action to improve air quality and assigned specific responsibilities to each level of government (Molina and Molina 2002). LGEEPA was the first regulation to define an institutional framework for air quality. This national framework established general environmental policy principles and instruments, including air quality control and prevention. LGEEPA provided national, state, and municipal governments the necessary authority to preserve and restore the ecological equilibrium of their territories. The national Environmental Secretary (Secretariat of the Environment and Natural Resources; SEMARNAT) became the central authority for air quality (LGEEPA 1988). LGEEPA also gave states the authority to control and prevent atmospheric pollution related to fixed and mobile sources. This responsibility is shared between the federal and the state levels, requiring multilevel integrated planning.

In 1992, as the air quality crisis peaked, the federal and state governments took swift action to combat it through implementation of the ZMVM’s first ProAire program, called the Comprehensive Program against Air Pollution, that integrated land use and transportation, among other actions (Molina and Molina 2002). To implement this new program, Mexico created its first metropolitan commission to address air pollution in the ZMVM—the Metropolitan Commission for Pollution Prevention and Control (MCPPC). Originally, this “metropolitan commission” involved only the federal government and Mexico City. Through its actions, the MCPPC recognized that air quality spans administrative jurisdictions and requires multijurisdictional coordination and cross-sectoral integration—in this case, by coordinating land use and transportation (Molina and Molina 2002).

The second iteration of the metropolitan-scale air quality program, ProAire II, was implemented from 1995 to 2000. In 1996, to strengthen the integrated
planning approach among the federal, state, and local governments, the MCPPC was redesigned into a new institution with increased responsibilities on environmental issues (Molina and Molina 2002). The agreement, which created the Metropolitan Environmental Commission (CAM), established a permanent entity with the authority to coordinate at the metropolitan level and to analyze and propose new environmental solutions for Mexico City, the state of Mexico, and the federal government (Congreso de la Union 1996).

CAM’S INSTITUTIONAL FRAMEWORK

CAM, founded by the federal government, was structured as a special commission at the metropolitan level, initially as an air authority, and later as an environmental authority (Congreso de la Union 1996). CAM’s immediate focus was to reduce air pollutants through policies and programs for the Valley of Mexico. Some of the programs and measures included Hoy No Circula, installation and operation of air monitoring networks, and new requirements to improve the fuel quality in the ZMVM.

At its inception, CAM was recognized by all national secretaries—treasury, environment, social development, energy, agriculture, transport and communications, administrative development, education and health—as well as the state of Mexico and Mexico City district governments. Other parties involved in the institutional structure were the state oil company Petroleos Mexicanos (PEMEX) and the public Energy Commission.

The regulatory and institutional structure was established quickly in the early 1990s by updating the legal and institutional framework to respond to the air quality crisis and to meet commitments for tighter environmental controls in the North American Free Trade Agreement (NAFTA), which was under negotiation. CAM’s members included SEMARNAT, the Secretariat of Health, the chief of government of Mexico City, and the governor of the state of Mexico. It also incorporated a consultative committee, including technical specialists and representatives from academia, private sector, and civil society.7 CAM was designed to be an independent entity led by Mexico City and by the state of Mexico, which alternated leadership every two years.

CAM faced institutional challenges. Its initial territorial scope in 2002 was limited, covering only some of the districts and municipalities of Mexico City and the state of Mexico (Molina et al. 2002; Rivas Tovar 2008) and lacking full coverage of the entire ZMVM.

In 2013, CAM expanded to cover the Mexico City Megopolitan Area, and became known as the Megalopolitan Environmental Commission (Comision Ambiental de la Megalopolis; CAMe), with a broader territorial and thematic

mandate, including other environmental topics. With this structure, CAMe incorporated additional states: Hidalgo, Morelos, Puebla, Tlaxcala, and Queretaro, as well as maintaining Mexico City and the state of Mexico, to address air quality at the airshed level (SEMARNAT 2018), and providing a structure for vertical coordination. It attempted to incorporate all administrative jurisdictions that contribute to the pollution of the ZMVM to maintain political balance and share responsibility.8

As a special commission, CAMe’s decision-making capacity and functioning are limited. For instance, CAMe does not have legislative power to set air pollution policies. Even so, CAMe has created space for open dialogue about the design and application of policies and strategic decisions, such as the metropolitan contingency plan and vehicle inspection procedures. This can be attributed to CAMe’s highly respected reputation as a technical entity that has managed to stay independent despite political changes.

**CAM/ CAMe Policies and Projects**

From 2002 to 2010, ProAire III, the third iteration of ProAire, was enacted by the governments of Mexico City and the state of Mexico. This phase of the program was characterized by the active participation of the scientific community, both national and international, led by Mario Molina, a Nobel Laureate in Chemistry, and Luisa Molina. A 2004–2005 collaboration with Massachusetts Institute of Technology (MIT) and the Molina Center for Strategic Studies on Energy and the Environment, an independent research center in Mexico City, provided advice for CAM’s institutional changes and the incorporation of the Metropolitan Fund. Under CAM’s new evidence-based approach, many new programs were enacted, making air quality management a truly comprehensive multisectoral approach. For example, new elements of ProAire III included: a gas capture system in gasoline stations; metrobus corridors in 2005; the EcoBici bike-sharing program in 2010; and the expansion of the Hoy No Circula program, which added further restrictions on automobile emissions.

ProAire IV, the fourth iteration of ProAire implemented in 2011, led by Mexico City and CAM, used evidence from field campaigns and continuous air quality monitoring and impact evaluation results.

Moreover, through ProAire, CAMe has incorporated community engagement practices that involve citizens with air quality monitoring and provide air quality alerts. Citizens monitor air quality daily and post results on CAMe’s website. On the ProAire website, a section details the status of ProAire initiatives and how they have reduced emissions. These initiatives include modernizing equipment at the vehicle verification centers in Mexico City; strengthening a

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8 CONVENIO de Coordinacion por el que se crea la Comision Ambiental de la Megalopolis, que celebran la Secretaria de Medio Ambiente y Recursos Naturales, el Gobierno del Distrito Federal y los estados de Hidalgo, Mexico, Morelos, Puebla y Tlaxcala.
program to replace old catalytic converters with new ones with lower emissions; and updating the Hoy No Circula program.

ProAire IV uses a systems-based model, acknowledging that environmental problems are complex and need to be approached holistically. For example, it explicitly considers climate change. It contains 116 actions across eight strategies: energy consumption, public transport, regulation of fuel consumption, clean technology, environmental education, green spaces/reforestation, citizen participation, scientific research, fuel quality standards; no-driving day programs; bus fleet renewal; subway and EcoBici expansion; and air monitoring technology updates (AQLI 2019).

CAMe is in charge of actions to prevent and manage environmental contingencies including harmonizing and integrating regulations about environmental protection, defining mechanisms to finance policies, and proposing new instruments and evaluating results. In addition to the ProAire programs, some of the most successful environmental policies and programs led by CAMe include:

- The Atmospheric Monitoring System to measure and provide information on the ZMVM’s main air pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and particulate matter (PM) 2.5 and PM 10.

\[ \text{Figure 4} \]
Chronological history of air quality events
Source: Natalia García based on SEDEMA and CAM 2002.
• The Environmental Atmospheric Contingency Plan, which issues environmental alerts based on environmental monitoring and scientific analysis (SEMARNAT 2019). When air pollutant concentrations are too high, authorities are mandated to implement immediate actions to reduce emissions. Measures can include closing certain factories or reducing vehicle circulation in critical areas (Robles et al. 2018). Businesses that use solvents, coal, or wood fires; gas stations; and liquefied petroleum gas suppliers are typically affected by the contingency measures. They are required to partially suspend activities unless they have mitigation measures or equipment to control emissions (SEMARNAT et al. 2019a). At the same time, the government provides incentives for businesses to install technologies to reduce emissions so they can receive special permits to operate under contingency conditions.

• The vehicle inspection program, initially in Mexico City, was expanded to the ZMVM states. Each registered vehicle must meet Mexico City’s emissions standards. The government authorized private businesses to inspect vehicles and receives part of the revenue from fees collected. Depending on their emissions performance, vehicles are allowed to be on the streets a certain number of days during the week.

• Self-regulation diesel vehicles program: This voluntary program allows businesses to implement replacement, maintenance, and new technologies to reduce emissions below Hoy No Circula levels. Vehicles that are part of this program are exempted from circulation restrictions based on environmental contingencies.

• Revenue resources for metropolitan area air quality policies are a complex structure of funds, combining federal, state, and municipal contributions, required from CAM members, and supplemental resources from multilateral banks and international cooperation. In Mexico, most local revenue consists of federal transfers. CAM/CAMe was initially funded by the federal government, but funding evolved into a Metropolitan Fund with partial federal funding, which has been reduced over time.
ENVIRONMENTAL TRUST FUND FOR THE ZMVM

At its inception, CAM established the Environmental Trust Fund for the Valley of Mexico to improve air quality in the area. This fund has provided financial stability and continuity to the efforts (Congreso de la Union 1996). The trust was created with $230,000 from the Secretary of the Treasury (Rivas Tovar 2008). It also briefly received funding from a gasoline tax, under the polluter pays principle. Throughout its 20 years of existence, CAM and its trust have implemented more than 71 projects, with almost $41.4 million (Rodriguez 2015).9

CAM/CAMe Trust Fund sources have evolved over time:

• In 1992, the first trust was established with federal resources to promote actions to improve the ZMVM’s air quality.
• In 1993, a taxing scheme was established to help fund CAM with one cent (minus VAT) per liter of gasoline sold in the ZMVM.
• In 1996, the gas tax increased at different rates for different mixes of gasoline: 3 cents per liter of Nova gas and 1 cent per liter of Magna gas.
• In 1998 the Secretary of the Treasury suspended the gas tax as a source of funding for the Trust Fund.

In 2014, a special $10 million ($200 million peso) trust was established to incorporate catalytic convertors into at least 160,000 vehicles over 15 years old (SEDEMA 2014).

LOAN AND GRANTS

A World Bank loan supported the acquisition of four atmospheric monitoring systems for the ZMVM. With the investment in technology to monitor air quality, it was possible for CAM to capture the magnitude of the air quality problem and create evidence-based programs that responded to trends in pollution. In addition to investments from the World Bank, Japanese International Cooperation Agency, and German Technical Cooperation Agency,
CAM also received grants from the U.S. government for capacity-building workshops for local air quality experts through the Environmental Protection Agency (EPA). The trainings occurred simultaneously with the negotiation of the North American Free Trade Agreement (NAFTA) treaty, which included a series of arrangements to strengthen Mexico’s environmental regulatory framework. The process was also supported by the U.S. state of California, through the South Coast Air Quality Board, which provided training for CAM’s staff.

LOCAL RESOURCES

Additionally, specific components were funded directly by local governments. For example, the monitoring equipment and implementation of monitoring networks in Mexico City and the state of Mexico were funded by each jurisdiction.

METROPOLITAN RESOURCES

The Metropolitan Fund for the ZMVM, created in 2006, established a formal financial mechanism to support sustainable metropolitan infrastructure efforts (Mejia 2015). Its initial budget of $52.3 million was increased the following year to $156.8 million (Mejia 2015). Until 2012, the Metropolitan Fund assigned resources to all metropolitan regions in Mexico, with almost half of its budget going to the ZMVM to finance projects with an air quality component.

With the creation of CAMe in 2013, parts of vehicle emissions inspection fees were earmarked for the Metropolitan Fund. Each state entity in CAMe would transfer about $0.25, for each vehicle inspection completed in their jurisdiction. As of 2018, the Subsecretary of Environmental Protection at SEMARNAT had received $2.3 million from vehicle inspection fees.

GLOBAL ENVIRONMENTAL BENEFITS AND SCALING UP

The environmental benefits of the programs and initiatives addressed in this chapter, are mainly in improving air quality and reducing greenhouse gases. In the past 25 years, as a result of integrated air quality initiatives in Mexico City, air pollutant emissions have decreased significantly. Lead pollution has decreased by 97 percent, sulfur dioxide by 89 percent, carbon dioxide by 79 percent, and PM10 by 66 percent (McDonald et al. 2016). These reductions are largely attributable to the CAM/CAMe programs, along with relevant state and federal actors.

From 1990 to 2016 in the ZMVM, concentrations of ozone, a greenhouse gas, decreased overall, despite temporal fluctuations (Figure 5). The contingency
plan, mentioned previously, is triggered when pollutants cross a threshold. Phase 1 of the contingency plan, for ozone, is triggered when the city’s ozone concentration reaches 155 parts per billion (ppb; the red dotted line in Figure 5). Phase 2 is triggered when ozone concentrations reach 205 ppb (purple dotted line). Figure 5 demonstrates how frequently the maximum ozone concentration would have triggered the ZMVM’s air quality contingency plan from 1990 to 2004. Since 2004, ozone concentrations in Mexico City have rarely surpassed 205 ppb, signifying an overall improvement in air quality.

Efforts to increase access to and efficiency of public transportation, under the auspices of air quality improvement policies aimed to improve public health, have also reduced greenhouse gas emissions. For example, Mexico City’s Metrobus, a 93-kilometer Bus Rapid Transit system, has reduced carbon dioxide emissions by 72,575 metric tons per year (Carrigan et al. 2013). Bel and Holst’s (2018) analysis of Mexico City’s Metrobus’s impact on air pollution, found that concentrations of indirect greenhouse gases, such as nitrogen oxides and carbon monoxide, were reduced by 5–7 percent. From 2008 to 2012, Mexico City reduced carbon emissions by approximately 7 million metric tons, with ProAire’s programs and policies largely contributing to this reduction (C40 n.d.).

**Figure 5** Ozone concentrations in Mexico City, 1990–2017

Source: World Resources Institute, with data from SEDEMA.
Conclusion

RESPONSE TO A CRISIS TRIGGERED multijurisdictional action in Mexico City. The integrated approach for air quality management in the ZMVM commenced in response to a pollution crisis. In 1992, two years after the 1990 Earth Summit in Rio de Janeiro kicked off the 1990s as a decade of global environmental concern, the United Nations declared the ZMVM the most polluted area in the world (INFOBAE 2019). Political leaders at the time could not ignore the situation. Coordinated actions from the federal and local governments were vital for immediate, multi-sectoral action at the metropolitan level. The crisis functioned as a trigger for a comprehensive, integrated planning approach that generated interjurisdictional and vertical coordination among different levels of government.

When CAM expanded to become CAMe, its jurisdiction expanded, along with its mandate to go beyond air quality. CAMe is a well-articulated coordination mechanism that involves federal and local governmental entities, a public consultation body, and governance norms. It constitutes the only metropolitan effort in the ZMVM that has been financed and expanded over time. CAMe receives funds from different sources, including federal and local contributions, as well as some resources from the Metropolitan Fund that covers metropolitan projects around the country.

The main factors that contributed to CAMe’s success include: first, dedicated and continuous funding mechanism, a tangible and universal crisis that required a big response from the government, and its technical expertise, legitimacy and high capacity.

THE FUTURE OF INTEGRATED PLANNING IN MEXICO CITY

The Metropolitan Fund has incentivized ad hoc metropolitan coordination. Metropolitan response to the air quality crisis, while sustained, has been targeted around air quality. Systemic, long-term metropolitan planning is nascent in Mexico City. Kim and Zangerling (2016) state that “Currently, there is no legal provision for a metropolitan government structure. Metropolitan areas are managed by municipal governments that make up the metropolitan areas, and there is no clear regional framework for sharing responsibilities and resources.” A metropolitan governance body is one way to facilitate swift action in a large metropolitan area to respond to increasing environmental pressures (Aguilar and Lopez 2018). Although the constitutional reform of 2017 did not establish a metropolitan agency inclusive of the state of Mexico and the state of Hidalgo, the reform included institutional changes so that Mexico City can work toward metropolitan coordination.
The 2017 constitution mandates creation of an integrated planning system under a newly formed planning institute, the Prospective and Democratic Planning Institute (Instituto de Planeacion Democratica y de Prospectiva; IPDP) to help Mexico City provide greater equity, connectivity, environmental sensitivity, and resilience as its population continues to grow. The new integrated urban planning system will encourage vertical coordination between levels of government, horizontal coordination among government agencies, and meaningful participation of NGOs, civil associations, and citizens (Aguilar and Lopez 2018).

Other environmental initiatives have been inspired by CAM’s work in the ZMVM. The National Strategy for Air Quality, for instance, is a planning instrument that coordinates actions at different government levels with a 2017–30, vision to control, mitigate, and prevent emissions and pollutant concentrations in urban and rural areas (SEMARNAT and INECC 2016). As part of this strategy, the ProAire programs manage and improve air quality around the metropolitan areas.

A positive example is a “technical norm” from SEMARNAT, which established maximum emission levels for vehicles circulating in the megalopolis, creating national criteria for all states that have mandated vehicular inspections. This regulation was adopted by SEMARNAT and developed with technical evidence collected by CAMe. It was initially designed for the ZMVM but has been adopted nationally.

REPLICABILITY OF REGIONAL COLLABORATION ON AIR QUALITY

The ProAire policy package has been replicated in other Mexican cities. Most air quality actions taken since CAM’s inception are potentially replicable in other cities in Mexico and beyond. The ProAire programs and contingency plans include actions that cover most of the fixed and mobile sources of emissions, which are similar in industrializing cities around the world. In all cities, air is a resource without administrative boundaries. Moreover, all levels of government should have a common interest in treating air as a shared resource because efforts to manage air quality are futile if they do not encompass the entire airshed.

Mexico City’s ProAire program, which can be considered a pilot, has been extended to different metropolitan areas and cities in Mexico with air quality challenges. As of 2019, at least 37 ProAire programs had been implemented across Mexico, with positive impacts for 96 percent of the Mexican population (SEMARNAT 2019b). The federal government works closely with state and municipal governments to incorporate best practices, to ensure that the minimum requirements of the local ProAire programs are implemented, and to update ProAire programs with relevant scientific data. Evaluation mechanisms have been applied in metropolitan areas where ProAire has been implemented (Figure 6).

10 NOM-167 SEMARNAT.
**Figure 6** Replicability framework for air quality and ProAire interventions in Mexico

Replicability Model for Air Quality Management

- **Health**
- **Transport**
- **Land Use**
- **Environment**

**Level of Government**
- Federal Government
- State Government
- City Level Government

**Sector Involved**
- Technical Input and Evidence
- Regulatory Capacity
- Metropolitan Commission
- Funding: Federal and Local

**Third Parties involved**
- Evaluation
- ProAire
- Metropolitan Instruments

**Inputs**
- Note: Blue areas on map indicate where ProAire has been implemented.

Source: Natalia Garcia, map based on SEMARNAT 2019b.
Replicability of the Mexican air quality management model depends on four factors: first, an effective institutional design that allows for and requires formal coordination; second, a financial structure that provides resources for implementation; third, deep involvement from different sectors: academia, civil society, and others to provide support for implementation of the policies and; fourth, effective air quality monitoring systems to support evidence-based policies.

Addressing air quality in a metropolitan area requires a strategy integrating health, transport, land use, and environmental policies (Figure 4). It must involve collaboration among the federal, state, and city governments at the metropolitan level. It benefits enormously from the involvement of academics, nongovernmental organizations, and private industry, and importantly, requires technical, regulatory, and funding capacity.

With sufficient funding and political backing, CAM/CAMe played a central role in integrating policies involving different sectors and stakeholders. This was not the case for other commissions that were established during the early 1990s. But it has since inspired other coordinated efforts across Mexico to improve air quality and reduce greenhouse gas emissions.
Density

Mexico City’s metropolitan population density has increased 45 percent between 2000 and 2017 while the average density of the core city may have marginally declined.

Figure 7
POPULATION DENSITY, 2000

Municipal
- Maximum: 45,320 people/km²
- Minimum: 1 person/km²
- Average: 5,231 people/km²

Metro
- Maximum: 73,503 people/km²
- Minimum: 1 person/km²
- Average: 1,273 people/km²
Figure 8

POPULATION DENSITY, 2017

Municipal
Maximum: 38,882 people/km²
Minimum: 1 person/km²
Average: 5,040 people/km²

Metro
Maximum: 44,870 people/km²
Minimum: 1 person/km²
Average: 1,856 people/km²

Figure 9
Overlay of density levels, 2000–2017
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ABBREVIATIONS

CAM Metropolitan Environmental Commission (Comision Ambiental de la Metropolitana)
CAMe Megalopolitan Environmental Commission (Comision Ambiental de la Megalopolis)
CDMX Mexico City (Ciudad de Mexico)
DF Federal District (Distrito Federal)
Edomex Mexico State (Estado de Mexico)
Hidalgo Hidalgo State (Estado de Hidalgo)
INEGI National Institute of Statistics and Geography
SEDEMA Ministry of Environment (Secretaria del Medio Ambiente)
SEMARNA Metropolitan Secretariat of Environment and Natural Resources (Secretaria de Medio Ambiente y Recursos Naturales)
ZMVM Mexico City Metropolitan Area (Zona Metropolitana de Valle de Mexico)
Semarang, Indonesia
Clustering and Connecting Locally Championed Metropolitan Solutions

Wiwandari Handayani, Rukuh Setiadi, Bintang Septiarani, and Lincoln Lewis
CASE STUDY 8: METROPOLITAN SEMARANG

Clustering and Connecting Locally Championed Metropolitan Solutions

Wiwandari Handayani, Rukuh Setiadi, Bintang Septiarani, and Lincoln Lewis


The Synthesis Report offers a range of integrated solutions (Mehrotra 2020).
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Map 1 Semarang metropolitan area—Kedungsepur
Map 2 Population density, 2017
Map 3 Urban expansion and sea level rise, 1985–2015
Map 4 City services, 2019
Map 5 Urban morphology, 2019

BOXES

Box 1 Semarang in Indonesia’s urban development context
Box 2 Semarang City’s financial structure versus neighbors
THE SOLUTION

Clustering and connecting locally championed metropolitan solutions

Semarang metropolitan area’s iterative development process

1700–1950s
COLONIAL CENTRALIZATION—colonial planners (bottom-up, with top-down approvals). Dutch administration’s hub in Semarang controlled central Java; early projects included local government proposed solutions, including social integration and community health improvements.

1950s–1999
CENTRALIZATION—national planners (top-down, gradually enabling bottom-up). Central government-led master planning and the initiation of the Kampong Improvement Program—a national slum upgrading program leveraging community engagement to facilitate neighborhood infrastructure improvements.

1999–2010
DECENTRALIZATION—national programs with local collaboration (nurturing bottom-up). Increasing community empowerment, including second phase of slum upgrading, initiation of bus rapid transit, and the commencement of the West Flood Canal project—enabling the eventual clustering and connecting of follow-on projects along the canal infrastructure.

2010–present
NEW AUTONOMY—intensifying decentralization, moving more from sectoral to integrated planning (bottom-up). Local government shares project development roles with national government agencies, and Semarang City participates in international platforms and takes initiative to coordinate metropolitan; more integrative spatial planning, third iteration of slum upgrading, East Flood Canal project, thematic responses to climate change promoted, and leveraging of public-private partnerships (PPP).

Figure 1 Integrated planning model
Source: Mehrotra 2020, with input from Lincoln Lewis.

KEY FINDINGS

1. Semarang City is taking an active role in international city networks and bolstering appreciation for the interconnectedness of challenges like climate change and traffic congestion, while promoting social inclusion through the mayor’s initiative “Moving Together”. This momentum is incrementally encouraging greater cross-sectoral integration.

2. A water resource and flood management project was proposed by Semarang City at its West Flood Canal after devastating floods in the 1990s. The project’s long-term sustainability was increased due to involvement of the local community and the later identification of clear maintenance responsibilities between government agencies.

3. Clustering and connecting projects along the West Flood Canal has generated higher environmental benefits than any single project could. The success is demonstrated by key elements of the work being replicated at the city’s East Flood Canal.
Cities can opportunistically cluster urban regeneration and greenfield projects in phases along major linear infrastructure projects that connect commercial opportunities with environmentally beneficial and socially inclusive development.

Semarang metropolitan area comprises the primate Semarang City and five surrounding other local governments. The case study provides an example of how linear infrastructure development—flood canals—can catalyze follow-on development. Semarang’s urban policymakers seized the West Flood Canal project to cluster multi-sectoral and cross-jurisdictional solutions around the infrastructure. Over time the project has connected revenue-generating activities, such as tourism and real estate development, with river normalization, dam construction, and urban drainage improvement components along with social inclusion initiatives. Innovative financing methods have propelled the follow-on projects, such as a public-private partnership for the area’s water supply network. Elements of this innovation have been replicated in Semarang along the East Flood Canal.

Such approaches offer urban policymakers opportunities to mobilize financing as well as engage a broader community of national and local government, private-sector, and community actors. Over the longer arc of time, Semarang’s experience indicates that gradual decentralization has expanded the opportunities for bottom-up metropolitan-led integrated solutions, opening space for private and community action.
The Metropolitan Context

BACKGROUND

SEMARANG LIES ALONG THE NORTH COAST of Indonesia’s Java Island in a unique low-lying area that gradually rises toward the surrounding hills. The area’s location at the mouth of a large, fertile river catchment provided geographic advantages to the initial settlement. The locational benefits later brought Semarang to prominence as an important Dutch colonial city, strategically sitting halfway between DKI Jakarta1 and Surabaya, that enabled control over much of inner Java’s agricultural production and commerce.

In the present day, Semarang City retains its importance and is the capital and most populated city of Indonesia’s Central Java Province. The primate city and surrounding administrative areas make up an area of approximately 4,300 square kilometers. This area is colloquially known by the portmanteau Kedungsepur, referring to the metropolitan conglomeration with Semarang City at its core, surrounded by the administrative areas of Kendal Regency, Demak Regency, Ungaran (Semarang Regency), Salatiga City, and Puwodadi (some subdistricts of Grobogan Regency). This area is shown in Map 1.

The fact that Semarang City is closely connected physically and socioeconomically to the surrounding administrative areas has positioned the greater area as one of the most important metropolitan regions of Indonesia. Due to this national importance and the challenges the urban area is experiencing, Presidential Decree 78 of 2017 made the Semarang metropolitan area a National Strategic Area in the Indonesian government’s National Spatial Plan (2008–2028) and defined the area of Kedungsepur.

1 Jakarta Metropolitan Area, Daerah Khusus Ibukota Jakarta.
In 2018, Semarang City had a population of 1.7 million people with an annual growth rate of approximately 3 percent and a population density of 4,650 people/km². The total population of Semarang metropolitan area was 5.7 million people with a population density of approximately 1,350 people/km². Approximately 27 percent of the population lives in Semarang City (CBS of Semarang City 2018). Based on Indonesia’s Law No. 26 of 2007, which classifies a “metropolitan area” as having a population greater than 1 million, Semarang City itself could be defined as a metropolitan area.

Looking at Indonesia as a whole, 56 percent of the population – or 151 million individuals – lived in urban areas in 2018 (UNDESA 2018) and by 2045 it’s anticipated that 70 percent will be urban (Roberts, Gil Sander, and Tiwari 2019). Semarang is the fifth largest metropolitan area on Java Island, and the sixth most populous in Indonesia, following DKI Jakarta, Bandung, Medan, Surabaya, and Surakarta. Within this urban development context, Semarang has taken a key role by participating in several initiatives, which are elaborated in Box 1.
To estimate population density, LandScan uses remote sensing imagery to disaggregate census counts within an administrative boundary. As a result, built-up areas such as airports and industry may appear to have a residential population where there isn’t one.
BOX 1. SEMARANG IN INDONESIA’S URBAN DEVELOPMENT CONTEXT

Semarang is at the leading edge of advancing Indonesia’s urban development in terms of urban planning processes, analytics, and financing initiatives. Many Indonesian local governments are unfamiliar with systematic data collection and sharing, and have limited infrastructure to process, manage, and host data. To assist these cities in strengthening their data capacity to leverage urbanization’s benefits, the City Planning Labs (CPL) program was established by the World Bank and funded by the Indonesia Sustainable Urbanization Trust Fund (World Bank 2016). The initiative provides technical assistance, shares international development best practices, and develops a spatial information strategy for cities that sets up processes and procedures encouraging government stakeholders to collect, share, and analyze data. It also seeks to build the capacity of staff to manage the technologies. The original CPL locations were in Semarang and Denpasar (Bali) (Singh, Raghupathy, and Volosin 2017).

In Semarang, the program recently developed a suitability tool to identify optimal affordable housing locations by carrying out more than 600 observations of commercial land values (Singh et al. 2019). Semarang’s CPL team has also used data analytics to inform the city’s medium-term plan. The analysis considered factors such as the city’s water supply network, health centers, schools, green spaces, and poverty rates, as well as the implications of land area reduction due to subsidence. The results have allowed planners to see more clearly how the city’s infrastructure gaps relate to issues such as poverty and the physical challenges of coastal land subsidence (World Bank 2016). Although the analysis was done for Semarang, the method used offers wider benefits when it is shared with other cities and informs their integrated planning processes. The scale-up of the CPL program will enable Indonesian cities to address the challenges that urbanization presents and to take advantage of the opportunities it offers.

CPL is a component of another initiative in which Semarang plays a key role. Indonesia’s National Urban Development Project (NUDP) is envisioned by the Indonesian government as a collaboration platform for coordinating urban planning and infrastructure development across various national sectoral programs. Semarang City is slated to be one of the beneficiaries of the project, which will support the development of capacity for making informed, sectorally integrated, and prioritized capital investment decisions. The project is supported by the World Bank and will enhance Indonesian cities’ ability to access alternative sources of financing in the long term (World Bank 2019).
Over time the Semarang metropolitan region’s geography has influenced the direction of its urban development growth. Development has foremost been concentrated southward along the corridor that connects Semarang City’s port to the region’s hinterland of inner Java, colloquially named Joglosemar, a port-manteau of Jogja, Solo, and Semarang (the first two jurisdictions referring to the formal names of the important cities Yogyakarta and Surakarta respectively). This development pattern along the main transportation corridor southward to these important cities is seen in Map 3.

Large residential developments and industries are located in the metropolitan’s south along with higher education facilities. The establishment of a north–south toll road has facilitated this southward urban growth. The latest urban expansion towards the south-west, which converts a significant amount of productive agricultural land and forested area, occurred in the last two decades due to the development of Bukit Semarang Baru (BSB) City and many other smaller residential developments.

The metropolitan’s peripheral west and east have also grown rapidly with industries and warehouses, mainly due to their proximity to Java’s east–west North Coast Road. Urban residential expansion towards the south-east of the city is also significant due to the relatively flat topography of the area.

From the north, increasing environmental impacts along the Java coast have also influenced the Semarang metropolitan area’s growth pattern. Challenges such as land subsidence, tidal flooding, and environmental degradation have had increasing effects. These effects have foregrounded concerns about Semarang’s climate resilience and raised awareness that more needs to be done. A toll road is currently being constructed along the coast to combat sea level rise, while also offering the benefit of traffic congestion management. Map 3 shows the affects of sea level rise on the Semarang metropolitan area’s urban footprint.

During this metropolitan growth, Semarang City has raised its attention to informal housing, since environmental impacts can disproportionately affect those who are in greatest need. Mayoral Decree No. 050/801 in 2014 classified almost 416 hectares of Semarang City as slum areas. This meant that approximately 110,000 people, or 6.4 percent of the total population of Semarang, were living in a slum. As for other economic and development indicators, the current unemployment rate in Semarang is approximately 6.6 percent and the literacy rate (for ages 15 years and above) is high at 97.9 percent (CBS of Semarang City 2018). In 2016 GDP per capita was $6,360² (CBS of Semarang City 2017) as cited by the mayor in his decree No. 11, 2017 regarding medium-term development plans.

² Here and throughout this chapter, all dollar amounts refer to US dollars.
URBAN INNOVATIONS

Semarang’s integrated metropolitan planning methods over time present several urban innovations that others can learn from. These innovations show how the local level functions within the national and provincial policy frameworks, how strategic sectoral issues can be approached, and how traditional sectorial innovations have become wider, more integrated, and implemented in phased approaches to achieve greater gains.

The examples primarily focus on the areas of multi-sectoral coordination, disaster risk management, slum upgrading and affordable housing, public transportation, and water resource and flood management. These innovations are – importantly – proposed and developed by different government entities with different sources of funding. Some of the approaches that are explained later were developed as national programs by the Indonesian national government and have been implemented in different forms in other cities. A summary of the innovations is shown in Table 1.

<table>
<thead>
<tr>
<th>SOLUTIONS</th>
<th>MECHANISM</th>
<th>DESCRIPTION</th>
<th>CASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-sectoral coordination</td>
<td>Kedungsepur Memorandum of Understanding (MOU)</td>
<td>Agreement that promotes horizontal collaboration among six heads of local government (Semarang City's mayor and five regents of the surrounding areas)</td>
<td>Kedungsepur (2010s–present)</td>
</tr>
<tr>
<td>Disaster risk management</td>
<td>Disaster Mitigation Collaboration Agreement</td>
<td>Operationalizing the Kedungsepur MOU; provides disaster mitigation collaboration by the head of the disaster management boards of the six jurisdictions</td>
<td>Kedungsepur (2010s–present)</td>
</tr>
<tr>
<td>Slum upgrading</td>
<td>New Neighborhood Development Program</td>
<td>Equipping developments with proper road access, sanitation facilities, and sewer service while linking them with surrounding kampongs or villages</td>
<td>Indonesia (Semarang 1910s–1920s)</td>
</tr>
<tr>
<td></td>
<td>Kampong Improvement Program (KIP)</td>
<td>Allocation of government budget through community participation to equip households with a water connection, sanitation, sewer, flooring, path/road</td>
<td>Indonesia (Semarang 1970–1990s)</td>
</tr>
<tr>
<td></td>
<td>Connecting KIP to regional infrastructure projects</td>
<td>Synergize the implementation of kampong improvement initiatives with a larger government investment plan in regional infrastructure</td>
<td>Indonesia (Semarang 1990s–2000)</td>
</tr>
<tr>
<td></td>
<td>Connecting KIP and revolving funds</td>
<td>Investing government budget in productive activities at the community level to improve community income and sustain participatory-based maintenance of kampong facilities</td>
<td>Indonesia (Semarang 2000–2015)</td>
</tr>
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</table>
TABLE 1. URBAN INNOVATIONS

<table>
<thead>
<tr>
<th>SOLUTIONS</th>
<th>MECHANISM</th>
<th>DESCRIPTION</th>
<th>CASE</th>
</tr>
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<tbody>
<tr>
<td>Affordable Housing</td>
<td>Establish public housing corporations</td>
<td>To assist the central government in building a large number of low-cost housing units for low income groups with a long-term planning scheme</td>
<td>Indonesia (Semarang 1980s)</td>
</tr>
<tr>
<td></td>
<td>Golden rule “1-4-6” for private real estate developers</td>
<td>For every single premium house development, one building permit would be released if the developer agreed to build at least four medium-cost and six low-cost houses</td>
<td>Indonesia (Semarang 1990s)</td>
</tr>
<tr>
<td></td>
<td>Public rental flats</td>
<td>Share of budget and responsibilities to develop vertical housing for rent with an affordable price, while establishing institution to collect rent and perform maintenance</td>
<td>Indonesia (Semarang 2000s–present)</td>
</tr>
<tr>
<td></td>
<td>State financial instrument for housing development</td>
<td>A state financial instrument Perseroan Terbatas Sarana Multigriya Finansial (PT. SMF) serves as a secondary financial market to fund private developers, with lower interest rates than primary financial institutions (conventional banks)</td>
<td>Indonesia, (2000s–present)</td>
</tr>
<tr>
<td>Transportation Infrastructure</td>
<td>Connect public transport corridor to public rental flats</td>
<td>Support public rental flats as a viable option for low-income groups</td>
<td>Indonesia (Semarang 2000s–present)</td>
</tr>
<tr>
<td></td>
<td>Agreement for public transportation stops in periphery jurisdictions</td>
<td>Operationalizing the Kedungsepur MOU; provides commuters with affordable public transportation options, while reducing traffic congestion</td>
<td>Kedungsepur (2010s–present)</td>
</tr>
<tr>
<td></td>
<td>Tanggul Laut toll road</td>
<td>Create a toll road embankment to increase connectivity and counteract sea level rise and urban flooding</td>
<td>Semarang (2010s–present)</td>
</tr>
<tr>
<td>Water resource and flood management</td>
<td>Semarang West Flood Canal development, comprising Garang River normalization, Jatibarang Dam construction, and improvement of the urban drainage system</td>
<td>Implemented cross-sectoral integration including infrastructural works and community empowerment, along with cross-jurisdiction between national and local administrations. Started in the 1990s due to two large floods and completed in 2014; follow-on activities continue (tourism improvement, real estate development, and waste management); project has been replicated at Semarang’s East Flood Canal.</td>
<td>Indonesia (Semarang 1990s–2010s)</td>
</tr>
<tr>
<td></td>
<td>Mandatory construction by real estate developers of a water retention pond for developments greater than 5 hectares</td>
<td>To improve urban flood resilience and reduce the burden on local storm water management infrastructure</td>
<td>Indonesia (Semarang 2010s–present)</td>
</tr>
</tbody>
</table>
Integration

HOW INTEGRATED PLANNING IS DEFINED AND ADOPTED

SCARSE AND SHEATE (2002) outline various meanings of integration, from the integration of actors to authorities; from the integration of data to process; and many other types of integration, such as mainstreaming. Despite the urgency to consider all of these kinds of integration, spatial and sectoral integration serve as two fundamental types of integration that are equally important and most relevant to this case study.

Actors in Semarang City define the integration of metropolitan planning as a chaotic but harmonious process involving different arrays of government actors in various sectors. This definition reflects sectoral integration, particularly in regard to process, in which the city actors perceive integration as harmonization of individual agency-based initiatives and actions. It also includes harmonization of initiatives and actions across levels of government.

The way actors in Semarang define integration is closer to the notion of bounded-incremental rationality (Simon 1972; Lindblom 1979), than that of linear rationality (Banfield 1959). However, spatial and sectoral integrations in the city have been overshadowed by the dynamic effects of Indonesia’s decentralization, which has made both spatial and sectoral integrations more difficult. The distribution of authority has dominated the decentralization narrative in the country over the last two decades. Therefore, the harmonization process to accomplish a shared objective or an integrated vision in Semarang metropolitan area is also affected by jurisdiction and authority constraints.

Another definition of integration involves a clear goal and an iterative strategy, allowing the process to result in optimal outcomes and sustainable solutions that work for both the city and greater metropolitan area. From this perspective the idea of spatial integration has emerged. The territorial boundary of a planning program or project often expands when following this iterative goal by utilizing visioning exercises and implementation strategies.

Integration in Semarang metropolitan area is a gradual process rather than a sudden change. For example, integrative solutions for dealing with housing and slums have been evolving since the early 1920s (Box 2). The same applies to water and flood management, which began in the 1990s through the Jatibarang Dam development program and continues through the clustering of follow-on projects. As time goes by, urban flood management also integrates other urban development goals, such as in the provision of clean water, which boosts urban tourism and at the same time influences placemaking.
Cross-sectoral integration over the last decade can also be seen in initiatives countering the effects of sea level rise, urban flooding, and traffic congestion management. The integrated adaptation solution was developed as a sea wall project that also serves as a toll road connecting Semarang and Demak. Through this example of clustering solutions, Semarang metropolitan area shows that a coordinated context-specific instigation can be developed as a solution to multiple challenges.

**PROCESSES, ACTORS, AND IMPLEMENTATION MECHANISMS**

Implementation of integrated urban planning in metropolitan Semarang has been challenging; not only because it involves different stakeholders and government at various levels, but also because it includes various sectors with substantial underlying issues. Lessons can be learned from analyzing different development stakeholders’ roles and responsibilities, the initiation process of projects, and the history and different generations of urban development solutions.

The metropolitan that comprises Semarang as the primate city and its surrounding administrative areas is under the authority of local governments who must also coordinate with the provincial and national governments. In addition to the multiple levels of government stakeholders, there are also private sector stakeholders, nongovernmental organizations (NGOs), and local institutions that have been making important contributions and play a significant role in Semarang’s development processes.

Most importantly, there is currently not a particular body within the government structure responsible for the implementation of Semarang’s metropolitan development. All development implementation in the metropolitan area is executed by each jurisdiction’s relevant agencies, based on their role and authority. Agency authority is dictated by the regulations of Indonesia’s Organizational Structure and Work Procedure (SOTK). Indonesia’s governance is divided into four levels: national, provincial, local (district), and community (subdistrict).

The institutions responsible for coordinating integrated development are the development planning agencies at three different levels. There is the Ministry of National Development Planning of the Republic of Indonesia (BAPPENAS) at the national level, the Regional Development Planning Agency (BAPPEDA) of Central Java Province at the provincial level, and the BAPPEDA at the district level. When it comes to cooperation between two or more local governments
in a particular sector, the administrative arrangement of the cooperation is coordinated by the Bureau of Government, Regional Autonomy and Cooperation under the secretariat office of Central Java Province. This bureau is also closely connected to the national Ministry of Internal Affairs for coordination with the national-level government. However, this arrangement does not always work in implementation. The provincial government has some limitations as a coordinator at the regional level, mainly because of complications that arise due to SOTK and budgeting guidelines.

Working within such considerations, strong government action has initiated the coordination of development programs. The establishment of Law No. 23, 2014 on Local Government Authority has transferred important coordination roles from both the national and provincial levels to the local level. Together with these decentralization efforts, there is a critical issue of capacity gaps managing metropolitan areas where there are still significant capacity gaps (a financial gap and limited human-resource capacity) between the government of the urban center (i.e. Semarang City) and the government of the surrounding administrative areas. Meanwhile, as stated earlier, the authority of the provincial government is very limited due to the regulations of SOTK.

While the government facilitates the integration process by providing relevant policy instruments (rules and regulations) and strategic public infrastructure, the private sector actors do most of the development. Developers have also a responsibility for the provision of infrastructure in the area that they develop. Most of the high-value land within the Semarang metropolitan area is owned by the private sector. Accordingly, the infrastructure development process for the construction of a satellite city, industrial park, or the erection of a new apartment building is mostly determined by the private developers/land owners involved. It is a challenge for the government to control the development due to the lack of strict control mechanisms, or insufficient detail in relevant policy instruments.

Communities have also been playing an important role in Semarang's metropolitan development. One of the important missions is to improve the environment and to ensure the provision of basic public infrastructure in the emerging slum and squatter settlements. Under the flagship National Program for Community Empowerment (PNPM), a local institution at the subdistrict level called Urban Village Empowerment Institution (LPMK) was established in 2007. In Semarang, there is another related initiative, introduced in 2015 under the National Slum Upgrading Program (NSUP), which is commonly referred to in Indonesia as the KOTAKU program (Kota Tanpa Kumuh, or Cities Without Slums). With the support of KOTAKU, the local institution Community Self-Help Group (BKM) was also established at the subdistrict level in 2015. These two initiatives at the community level aim to perform as a platform for communication and coordination among communities as well as between communities and...
local government. Most importantly, LPMK and BKM are also expected to act as the agents of change to sustain many initiatives on community empowerment and the basic infrastructure fulfillment program. These two institutions have also a further strategic role to ensure that marginal actors (i.e. people who live in the slum area) are able to contribute actively in the development process.

In line with the Semarang City mayor’s tagline “Moving Together”, there has been a strong transition towards a more inclusive development process in metropolitan Semarang. Even though it is still limited to Semarang City, some initiatives have been set up to build a coalition between the city’s government and stakeholders from surrounding jurisdictions. For example, the mayor of Semarang has initiated a platform to involve local experts by forming a Semarang Advisory Board in 2015. The board consists of experts from various fields who advise the mayor on strategic urban issues. There are also corporate social responsibility initiatives and green community forums to connect government with private stakeholders and local communities.

Unfortunately, only one forum exists at the regional level to promote community-based disaster preparedness action: the Garang River Basin Forum. Initiated by the Greater Basin Territory Center (BBWS) in coordination with the Central Java Province and Semarang disaster management agencies, the forum was created in 2018 and consists of various stakeholders (local community, government representatives, local NGO, and academics). It is expected that the forum may be able to synchronize programs/initiatives from the Garang River’s upstream areas to the downstream areas, which crossed two different jurisdictions (Semarang City and Semarang Regency).

Speaking to the initiation of projects, an integrated development project may be started from any level of government. For example, the toll road development on the northern coast of Java Island is purely top-down; that is, the development initiative comes from the national level. It was initiated by President Jokowi in his first presidential period (2014–2019) to promote connections between cities along the northern coastline. The project is regarded as a national policy as its budgeting is under the responsibility of the national government; accordingly, the governments at the local level affected by the construction should adjust their development/masterplan to maximize the benefit of the improved accessibility brought by the toll road.

In general, implementation of integrated projects in the metropolitan area follows agencies’ authorities and jurisdictions, based upon either bottom-up or top-down initiatives. The term “bottom-up initiative” refers to projects or programs proposed by local government, although their funding and a major portion of implementation belong to the national government. In contrast, a “top-down initiative” refers to projects or programs that are proposed, funded, and implemented by the national government.
While considering the current roles and responsibilities of stakeholders in the development process, reviewing the different generations of urban development solutions that have contributed to the distribution of roles in Semarang metropolitan area provides important lessons.

The first generation of urban development during Semarang’s colonial period shows that innovative solutions towards more integrated planning involved various development actors through early consultation and bottom-up initiatives. In dealing with housing and upgrading of slums, for example, a concern or need was raised by stakeholders to the city council (e.g. local politicians, local business elites). This was typically supported by local professionals and practitioners (e.g. doctors, scientists, architects, and urban planners) to convince the decentralization adviser and local council that action needed to be taken. Later, after a solution to the concern was devised and plans agreed by the stakeholders (e.g. kampong or village improvement, new neighborhood development, municipal public housing), the city council persuaded the Dutch colonial central government to provide funding.

Once funding was obtained, the execution of the plan was handled by the city council, under agencies that held specific authorities (e.g. the municipal housing corporation). Such implementation was also supported by third parties (e.g. surveyors, construction companies, housing developers, operations, and maintenance staff). The council oversaw the functioning of the program and ensured its long-term sustainability. The outcomes of Semarang’s first generation of urban development can be seen in Map 5.

Semarang’s urban development in the 1800s took place in the old city which was the Dutch administration’s center. The Dutch in 1904 started construction of the Dutch East Indies Railroad Company headquarters in Lawang Sewu area. In 1914, Thomas Karsten arrived to Semarang and planned new neighbourhoods, such as the Niew Tjandi District. Semarang’s city square (Simpang Lima) was developed at the end of 1960s. Since the 1980s, development in the Semarang City’s center has been concentrated in and around the golden triangle area--stretching between Simpang Lima, Lawang Sewu, and the old city.

Semarang’s later generations of urban development utilized integrated planning strategies to deal with housing and slum-upgrading concerns; there was a similar consultative process, but a more diverse range of actors and mechanisms were involved. Examples of this include combining the Kampong Improvement Program (KIP) with regional infrastructure investment under the flagship program National Program for Integrated Urban Infrastructure Development (IUIDP) and a revolving fund under PNPM.

In the project preparation stage the national government, through BAPPENAS and the Ministry of Finance, focused on the funding, which was mainly assisted by the World Bank. Legislative or parliament members were involved at the
national level to assess the role of the national government and financial commitment. The Public Works Department coordinated activities at the national level, while agencies at the local level coordinated the implementation of each project.

The program included a selection of prioritized or targeted neighborhoods and communities. As the second and third generation of kampong improvement for the poor and those who are vulnerable due to the economic crisis, the community’s involvement was extensive. The city thus did not only improve the neighborhood for the poor, but also with the poor. Experts (e.g. urban planners, sociologists, economists) were specifically hired as local facilitators to build engagement with the program’s beneficiaries in the community. Engineering consultants and academics were involved in the technical and physical implementation. This arrangement made for an important new view, in the eyes of the Indonesian public, of the role of urban planners. Urban planners subsequently do not only ensure the alignment and connectivity of regional infrastructure systems with neighborhoods, but also facilitate the stakeholder empowerment process at the community level.

An example of another bottom-up approach is the integrated water resources and flood management project in Semarang’s West Flood Canal (Garang River basin). The initiative for this project came from Semarang City as a response to the devastating floods of 1990 and 1993. The city proposed the project to the national government. BBWS now acts as the most responsible actor in the implementation phase for the Garang River basin.

Despite the coordinating agencies BAPPENAS and BAPPEDA, integrated urban planning actors may vary between sectors because implementation depends on the responsible technical agencies involved. Again taking Semarang’s West Flood Canal development as an example, apart from the key role of BBWS, strong vertical (national–provincial–local) and horizontal cross-jurisdictional coordination was necessary. This is because the river along its entire course being under a national authority, but the land use, sanitation, drainage systems, and other related elements within the ecological system along the river are under provincial and/or local government authority.

**TOOLS AND SECTORS INVOLVED**

A national legal framework in Indonesia has been the main tool for both sectoral and spatial integration at the metropolitan scale. Law No. 25, 2004 requires local governments, both at provincial and local levels, to have a long-term development plan spanning 20 years. Long-term visions are outlined in the planning document and regional strategies are proposed to achieve them. The plan then informs the creation of a district-level Medium-term Development Plan (RPJMD) spanning five years. The RPJMD reflects the vision of the elected mayor along
with socioeconomic indicators and includes targets that inform the agenda for governance, social services, infrastructure priorities, and other aspects of socioeconomic development. Also, a Local Government Work Plan is created for the short term. The RPJMD is used by government sectoral agencies to formulate their Agency Strategic Plan (Renstra OPD) and Agency Annual Development Plan (Renja OPD). This hierarchical system by design promotes cross-sector integration vertically between and horizontally across government entities.

Law No. 26, 2007 on spatial planning is also a key tool for spatial integration. The law gives privileges to the national government to assign a National Strategic Area, in which local spatial plans must accommodate and align with the strategic plan. The National Spatial Plan of Indonesia 2008–2028 mandated the Semarang metropolitan area as a National Strategic Area, which was then strengthened by Presidential Decree No. 78, 2017’s determination of Kedungsepur. This decree provided a strong legal basis for local government to propose programs at a metropolitan scale.

With the involvement of various stakeholders and programs, issues are mainstreamed and influence the policy-making process (Sabatier 1999). This is especially the case during the development of the RPJMD, which has been a tool for creating integration at the local level. In Semarang City, for example, the issue of climate change was successfully integrated into the development of RPJMD 2012–2017 (Setiadi and Lo 2019); the same is the case for urban resilience mainstreaming in RPJMD 2018–2023.

Similarly at the provincial level, integrated metropolitan policies have been successfully mainstreamed in the RPJMD of Central Java Province 2018–2023. Some integrated projects at the metropolitan scale are indicated in the document, such as the reactivation of the railway from Kedungjati to Yogyakarta (the southern part of the metropolitan area); and from Semarang to Rembang (the eastern part of the metropolitan area). Another integrated project highlighted in the RPJMD document are road connections from Kendal to Ungaran and from Semarang to Grobogan.

One of the most well integrated development sectors has been water management in Semarang City’s flood canal projects. Various water management projects have successfully addressed metropolitan issues such as flooding and water scarcity while creating co-benefits to other sectors, such as housing, community development, tourism, and industries. The sector has involved various actors including the national government and its regional offices, provincial government, and local government (cities and regencies), communities, regional-owned water companies, the private sector, universities, NGOs (international and local), donor agencies, and financing institutions (e.g. the World Bank and the Japan International Cooperation Agency, or JICA).

Various water management projects have successfully addressed metropolitan issues such as flooding and water scarcity while creating co-benefits to other sectors, such as housing, community development, tourism, and industries.
A growing appreciation for community empowerment and economic development is encouraging greater integration of solutions along Semarang’s West Flood Canal to combat climate change and reduce inequality.

Source: Photography by Mangiwaui/Moment via Getty Images.
Implementation

INSTITUTIONAL ARCHITECTURE

There has been an important transformation in Indonesia’s institutional architecture that has encouraged integrated development. From 1966 to 1999 Indonesia was in the centralized (New Order) era, but in 1999 it began the decentralized/autonomy (Reform) era. There also came into existence after the establishment of Law No. 23, 2014 a new autonomy at the local (city/regency) district level. As stated earlier, the management of the Semarang metropolitan area at present cannot be carried out by an independent body, but has to be governed in the four-level administrative structure (national–provincial–local–community). As such, collaboration is a very critical point to manage the metropolitan area as there are growing issues because of its rapid urban expansion. However to some extent, the new autonomy based on Law No. 23, 2014 has led local governments that have challenges that are horizontally or vertically overlapping with other jurisdictions to become demotivated about regional collaboration because it is, essentially, outreaching their authority.

In this context, Semarang City has been playing a strategic role in promoting horizontal collaboration throughout the metropolitan area. The mayor has stated on several occasions that he should not be active only as mayor of the city based on its administrative boundary, but also should act as a coordinator for the development of the whole metropolitan area. His commitment is actualized by the Kedungsepur MOU agreement among the area’s six heads of local government (the Semarang mayor and five leaders of the surrounding areas), which was signed on April 10, 2018 (JawaPos 2018). This MOU was a very important milestone to further integrate Semarang’s metropolitan development.3

Based upon the MOU, there have so far been two sectoral cooperation agreements signed by Semarang City and the surrounding areas. The first was on disaster mitigation collaboration between the heads of the Disaster Management Boards of Semarang City, Semarang Regency, Kendal Regency, Demak Regency, Salatiga City, and Grobogan Regency. The second cooperation agreement was for integrated public transport services collaboration by the head of the Transpor-

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3 For information regarding how the Kedungsepur MOU compares with other methods of metropolitan cooperation in Indonesia, refer to Roberts et al. 2019, p. 187.
Semarang: Clustering and Connecting Locally Championed Metropolitan Solutions

The Mayor's initiative for coordination and the two signed agreements should be regarded as critical milestones to facilitate the area's integration process. Acknowledgment of the mayor's achievement can be indicated by him having been designated as one of Asia's best mayors by the Asia Global Council in 2019.

As well as formal collaboration, informal horizontal coordination between Semarang City and the surrounding administrative areas has helped to promote integrated solutions. Inter-agency and inter-jurisdictional coordination have already been in effect, and the intensity has increased in line with the emerging cross-boundary issues, mainly because of the rapid urban expansion of Semarang metropolitan area. Most of the initiatives are led by Semarang City mainly because the city has to deal directly with various urgent urban issues that need an immediate solution at the regional level. Meetings and workshops are the two common approaches to synchronize inter-agency and inter-jurisdictional programs and initiatives. There has also been informal communication, which is most of the time regarded as a better means of communication. There is essentially no competition among the local governments, as each local government has mostly different priorities and needs. The coordination issue is more about ensuring harmony in the sense that any initiatives to fulfill particular needs initiated by one jurisdiction may not harm other jurisdictions; however, there is not yet any incentive mechanism to encourage the development of more harmonious programs among sectors and among stakeholders of different jurisdictions.

Semarang City has experience with international networks, such as being a part of the Asian Cities Climate Change Resilience Network (ACCCRN) and the former 100 Resilient Cities network, which have provided valuable momentum and self-confidence, and also a willingness for the city to be involved in wider partnerships and other platforms promoting better development implementation. Greater advantages could be leveraged if these networks and collaborations would be expanded into the wider metropolitan area.

**Sustainability**

During the New Order era, under the centralized government all development initiatives were likely to be a directive from the national government. Decentralization started in 1999, followed by the launch of Law No. 23, 2014 on local government and autonomy, which reached two important milestones for further discussion on the long-term sustainability of integrated planning implementation in Indonesia.

Metaphorically speaking, the New Autonomy stage of post-independence governance, which started in 2014, has been very much like parents (the national government) giving more trust and freedom to their children (the provincial governments) and grandchildren (the local governments) to take care
of themselves. However, critical challenges have emerged around the children and grandchildren’s ability to take advantage of the momentum of initiatives and sustain opportunities and tasks on their own.

As an example, to ensure water supply, run-off sustainability, and flood resilience, the Semarang City issued Government Regulation No. 7, 2014 for the Drainage Master Plan. This step forward in water policy for the city, which has also been implemented in various forums in other cities of Indonesia, states that all developments (residential and industrial) with an area of five hectares or more are required to construct at least one reservoir to provide water availability and to ensure no run-off exits their property that would contribute to flooding elsewhere.

An example of an innovative project that promotes water sustainability is the Semarang West Flood Canal (Garang River basin) integrated water resources and flood management project. As stated earlier, the initial initiative was taken by Semarang City and was to actively build intensive communication with the national government (BAPPENAS and Ministry of Public Works) in the 1990s. This was in response to the two large floods that affected Semarang in 1990 and 1993 and was first formally stated in the Semarang Spatial Planning 1995–2005 document. However, the project progressed slowly, largely because of lack of funding and authority coordination issues.

Long-term efforts to implement the project and active communication between stakeholders finally paid off when an investment project loan of $50 million was accepted from JICA in 2006. The project was executed under the coordination of BBWS with the three main components of normalizing the Garang River, constructing the Jatibarang Dam, and improving the urban drainage system.

Overall, the project has significantly promoted two forms of integration. The first is cross-sectoral integration as the focus of the project is not only the infrastructural works, but also includes community empowerment and local economic improvement for the people affected by the project. The second is cross-jurisdiction integration, as the location crosses two local administrative areas (Semarang City and Semarang Regency).

Since the project’s completion in 2014, there have been some worthwhile strategies implemented to increase its long-term sustainability. Maintenance of all the infrastructural works are now under the appropriate agency according to SOTK. For example, dam operation and maintenance are under the responsibility of BBWS, while Semarang City is in charge of the drainage system. As well as the physical project outputs, community empowerment and the local economic development program also need to be sustained. Accordingly, there are ongoing negotiations between BBWS and Semarang City on distributing roles and responsibilities. BBWS is responsible for facilitating community-based environmental conservation and the local government is focused on the continuation of
economic development by working closely with residents on community-based tourism attractions in the surrounding Jatibarang area.

There have also been some follow-on activities to the project. These ongoing projects include tourism activities, real estate development, and waste management improvement. Furthermore, the sustainability of the works has expanded with the involvement of the private sector. A Public-Private Partnership (PPP) was first conceptualized in 2017 and launched in 2019 to develop an integrated water supply system to further utilize untreated water from Jatibarang.

The successes of Semarang’s West Flood Canal project are in the process of being replicated at its east canal. The construction of the East Flood Canal began in early 2018 and the project scope includes the normalization of 14.6 kilometers of river from the Pucanggading Dam to the Java Sea. The first phase of this project began with the most difficult 6.7 kilometers of riverbed sediment dredging by starting at the dam and working downstream. This phase had a budget of Rp 560 billion and affected residential and informal commercial activities of the community. The nationally managed program was integrated into the city’s development program and the city government persuaded the affected communities to participate in remediation efforts, including providing new shops for hundreds of informal businesses not far from their existing locations. However, the completion of the project’s first phase was delayed due to some street vendors being reluctant to relocate (Tribun Jateng 2019).

The second phase of the project, comprising 7.7 kilometers, continues from the middle segment heading to the south towards the Pucanggading Dam. This phase is scheduled to be completed by the end of 2020.

According to the project’s detailed engineering design, after normalization, the width of the river channel will increase significantly to 65 meters at the surface and about 50 meters at the riverbed. In addition, flood-retaining walls of varying heights are to be constructed, ranging from 40 cm to 100 cm. Various types of public facilities have been planned in sports and recreation zones with a total area of 40 hectares; these will be located in residential areas including the Gayamsari, Karangtempel, Sawah Besar, Pandansari, Mlatiharjo, and Rejosari subdistricts.

To implement projects such as these, the Semarang City government needs to deal with a significant financing gap while solving its emerging development issues and to sustain the benefits of its ongoing initiatives. The city’s engagement in global networks provides more opportunities by intensifying collaborations with international platform partners. There are some good examples, such as the Bus Rapid Transit services improvement project, which started in 2016 in cooperation with the Institute for Global Environmental Strategies and Toyama from Japan, and a waste-to-energy project in collaboration with Denmark’s International Development Agency in 2017 that is continuing with an initiative for
PPP works on renewable energy. In 2019 a new PPP project was also initiated to develop a Light Rail Train system. Speaking to the importance of these efforts, at the beginning of 2019 Semarang City won the nationwide annual performance competition for PPP schemes organized by BAPPENAS.

PRIVATE PARTICIPATION

Land owners and developers are the two most important types of private stakeholders in the development process. Most strategically located land in the Semarang metropolitan area is already possessed by private owners, particularly large-scale developers. Therefore, clear communication and coordination mechanisms between private land owners and the government are necessary to ensure that land use allocations meet the private sector’s expectations, but also to protect the public’s aspirations and needs while safeguarding environmental sustainability. The government should also be equipped with robust policy instruments.

A good example of private participation is the BSB integrated satellite city development project, which started in 1999 and comprises approximately 1,000 hectares in the western area of Semarang City. The BSB developers designed and prepared the required infrastructure and detailed land use allocations with good coordination with local government. Local government committed funding to improving the area’s main road connectivity and drainage system, including the development of a new corridor for public buses to increase connections from BSB to the city center. Likewise, the BSB developers had a responsibility to develop local roads and other basic infrastructure, including developing public open spaces and water reservoirs, to increase the quality of the environment. Map 4 shows some of this infrastructure. This kind of negotiation cannot be easily done between the local government and smaller developers with low capabilities. The example demonstrates that developers with high capabilities are needed to develop areas in an integrated manner in partnership with the local government.

PPPs and corporate social responsibility initiatives are the most common mechanism involving the private sector in supporting the development process. PPPs are likely to be more focused on private participation for the provision of public infrastructure, while corporate social responsibility initiatives are more about private sector support for community empowerment and environmental conservation. Over the last five years PPPs have been used even more intensively to minimize financing gaps and ensure that local government is not the only stakeholder responsible to fulfill development needs. There are some national initiatives to motivate local governments to use PPPs to implement their development plans, including incentive schemes and government support through three financial institutions under the Ministry of Finance (Perseroan Terbatas Sarana Multi Infrastruktur [PT. SMI], Perseroan Terbatas Penjaminan
There have been three main stages of government that have shaped the integration process in Semarang metropolitan area post-independence: Centralization, Decentralization, and New Autonomy. The national government was the central player in directing the development process post-independence. Decentralization in 1999 was the turning point for transferring some of the roles and responsibilities to the local government. The local governments across the country addressed this new situation differently, very much influenced by their individual financial and resource capacities. Semarang City’s administration has been one of the governments that have shown some innovation and strategy in their methods of addressing unprecedented cross-boundary urban challenges.

Semarang City has been playing the central role in ensuring a sustainable integration process for the metropolitan area. The provincial government (i.e. BAPPEDA and the Bureau of Government, Regional Autonomy, and Cooperation under the secretariat office of Central Java Province) has had challenges mainly because of issues with their budgeting regulations. There is still also a regional capacity gap, mostly in terms of financial and human resources, between Semarang City and the local governments of the surrounding areas. The situation has been driving Semarang City to take a leading role through at least two different strategies. The first is initiating integrated work processes, as indicated
by the Kedungsepur MOU signed in 2018 and its two resulting agreements, and the second is intensifying communication with national government around safeguarding and ensuring that support from them provides the maximum leverage for the Semarang metropolitan area’s economy.

Along with the coordination with the neighboring regencies, internally the Semarang City government has also been initiating communication with the private sector stakeholders and maintaining connections with local experts through the Semarang Advisory Board and various community groups. Regular coordination meetings, for example between Semarang’s mayor and members of the Indonesian Real Estate Association, the Indonesian Chamber of Commerce and Industry, and local community preparedness groups are important approaches to connecting the government with local stakeholders. Issues related to land acquisition, relocation, and broader issues of development within the city are discussed in regular meetings.

Semarang metropolitan area has, largely in the New Autonomy stage of post-independence governance, shown more inclusivity in its development process as there has been more participation from the private sector and community groups. There has been found to be almost no public objections to the projects that have been implemented. Very sensitive issues such as land acquisition and relocation of informal sectors, slums, or squatter settlements are always approached through consultation meetings. The kelurahan, or urban communities, are the fourth and lowest level of government and play a very important role in bridging communication between local people/community representatives and government. As a result, much of the process of land acquisition, such as for the flood management project in the Garang River basin or slum upgrading under the KOTAKU Program, have run relatively smoothly. Most of the new public housing developments, for example, are located not too far from activity centers as local stakeholders have been able to send the message to government that they will only agree to be relocated under certain conditions. Even though in most cases the process is very slow due to the large volume of meetings and communication, which results in delays or even postponement of the project work, the strategy for ensuring inclusivity since the beginning of the projects’ planning and implementation has overall made Semarang’s development journey more conducive and synergetic.

Despite all of the good things that have been achieved so far, there are still challenges and pending tasks for environmental conservation, as the economy and welfare are still regarded as the most important government indicators
Semarang is a leading city in Indonesia showing a concrete commitment to climate change mitigation and adaptation initiatives.

to measure development success in Semarang. One success story is that of the protection of a particular monkey species during implementation of the Jatibarang Dam project; the forested area has been preserved for the monkeys. After some studies and coordination among the relevant agencies, the monkey forest is becoming a successful tourist destination in Semarang. Other environment-based works, such as mangrove conservation, have also been taking place in the area with the support of international foundations such as the Rockefeller Foundation and Mercy Corps.

In the housing sector, a financial instrument designed by the Ministry of Finance through the establishment of Perseroan Terbatas Sarana Multigriya Finansial (PT. SMF) in 2005 has increased the availability of long-term funding for housing development projects, which then enables affordable home-ownership, particularly for medium- and low-income groups. PT. SMF serves as a secondary financial market to fund private developers with lower-interest loans than primary financial institutions (conventional banks), with an average capacity to facilitate 20,000–25,000 home purchases per annum. For example, in 2018 PT. SMF contributed 16 percent of the total disbursement of loans for housing ownership projects in Indonesia, and 636 debtors of this scheme were in the Central Java region (PT. SMF 2018).

**RISK MANAGEMENT**

A feasibility study is part of the formal procedure to start any planning project in Semarang. Additionally, a detailed assessment of the socioeconomic and environmental impact is very important to ensure project sustainability. For particularly big investments, the government may have support from various institutions to increase the quality of the feasibility study. For example, the study for the Integrated Water Resources and Flood management in Garang River basin was supported by JICA and the study for the West Semarang Water Supply PPP project was facilitated by PT. SMI.

The government avoids risks, especially when they relate to the provision of public infrastructure and with greater private involvement in PPP mechanisms, the potential risks are shared more proportionally between the government and the private sector. Typically the government will take responsibility for land acquisition, while the private sector will lead in construction. The government does need to exercise caution and oversight during the design stage, since they will eventually take over the operations and maintenance from the private sector and the equipment and maintenance will become a financial burden if it is not able to be sustainably managed. Previously there have been some unproductive
public expenditures and project handover delays, especially when there have been changes or turnover in the government’s strategic role in the PPP process or new decision makers becoming involved and making changes in the project delivery mechanisms. Therefore, cooperation and agreement between the public and private sectors on the details of all PPP projects is very important.

GLOBAL ENVIRONMENTAL BENEFITS: OUTCOMES AND SCALE-UP

Semarang is a leading city in Indonesia showing a concrete commitment to climate change mitigation and adaptation initiatives. As a part of ACCCRN from 2009 to 2014, followed by Semarang City’s active and ongoing engagement in the former 100 Resilient Cities Network starting in 2014, the city has introduced initiatives to reduce the impact of climate change in some pilot projects such as a flood early warning system, mangrove preservation, and dengue prevention. The city released its City Resilience Strategy in 2016, and some of the strategies have already been integrated into the medium-term RPJMD plan and spatial plan (Rencana Tata Ruang Wilayah).

Some of the strategies have also been implemented by linking them with platform partners, such as in the transportation sector (e.g. Bus Rapid Transit improvement to reduce emissions), where Semarang is collaborating with Toyama and Global Environmental Strategies under the Joint Credit Mechanism scheme. In disaster management, the city government collaborates with the Zurich Alliance; and in mangrove preservation and coastal management the city is supported by the government of the Netherlands. The most current initiative is a climate change resilience project on integrated water management that is supported by the Netherlands Enterprise Agency under the Water as Leverage for Resilient Cities Asia program.

The programs implemented in Semarang metropolitan area have improved capacity building, increased awareness, and most importantly have found innovative solutions to increase the livelihoods of residents. They simultaneously are also improving conservation efforts, and work toward reducing the impacts of climate change. With the integrative urban innovations compiled in this case study of Semarang metropolitan area, the lessons learned can be disseminated, adopted in other locations where relevant, and scaled up to further leverage their global environmental benefits.

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4 A system for cooperation with developing countries in reducing greenhouse gas emissions, in which the result of reduction is assessed as a contribution by both partner countries and Japan (www.mofa.go.jp/icc/chi/pagetwe_000105.html).
5 Initiated by RVO (Netherlands Enterprise Agency), the program aims to create an inclusive and innovative pre-project preparation facility using water as leverage for making cities resilient (https://english.rvo.nl/subsidies-programmes/water-leverage).
Financing

FINANCING SOURCES

Understanding how integrative projects are financed can help to promote further coordination efforts. Local government cities and regencies comprising the Semarang metropolitan area are usually financed through three sources of revenue, based on Law No. 33, 2004 on local government. First, own-source city revenues, which include taxes and collected fees. The second source includes national government transfers or balancing funds, which consist of tax revenue funds, non-tax profit sharing funds, general allocation funds, and special allocation funds. The third source is other legitimate revenues, including: transfers consisting of special autonomy funds and adjustment funds; provincial government transfers consist of tax revenue sharing and other profit sharing (provincial/other city/regency governments financial assistance); grants; and emergency funds.

Based on the Report of Accountability from Mayor of Semarang Municipality at the End of 2017 (Semarang City Government 2018), Semarang City performs better compared with other jurisdictions of the metropolitan area. The own-source revenues of Semarang City contribute almost 50 percent of total revenue, while the surrounding regencies (Semarang Regency, Kendal Regency, and Demak Regency) are only able to provide less than 20 percent of revenue from their own sources. Accordingly, Semarang City receives only 40 percent of its total revenue from the national government, which is much lower than the approximately 70 percent of revenue that national government provided for fulfilling the financial gaps of the surrounding local governments in 2017.

The fourth source of financing is through grants, either bilaterally from multilateral donors, or from other sources, including NGO intervention programs. For example, the Rockefeller Foundation in collaboration with Mercy Corps Indonesia contributed up to $2 million in 2010–2014 to build Semarang City’s urban climate resilience under ACCCRN (Setiadi 2016), which was followed by further programs and donors, such as the 100 Resilient Cities network, Zurich Flood Resilience Program, and Water as Leverage for Resilient Cities Asia.

Information regarding Semarang City’s financial structure compared to its neighbors is provided in Box 2.
BOX 2. SEMARANG CITY’S FINANCIAL STRUCTURE VERSUS NEIGHBORS

Semarang City has much larger financial capacity than its surrounding regencies. In 2017, Semarang’s total revenue was $370 million compared to that of Semarang Regency, Kendal Regency, and Demak Regency, which were each around $130 million–$148 million. Approximately 40–50 percent of these regencies’ budgets were allocated to personnel expenditures and their own-source revenue (mostly from tax collection and fees) contributed only approximately 20 percent of their total revenue. Because of this, outside of Semarang City the different administrative areas of the metropolitan area depend greatly on the national government for budget support. At the same time, they still have limited ability to explore alternative development funding from outside of the government. Together with this there is a lack of capacity and most importantly, there is also hesitation to take financial risks.

In terms of revenue distribution, Semarang City funds various sectors within the city as a direct cost (capital expenditure) to operationalize development activities. Based on the city’s 2017 annual report, most of the budget goes to three priority sectors: public works (31 percent), health (15 percent), and education (11 percent). The allocation is similar to how other local governments within the Semarang metropolitan area distribute their revenue. The Human Development Index is also an important indicator that influences budgetary allocations. This is a reason why the budgets of most Indonesian local governments focus their resources on the three primary areas of education, health, and increasing per capita income. As a brief illustration for the situation in 2017, the Semarang City budget for development activities had direct expenditures of $205 million, much higher than the surrounding regencies, which ranged from $50 million to $100 million. Around 30 percent of Semarang City’s budget is allocated for the three priority areas while the rest is distributed to more than 20 other areas, in accordance with Law No. 23, 2014.

Based upon their financing models, the magnitude of development projects costs can be staggering for local governments without additional support. For instance, the ongoing West Semarang Water Supply Project as a PPP has a total investment cost of approximately $90 million. This illustrates the financial gaps faced by local government in their challenges to promoting integrative processes.

Source: Semarang City Government 2018.
PROMOTING INTEGRATIVE APPROACHES

The main funding source of integrated programs in Semarang metropolitan area has come from the proponent of the program, whether at the national, provincial, or local levels. As an example, for national government initiatives where the Indonesian government provides the primary funds, the other stakeholder parties (e.g. province and district) provide complementary funding. However, funding for local government-led initiatives is limited to only their own authority and jurisdiction. This demonstrates that funding has not been flexible for local governments when it comes to inter-regional collaboration. For instance, Semarang City is not allowed to spend its funds on the rehabilitation of degraded land in its upper hinterland areas of Kendal. In this example, the provincial government would be responsible for initiating and funding the program due to it being a cross-border intervention.

More recently, there is a strong tendency for the regime of financing at the national and local government levels to shift from “money follows function” to “money follows the program”. Under the function regime, local government agencies have the flexibility to propose programs that will be included in the Local Government Work Plan. Then BAPPEDA connects the proposals and groups them into several program themes for approval in the regional/local government budget.

This financing regime embraces the assumption that urban development goals and objectives are impossible without intervention. In other words, under this financing regime planning is designed to achieve shared goals and objectives built by strong consensus across agencies and sectors. Therefore, this kind of financing model avoids overlapping programs and activities between ministries at the national level or between agencies at the local level. It also aims to strengthen connections between ministries and agencies. In summary, the money-follows-program regime will produce a series of activities that lead to achieving prioritized goals efficiently so that the benefits and impacts of the program are more tangible and significant.
INNOVATIVE FINANCING MECHANISMS

Several projects clustered in Semarang’s Garang River basin showcase innovative funding mechanisms, which are different from traditional business as usual financing.

One project that has innovative financing mechanisms, introduced earlier, is the integrated water resources and flood management project in the West Flood Canal of Semarang (Garang River basin). The financing mechanism of the project also indicates the integrated nature of the project activities as it has shifted from single-sector to multi-sector allocation, as well as from one independent project to several interconnected projects, including currently at least four additional components since the inauguration of Jatibarang Dam in 2014. These additional components include an urban regeneration project along the Garang River, community empowerment for the people who live in the area surrounding the dam, tourism attractions development, and the development of a water supply system.

This sophisticated project has required a complex financing structure. The total investment for integrated water resources and flood management project was $85 million. The project funding comes from a JICA loan of $50 million, while the other $35 million comes from the national government’s budget. Separately, Central Java Province and Semarang City have contributed not less than $20 million for land acquisition, including the urban regeneration project along the Garang River mentioned earlier that relocates informal traders along the river to a new formal market nearby.

The project also incorporated an important community empowerment program. Training and other income-restoration activities were supported by the national government through BBWS in cooperation with the local government. The main aim of this sub-component was to increase the income of the local people based on local economic activities. The annual budget for this component was $290,000.

A separate innovative financing initiative is the West Semarang Water Supply PPP, which is an investment of $90 million. As mentioned earlier, the project effected a good transformation beyond business as usual practices by leveraging the private sector.
Conclusion

EXTERNAL VALIDITY

Semarang’s pressing metropolitan issues include the need for more affordable housing, better transportation and community infrastructure, adequate water, and increased resilience to climate change and natural disasters. These challenges need to be balanced with limited budgetary resources and capacity gaps, together with Indonesia’s typical human development priorities at the local level of education, health, and increasing per capita income. Semarang metropolitan area has leveraged a range of integrative urban innovations over time and continues to improve coordination through the leadership of Semarang City.

The top-down urban solutions demonstrated by Semarang metropolitan area have been implemented in some form in other parts of Indonesia and are similarly transferable to other locations. The inter-city transferability of the innovations is not a problem domestically because these innovations were developed as national programs by the Indonesian national government. For instance, all three generations of KIP and housing solutions have been implemented in other Indonesian cities.

The bottom-up initiatives, while unique to Semarang’s context, speak to some processes that were developed during the colonial period and revisited in different forms during Indonesia’s gradual decentralization. More recently Semarang’s West Flood Canal, and then subsequently its East Flood Canal, have leveraged bottom-up initiatives to locally champion metropolitan integration by connecting and clustering solutions. For instance, the multi-sectoral water resource and flood management approach to develop a river basin area with associated programming is a good example that is relevant for other cities in Indonesia and beyond. In practice, it is possible to cluster and integrate infrastructure works (e.g. dam construction and river normalization) with other relevant physical projects such as the development of housing and public space improvement, while also considering socioeconomic outcomes such as tourism, local economic development, and community empowerment.
Overall, Semarang’s case study demonstrates that the innovations showcased are step-by-step, or incremental. They are iterative and have not involved a radical solution straight away. Together, the implementation of these innovations helps Semarang achieve global environmental benefits and improve its overall urban sustainability.

Meanwhile, these urban innovations could also be considered in other countries’ contexts. For instance the urban development history of Semarang reveals that some of the solutions took references from the methods of the Netherlands, which eventually modernized urban planning in Indonesia.

**LESSONS LEARNED**

Three important lessons have been learned from the Semarang case study about the future challenges of promoting integration.

First, sectoral and spatial integrations need to consider the governance system particularly in a decentralized system that is relatively complex and rigid in practice. No matter how perfectly integration is designed, the strong division of vertical authority and horizontal jurisdiction between agencies and across government has made integration more difficult. Integration requires extra coordination and intensive communication.

Second, providing a wide range of financing options is an important key to integration. Flexible financing options help local governments to be more self-reliant, which at the same time reduces dependency on the national government.

Third, actors or agents who are involved in integration have different knowledge bases, resources, and capacities. Gaps in resource allocation create barriers and stifle efforts, which eventually discourage collaboration. Leadership is the key in this situation. Initiative in building communication and coordination and leading the integrative process of planning and development is highly required. Strengthening the leadership of cities and regencies to foster integrated metropolitan development is a strategic investment for the future of Semarang and beyond.
Density

Figure 4
POPULATION DENSITY, 2000

Municipal
Maximum: 95,833 people/km²
Minimum: 106 people/km²
Average: 4,461 people/km²

Source: LandScan 2017.
Figure 5
POPULATION DENSITY, 2017

Municipal
Maximum: 54,948 people/km²
Minimum: 1 people/km²
Average: 3,377 people/km²

Source: LandScan 2017.

Figure 6
Overlay of density levels, 2000–2017
REFERENCES


ABBREVIATIONS

ACCCRN  Asian Cities Climate Change Resilience Network
BAPPENAS  Ministry of National Development Planning of the Republic of Indonesia (Badan Perencanaan Pembangunan Nasional)
BAPPEDA  Regional Development Planning Agency
BBWS  Greater Basin Territory Center
BSB  Bukit Semarang Baru
CBS  Central Bureau of Statistics
CPL  City Planning Labs
IUIDP  National Program for Integrated Urban Infrastructure Development
JICA  Japan International Cooperation Agency
KIP  Kampong Improvement Program
KOTAKU  Cities Without Slums
LPMK  Urban Village Empowerment Institution
MOU  Memorandum of Understanding
NGO  Nongovernmental organization
NSUP  National Slum Upgrading Program
NUDP  National Urban Development Project
PNPM  National Program for Community Empowerment
PPP  Public-Private Partnership
PT. PII  Perseroan Terbatas Penjaminan Infrastruktur Indonesia
PT. SMF  Perseroan Terbatas Sarana Multigriya Finansial
PT. SMI  Perseroan Terbatas Sarana Multi Infrastruktur
Renja OPD  Agency Annual Development Plan
Renstra OPD  Agency Strategic Plan
RPJMD  Rencana Pembangunan Jangka Menengah Daerah (district-level medium-term development plan)
SOTK  Organizational Structure and Work Procedure
UNDESA  United Nations Department of Economic and Social Affairs

Currency exchange rate: IDR 13,500 = 1 USD
Shenzhen, China
Rail + Property for Transit-Oriented Development
Jiwen Yang and Jiangping Zhou
CASE STUDY 9: METROPOLITAN SHENZHEN

Rail + Property for Transit-Oriented Development

Jiawen Yang and Jiangping Zhou


The Synthesis Report offers a range of integrated solutions (Mehrotra 2020).
Learning from Hong Kong SAR China’s low-fare yet profitable metro model, Shenzhen has scaled up Rail plus Property development as a means to finance an extensive rail network.

**KEY FINDINGS**

1. The expansion of the special economic zone (SEZ) to cover Shenzhen’s whole territory coupled with provincial legislative power consolidated its efforts in integrated planning for the whole metropolitan city. Shenzhen pioneered the integration of transport and land development planning, providing a blueprint for other Chinese cities to move from cash to land contributions to fund metro projects. However, its ability to learn from neighboring Hong Kong SAR, China was also a significant asset.

2. As public land ownership enables local governments to capture land value uplift, integrating transport and land is strategic to city finances, but also creates tension between protecting agricultural land and local economic development. Transit-orientated development (TOD) and rail plus property (R+P) planning developed in Shenzhen offers urban mobility and associated financing solutions. However, China’s current institutions favor state-owned-enterprises, particularly those owned by city governments.

3. The integration of transit investment, land development, and finance has not only enhanced city government’s ability to deliver metro projects but also enabled better outcomes for urban transport, land preservation, and emissions reduction.
IDEA IN BRIEF

Cities can integrate in phases, utilizing a combination of national strategic economic development programs, such as the expansion of special economic zones or industrial parks, and metropolitan infrastructure initiatives like mass transit.

Shenzhen scaled up its successful Special Economic Zone’s integrated planning by incorporating adjoining urban areas into one metropolitan region. The city is stitching together fragmented super-sized urban blocks with an extensive metro rail network financed by a rail-plus-property (R+P) model that integrates transport, real estate, and land development.

The city collaborates with its metro rail authority to jointly profit from increases in property value along new rail lines. Metro rail auctions real estate development rights to private developers around train stations to maximize revenue. High-intensity development around the metro has the added benefit of cutting down the use of carbon-intensive cars and reducing sprawl.
The Metropolitan Context

THE MEGACITY OF SHENZHEN is one of four first-tier cities in China, especially known for its innovation and tech industries. Shenzhen is viewed as China's model city for showcasing the country's policy of reform and opening-up. Its growth and relationships with neighboring jurisdictions over the past four decades shows a history of regional cooperation.

Shenzhen is located in the Greater Bay Area, also known as the Greater Pearl River Delta, which surrounds the Pearl River estuary where the river flows into the South China Sea. The Greater Bay Area is a megalopolis that includes China's Hong Kong Special Administrative Region (SAR), the Macao SAR, and nine delta cities: Dongguan, Foshan, Guangzhou, Huizhou, Jiangmen, Shenzhen, Zhaoqing, Zhongshan, and Zhuhai. This area has witnessed unprecedented growth during the past few decades, transforming from mostly agricultural land into a global economic center.

DESIGNATIONS OF THE SHENZHEN REGION

In the 1970s, Shenzhen was the county seat of the then-rural Bao’an County, with a land area of 1,997 square kilometers. In 1979, Bao’an County was renamed Shenzhen City, and in 1980 its interior portion (328 square kilometers) was classified as a special economic zone (SEZ) when it was still a small town focused on farming and fishing. One reason Shenzhen was designated an SEZ was its proximity to Hong Kong SAR, China, a former colony of Great Britain. In the early 1980s, many manufacturing activities moved from Hong Kong to the Shenzhen SEZ and other parts of the delta, attracted by cheaper land, labor, and operating costs, accelerating regional cooperation within the Greater Bay Area (Hong Kong SAR 2017).

Hong Kong, SAR China and the government of Guangdong Province have explored opportunities to facilitate Greater Bay Area cooperation to enable even more growth (Hong Kong SAR 2017). In the north, west, and east, Shenzhen shares boundaries with Dongguan and Huizhou, two prefecture-level cities in Guangdong Province that have increasingly enjoyed the spillover effects of Shenzhen’s fast development.

China does not have an official definition for “metropolitan area.” The geographic scope of Metropolitan Shenzhen today can be delineated in two ways: first, based on its concentrated metropolitan population, or second, based on the regional interconnections among local governments. Following the first approach, the City of Shenzhen itself can be viewed as a metropolitan area, boasting a jurisdiction of 1,997 square kilometers and a total population of more
than 13 million. Its four inner urban districts—Futian, Luohu, Nanshan, and Yantian—form the central part of this area and the entire area is known as the Shenzhen Metropolitan Area (SMA).

Under the second approach, the region consisting of Shenzhen, Dongguan, and Huizhou has been named the Shenzhen-Dongguan-Huizhou Metropolitan Area. In this area, Shenzhen is the “primate” city. This term was coined to encourage intergovernmental collaboration and was not based on commuting flow patterns; in fact, few workers from Dongguan and Huizhou commute to Shenzhen’s inner-city area.

This case study focuses on the Shenzhen Metropolitan Area as defined in the first approach.

**POPULATION DENSITY AND GDP**

Table 1 presents the population, density, and GDP statistics of the SEZ, SMA, and greater metropolitan area. The SEZ portion of Shenzhen, which was set up in 1980 comprising the four central districts, is the most developed area in the SMA. Covering 328 square kilometers, it has a very high population density of nearly 12,000 persons per square kilometer (1.84 times the average density of the SMA) and a high GDP per capita (1.44 times higher than in the SMA). The large Shenzhen-Dongguan-Huizhou Metropolitan Area covers more than 16,000 square kilometers. Compared with the SMA and SEZ areas, it has a lower population density and GDP per capita.

<table>
<thead>
<tr>
<th>SCOPE</th>
<th>POPULATION (THOUSANDS)</th>
<th>AREA (KM$^2$)</th>
<th>DENSITY (PERSONS/KM$^2$)</th>
<th>GDP ($ BILLIONS)$a</th>
<th>GDP PER CAPITA ($ THOUSANDS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shenzhen Special Economic Zone (SEZ)</td>
<td>4,410</td>
<td>328</td>
<td>11,984</td>
<td>166</td>
<td>37.8</td>
</tr>
<tr>
<td>Shenzhen Metropolitan Area (SMA, 10 districts)</td>
<td>13,026</td>
<td>1,997</td>
<td>6,523</td>
<td>339</td>
<td>26.0</td>
</tr>
<tr>
<td>Shenzhen-Dongguan-Huizhou Metropolitan Area</td>
<td>26,284</td>
<td>16,061</td>
<td>1,636</td>
<td>512</td>
<td>19.5</td>
</tr>
</tbody>
</table>

a Here and throughout this chapter, all dollar amounts refer to US dollars.

Source: SSB 2018; GSB 2018.
Population density is uneven in the SMA (see Maps 1 and 2). Futian and Luohu districts, two of the four inner districts of Shenzhen, are the densest and the most developed. The central part of Nanshan district is also highly developed with many high-tech firms and related services. In recent years, the northern part of Shenzhen’s central axis (i.e., the Longhua district) and the western part of Longgang district) experienced significant population growth, partly because of the introduction of metro services that link them with the central part of the SMA.

The urban expansion of Shenzhen follows a “ribbon development” pattern. Major regional transport corridors were instrumental in urban expansion. By the 1990s, the central city was highly developed and by 2020, most areas in the eight districts, excluding Dapeng and Yantian, were densely populated.

The administrative jurisdictions of city service providers follow the municipal boundaries of Shenzhen City. Within the city, the subdivision of service supply may or may not follow the district boundary, as illustrated by the example of water supply service (see Map 3). The 10 districts in Shenzhen are served by five subdivisions of water supply: western coast, central, mideast, east, and eastern coast (SPNRB 2017).

After 40 years of development, the SMA has a relatively complete transport network. Intercity highways and intracity expressways link some built-up areas. The SMA has eight metro lines with 167 stations and a total length of 285 kilometers. Most of these stations are concentrated in the central districts: Luohu, Futian, and Nanshan (see Map 4).

**SPECIAL ECONOMIC ZONE STATUS**

The most significant factor accounting for Shenzhen’s tremendous progress stems from its role as one of China’s special economic zones, a status that grants Shenzhen preferential treatment (Box 1). This privilege was initially limited to the inner area of Shenzhen and then expanded to the whole municipal territory. Similar government consolidation has happened in many other Chinese cities, with similar planning integration processes.
To estimate population density, LandScan uses remote sensing imagery analysis to disaggregate census counts within an administrative boundary. As a result, built-up areas such as airports and industry may appear to have a residential population where there isn't one.

SOURCES: LANDSCAN; NASA SRTM 30m; OpenStreetMap Contributors

MAP PROJECTION: UTM ZONE 49N, WGS-84 DATUM

Population per square kilometer

50 KILOMETERS
Shenzhen is one of China’s first and largest SEZs, established in 1980. It remains the pacesetter of its economic liberalization policy.

**Box 1. Urban Innovations**

**Establishment of the Special Economic Zone**

In the four decades since 1978, China’s Reform and Opening-up Policy has sparked rapid economic growth across China. The four special economic zones (SEZs), of which Shenzhen is the largest, are considered to be the pacesetters of this policy. Special preferential policies and flexible institutions to promote export-oriented economic development are first piloted in SEZs. Because of its proximity to Hong Kong SAR, China, Shenzhen was selected as one of the first SEZs in 1980 and so far, Shenzhen is China’s most successful SEZ.

**Local legislative power**

The SEZ of Shenzhen was granted provincial legislative power by the National People’s Congress in 1992. Usually, such power is given only to a provincial government. With this power, the SEZ can formulate local regulations according to actual situations and development needs, as long as the regulations do not conflict with national laws. Local legislative power provides Shenzhen with great institutional flexibility. According to a recent statement by the Director of the Standing Committee of Shenzhen People’s Congress, Shenzhen has enacted more than 400 regulations or regulation-related decisions since 1992, of which 167 are still in effect. These regulations have made great contributions to Shenzhen’s prosperity and stability.

**Elimination of the former SEZ boundaries**

When it was first established in 1980, the Shenzhen SEZ covered the four central districts of Shenzhen, namely Futian, Luohu, Nanshan, and Yantian, all adjacent to Hong Kong SAR, China. Over the years, this SEZ prospered, significantly outperforming other areas in Shenzhen. This economic gap in the area was considered a major challenge for many years. In 2010, the SEZ was extended to all of Shenzhen, which enabled the city government to expand SEZ policies to non-SEZ areas and enhance its planning and development control. Currently, the whole territory of Shenzhen is unified under the same set of development plans. Similar government consolidation has happened in many other Chinese cities, with similar planning integration processes (Yang and Li 2014).
HOW INTEGRATED PLANNING IS DEFINED AND ADOPTED

WITH ITS HISTORY as a planned economy, China has considerable experience in integrated planning, though it has not always been called “integrated planning.” The closest term for such an integration mechanism in China may be “comprehensive or unified planning.” The former term points to the practice of including into a comprehensive plan as many relevant sectors as possible. The city masterplan is a typical example. The latter term denotes a practice that keeps relevant plans separate but emphasizes their consistency. This practice was promoted to solve inconsistencies between land use plans and city masterplans, which eventually led to the unified spatial planning practice of today.

Although it describes integrated planning practice in general, this case study focuses on the integration of transport and land, which China has recognized as significant for economic development. Since China opened its economy, its local governments have striven to impress higher-level government leaders with their economic development. To do that, they have primarily relied on land lease revenue to finance infrastructure and local economic development. In addition, they have often used transportation and other infrastructure investments to trigger higher land lease values.

Public land ownership in China enables local governments to garner the appreciated land value stemming from infrastructure investment to capture at least the short-term benefits of the transportation investment. A plan that carefully integrates infrastructure investment and land development therefore helps the local government garner more resources for local economic development (Wu 2015).

In Shenzhen, constraints in land supply together with rising automobile ownership and traffic congestion led to a transit-centered development strategy, which emphasized transit investment and high-density development. As a result, integrated planning efforts have focused on managing land development, metro investment, and the integration of the two along metro lines and around stations.

THE CITY’S PLANNING FRAMEWORK

The baseline for urban development planning in Shenzhen is characterized by three separate but relevant plans: the Shenzhen Economic and Social Development Plans (ESDP), the Shenzhen Land Use Plan, and the Shenzhen City Master Plan.

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1 Comprehensive planning is referred to as zhonghe guihua in Chinese and unified planning as duogui heyi.
The overall urban planning system in Shenzhen can be described as “three levels and five stages”.

ESDPs are plans that set goals for national or local economic and social development in the long term (20 years), medium term (10 years), and short term (5 years), to guide land use plans and masterplans. They are compiled by the Municipal Development and Reform Bureau or Commission and approved by the local People’s Congress, after consulting with officials and representatives from different functional areas at both the municipal and provincial governments.

Municipal land use plans are overall plans for land use that meet the requirements in a wide array of areas: the national economic and social development goals (set in various ESDPs), national and provincial land consolidation plans, local resource conservation and environmental protection rules, land supply quotas (set by the central government), and various construction projects within the local jurisdiction. Usually, a municipal land and resource agency oversees the local land use plan. Sometimes, a joint agency—combining the land, resource, and planning agencies—will produce both a land use plan and a masterplan for a city. In the SMA, for instance, the Shenzhen Bureau of Planning and Natural Resources is responsible for both land use plans and city masterplans.

Most details regarding masterplans, such as their content, processes, and responsible agencies, are defined in the Urban and Rural Planning Law of China. At the municipal level, the Bureau of Urban Planning is responsible for leading the effort to draft masterplans. However, the functional-area plans (also called sector-based plans) are often the responsibility of other specialized bureaus. The road and public transport plans, for instance, are the responsibility of the local transport bureau. This can be considered as a horizontal division of labor among different bureaus.

The Shenzhen Master Plan is comprehensive, and it covers much of the content of the Shenzhen ESDP, the Shenzhen Land Use Plan, and even conventional public policies at the municipal level. Its content and format are specified in two documents:

• *Regulations on Urban Planning of Shenzhen*, which specifies various plan components and related outputs in Shenzhen; and

• *Shenzhen Urban Planning Standards and Guidelines*, which specifies various technical standards for plan making, is based on the *Regulations on Urban and Rural Planning of Guangdong Province*, the *Regulations on Urban Planning of Shenzhen*, and other relevant laws and regulations.

The overall urban planning system in Shenzhen can be described as “three levels and five stages” (see Figure 3). The three levels are the city (metropolitan) level, the subcity (submetropolitan area) level, and the local level. The five stages are the Shenzhen Master Plan at the metropolitan level, the submetropolitan plan, the local/district plan, the Statutory Graphic Standard, and the Shenzhen Layout Plan.
To ensure compliance with ESDPs, both land use plans and masterplans also follow the temporal horizons of 20 years for the long-term plans, 10 years for medium-term plans, and 5 years for short-term plans. Both the long-term plans and the medium-term plans set up strategic goals and guidance for the future. Short-term plans outline the interventions to be made and projects to be carried out to ensure that the goals in the long-term plans are met. For cities designated as nationally important, including Shenzhen, the State Council (the central government) requires these masterplans to pass a mandatory review led by the relevant central ministry.

City masterplans—that is, plans designed at the municipal level—are overall arrangements for the development of cities or towns including details on land use layout, comprehensive transport systems, infrastructure such as water, sewage, and electricity, and services such as schools and hospitals. These plans serve as platforms for the horizontal integration of all infrastructure sectors in the urban development process. When they are being drafted, the municipal bureaus of relevant sectors are invited to review them and provide input.

The cluster plans, statutory graphic standards, and layout plans cover the same set of information as masterplans but with smaller geographic coverage,
and they all go through a similar horizontal integration process. If conflicts or necessary improvements are identified, the team will discuss them with the bureau responsible for the respective plans to ensure that planning documents kept by different bureaus are synchronized.

**PROCESSES, FINANCING, AND IMPLEMENTATION MECHANISMS**

Over the past four decades, these three types of plans—ESDPs, land use plans, and masterplans—have changed significantly in Shenzhen, and so have the corresponding agencies responsible for them. Two separate agencies used to be responsible for land use plans and masterplans, but in recent decades the two were merged into a single entity responsible for both kinds of planning, which makes plan integration more feasible. Of course, the merger of those bureaus does not solve all problems, as full horizontal coordination is hard to achieve.

Vertical coordination is also needed, because the bureaus need to both address the concerns of the local government and also follow the rules and specific requirements of their respective supervisory entities at the provincial and national levels. For example, the amount of developable land for each city is specified in an upper-level plan by the province or national government. This land quota is typically viewed as a constraint by the local government, which oversees economic development and must respond to local demand for more land.

**Multiplanning integration for land management**

The amount of land available for urban development or redevelopment determines local governments’ ability to use land-value-capture mechanisms. As a result, local governments always try their best to expand their base for land development, something that is closely watched by the central government. The battle between the local governments’ efforts to maximize the use of land and the central government’s efforts to protect basic agricultural land eventually led to the integration of ESDPs, land use plans, and masterplans, not only in Shenzhen but also in all other cities in China in recent years.

Economic and social development plans forecast local development trends, which are then used to estimate the local demand for land. The land use plans then specify the amount of land that can be supplied for future urban use. The planning follows a top-down approach, as the quota for developable land is specified by higher-level governments, that is, the central and provincial governments. The masterplan at the city level must resolve issues between land demand and supply. Usually based on optimistic assumptions about the future, the city specifies where development will happen and, thus usually requests a higher land quota.

Even though it would be logical to expect coherence among the three plans because they are prepared for the same local government, they are usually based on different rationales and can forecast different results. A common conse-
sequence of this mismatch is overdevelopment of land at the local level. In China, city population growth tends to be forecast to happen faster than it actually occurs. This has helped local governments increase their land quota, which may not be efficiently utilized (Li and Wang 2007).

BOX 2. TIMELINE FOR SHENZHEN’S INTEGRATED PLANNING EFFORTS

The major events that provided the basis for Shenzhen’s integrated planning efforts that led to more effective land development management are described below.

Shenzhen’s first masterplan (1986). The sector-based plans covered only the four SEZ urban districts (Zhang 1999; Zou 2013). It assembled components of land use, transport, sewage and electricity, which were planned separately by specialized government bureaus such as the transport bureau and electricity bureau. The coherence of this masterplan was limited as there were few regulations regarding coherence across sectoral bureaus.

Merger of land and planning bureaus a single entity (1989). Shenzhen’s Land and Resource Bureau and Planning Bureau were merged in 1989 into a single Planning, Land, and Resource Bureau. This merger aimed to facilitate the integrated planning of land use and city development and had been made possible through the special local legislative power granted by the central government (Wang and Xiang 2009). This was a significant move toward integrated planning, which became more institutionalized than ever when the responsibilities of local masterplanning and land use control were established under a single agency.

Central government approval of expanded development into non-SEZ areas (1991). Shenzhen received the central government’s approval to expand its development areas into what were then non-SEZ areas (Zhang 1999). This approval made more land available for Shenzhen’s economic development. The Planning, Land, and Resource Bureau was empowered to take a citywide approach with new plans. It began to employ GIS techniques to provide benchmarking for planning in different bureaus. Conflicts between other relevant plans such as the ESDP and land use plan began to emerge (Tan 2015; Wang and Xiang 2009; Zhang 1999; Zou 2013).

Creation of a separate bureau for planning (2004). In 2004, the Planning, Land, and Resource Bureau was divided into two bureaus: Land, Resource, and Housing Management Bureau and the Planning Bureau (Zhou 2013). This move was made in the belief that too much responsibility for the Planning, Land, and Resource Bureau would easily lead to decision-making mistakes (Huang 2012). As a result, land use plans and masterplans became divided
in two separate units again. But shared review processes across the two plans were introduced to ensure consistency. Both land use plans and masterplans are required to be coherent with the ESDP. Land Use Plans at the district level were added to enhance coherence between the land use plan and the masterplan (Tan 2015; Wang and Xiang 2009; Liu and Liu 2011).

**Merging of separate bureaus into a single bureau (again) to cover both planning and the management of land, resources, and housing (2009).** The Land, Resource, and Housing Management Bureau and the Planning Bureau were merged again, this time into an Urban Planning, Land, and Resource Commission. The new commission took responsibility for making, monitoring and organizing reviews of land use plans and masterplans (Zhou 2013).

**Reorganization of Shenzhen’s administrative structure to better manage urban development outside the non-SEZ area (2010).** Within the then Bao’an and Longgang Districts, Shenzhen created four special urban districts: Dapeng, Guangming, Longhua, and Pingshan (Wang 2013; Zou 2013). The SEZ policy was expanded to cover every corner of Shenzhen. Comprehensive development planning was introduced for the new districts. Efforts for integrated planning increased. The Municipal Development and Reform Commission and the Urban Planning, Land, and Resource Commission oversaw sectors and institutions that were included in the integrated masterplan. Sectors and institutions were expected to agree on development sequences, key issues, strategic management, and objectives for future development before detailed plan making. They were also required to share data on the same geographic information system (GIS) platform. Relevant plans were required to have a strategic component and an implementation plan (Wang 2013).

**The central government’s requirement that city masterplans and land use plans be integrated into a spatial planning framework (2018).** Planning authority over the spatial planning (framework) was assigned to the local bureau managing land and natural resources. This requirement applied to all cities in China but had little impact on Shenzhen, where plans largely followed Shenzhen’s past practice. Shenzhen will work on integrated spatial plans like all other cities and phase out formerly separated land use plans and masterplans at the city level.

**Integrated planning in the transport sector**

For a period, transport planning in Shenzhen was siloed and managed by different institutions. Responsibilities for rural, intercity, and water transportation were assigned to the Bureaus of Transport, whereas responsibilities of urban transport were assigned to the Commission of Construction and the
Planning Bureau. Thus, confusion often arose when urban areas expanded: the relevant sectors or bureaus were unsure of their respective responsibilities. Comprehensive urban transport planning that synthesized transport-related plans drafted by separate entities across different levels of government was not required by law in China. Leaving the initiative to local municipalities to decide whether an integrated multimodal transport plan was needed resulted in a lack of integration. (Yang and Fang 2015).

As with multiplanning integration for land management, described earlier, Shenzhen introduced an institutional reform for transport planning and management ahead of the central government’s requirements. In 1996, Shenzhen created an urban transport management headquarters to oversee and coordinate urban transport planning, financing, and implementation and to ensure that urban transport development followed the policies, the city’s masterplan, and the budget. In 2001, the city created a comprehensive urban transport commission, based on successful experiences, with responsibilities for almost all transport modes and services, including roads, urban transit, waterways, seaports, railways, urban rail, airport, freight logistics, and postal services. Starting in 2005, comprehensive transport planning was conducted every five years to coordinate different transport modes, regardless of which entities were involved (Zhang et al. 2010).

A significant change came in April 2008, when China’s central government decided to move the responsibility for urban road transportation planning and management from the Ministry of Housing and Urban–Rural Development to the new Ministry of Transport. Part of the reason for the move was to consolidate the planning and management of different modes of urban transportation such as road transportation, subway, buses, and private motorized transportation. Following this announcement, all city governments were required to create a comprehensive transportation policy-making commission or bureau. Shenzhen had made the required change in 2001, five years in advance.

The connection between transport investment and land development has always been under the scrutiny of the Shenzhen municipal government. In 2006, Shenzhen set up a transport planning framework consistent with that of the masterplans. Like masterplanning, this effort includes planning at five levels: comprehensive transport planning, a cluster transport plan, a special plan for component transport modes such as rail transit, a district transport plan, and a transport layout plan; as well as implementation plans for the short term (three years) and every year (Zhang, Yuan, and Chao 2016; Zhang et al. 2010). All the innovations described here paved the way for an integration of metro investment and land development.
TOOLS AND SECTORS INVOLVED

As a city facing severe land constraints, Shenzhen's development has followed a high-density development pattern. The vitality of the city depends on a well-functioning and extensive metro system. Significant efforts were put into planning for transit-oriented development and for “rail and property” (R+P) development, both of which can foster integration between land development and rail transit at especially around rail stations.

Transit-oriented development

Transit-oriented development is an integrated strategy for compact, mixed-use, and pedestrian-friendly development connected to transit stations. Setting up a transit-oriented development planning mechanism based on master and transport plans is a fundamental step to ensuring that planning contributes to future urban vitality. Shenzhen’s transit-oriented development program includes citywide development strategies, submetropolitan and route-level development planning requirements, and design guidance for station-level development. Suitable areas have been identified for metro alignment, station placement, and transit-oriented development, although these locations may or may not follow the density criteria (Zhang et al. 2010; Zhang et al. 2011; Shao et al. 2011; Yang et al. 2016).

With transit-oriented development, land development can be tailored for denser development around rail stations, which provides the opportunity to capture the increasing land value that comes from the infrastructure investment and that can in turn be used to finance infrastructure and sustain ridership. In mainland China, because land is publicly owned, the city government can use the land lease revenues from relevant parcels to fund rail transit construction and provide operational subsidies. This mechanism helps lower the pressure for the government to fund expensive metro projects with tax revenues.

Rail and property development

R+P as a development practice is relevant to the concept of transit-oriented development. While the latter refers to the planning practice that emphasizes clustered development around transit stations, the R+P model goes a step further by creating a joint development of transit infrastructure and real estate and by allowing the metro operator to participate in the relevant real estate projects (Tang et al. 2005).

The term R+P was first used to describe the involvement of the Hong Kong Mass Transit Railway Corporation (MTRC) in real estate development around stations. The R+P model has been used in Hong Kong SAR, China as a value-capture tool to finance railway infrastructure. Under the R+P model, the MTRC acquires the right to develop land around or above each railway station at the market.
price based on the “greenfield” site value and sells or leases the completed development projects at the market price after the rail station is built (Cervero and Murakami 2009). Due to the accessibility and agglomeration benefits brought by railway projects, MTRC can capture the land value increment (Chang and Phang 2017). This approach is well suited to financing rail infrastructure and advancing transit-oriented development in the rapidly growing cities of mainland China, where many cities, including Shenzhen, have imitated this joint development model.

Implementation

This section focuses on the implementation of an integrated planning approach in Shenzhen. As transit-oriented development, it involves the articulation of land use and transportation projects, and the additional infrastructure required to provide the necessary services for the additional population that transit-oriented development projects are expected to attract to live near metro stations.

The first two metro lines in Shenzhen, known as Line 1 and Line 4 (the first portion), started operation in 2004, making Shenzhen the fifth city to operate a metro system in mainland China. That project was carried out by the Shenzhen Metro Corporation. However, transit-oriented development planning and R+P projects involve the participation of many government units and relevant corporations. For this reason, the Shenzhen municipal government created the Rail Transit Development Headquarters for policy-making and charged it with synchronizing the actions of relevant stakeholders.

Major Players in the R+P Programs

The creation of the R+P programs in Shenzhen benefited significantly from the city’s proximity to Hong Kong SAR, China and the involvement of MTRC in the planning and investment from the beginning of Shenzhen’s metro development. Besides Shenzhen’s city government, the other two major players in this project were the local metro operator, Shenzhen Metro Corporation, and Hong Kong MTRC. A history of how these players interacted to produce transit-oriented development in Shenzhen is given in Box 2.

Shenzhen Metro

Shenzhen Metro, which was established in 1998, is completely owned by the Shenzhen municipal government. It has established a comprehensive system of rail construction, rail operation, property development, and asset management.
More recently it has begun planning to expand its business beyond urban rail and get involved in intercity and national railway development. In 2016, Shenzhen Metro claimed to be the first rail transit operator in mainland China to make a profit (SZMC 2017). By 2018, its net profit was $1 billion and its annual operating income was $1.6 billion (SZMC 2018). In 2019, it had about 19,000 employees and an average daily ridership of 4.3 million. Its registered capital was about $6.2 billion, its total assets were $54.3 billion, and its net assets were $33.3 billion (SZMC 2019).

Shenzhen Metro had completed 270 kilometers of rail track and 189 stations by 2020, including Shenzhen’s metro Lines 1, 2, 3, 5, 7, 9, and 11 as well as the southern section of Line 4. It has developed interchange hubs such as those at Luohu, Futian, Shenzhen North Station, and Shenzhen East Station. At present, it is working on completing Lines 6, 8, and 10 and extensions to Lines 2, 3, 5, 6, and 9. It operates all metro lines in Shenzhen except for Line 4, which is operated by Hong Kong MTRC.

As a real estate developer, Shenzhen Metro has obtained development rights for 12 land parcels, with a total floor area of 4.5 million square meters. About 75 percent of this area is still under construction. Seven projects are either in use or ready for sale. In 2018, Shenzhen Metro was ranked in second place in its development capability among all real estate developers in Shenzhen. It was also recognized as a “Shenzhen Real Estate Social Responsibility Benchmarking Enterprise” for its involvement in public housing and other social activities (SZMC 2019).

**Hong Kong MTRC**

Hong Kong MTRC is one of the few profitable rail transit companies in the world. Its annual passenger volume reached 2 billion in December 2018. As a metro operator, Hong Kong MTRC has achieved a punctuality rate of 99.9 percent for 10 consecutive years. In the past 10 years, Hong Kong MTRC has actively expanded its international business, with projects in mainland China that include Beijing as well Shenzhen. It has obtained railway operation franchises in the United Kingdom, Sweden, Australia, and Macao SAR, China.

The R+P practice was introduced to Shenzhen by Hong Kong MTRC. When the Shenzen Mutral Government began to plan for its metro rail, it invited Hong Kong MTRC to share its expertise, the municipal government eventually invited Hong Kong MTRC to develop and operate Metro Line 4 and develop the Tiara block, a real estate project that sits atop Line 4’s train depot.

On January 15, 2004, Schenzhen Mutral Government and Hong Kong MTRC signed the Initial Agreement on the Investment, Construction and Operation of Shenzhen Rail...
Transit Line 4. Shenzhen Metro Line 4 adopted the build-operate-transfer model. Hong Kong MTRC has a 30-year franchise for Line 4 (until 2040).

Line 4 was constructed in three stages. In the first stage, four stations and 4.5 kilometers of track were completed by December 2004. In the second stage, 16 new stations and 16 kilometers of track were completed by 2010 and began operation in June 2011. The third stage, which will extend the line to the east, is under construction now. Line 4 has become one of the most important and busiest metro lines in Shenzhen. Its average daily ridership is around 630,000 passengers, making it Shenzhen’s most profitable line as well.

Hong Kong MTRC opened a branch office in Shenzhen, which is responsible for the investment, construction, financing, and operation of Line 4. The Tiara block on the train depot is the first and only R+P project run by Hong Kong MTRC in mainland China.

**INSTITUTIONAL ARCHITECTURE**

The implementation of R+P in Shenzhen is led by the Shenzhen Mutual Government, which has helped to overcome the most significant barrier, namely access to financial resources, by pooling various resources to support metro development and enabling metro operators to participate in real estate development.

Metro developments are complex civil work projects that require communication among many government units, in this case the Shenzhen municipal government’s Budgetary Office, the Planning and Land Bureau, the Transport Commission, and the Development and Reform Commission. The metro lines typically connect the territories of different districts, so the relevant district governments are also involved. To streamline communication among stakeholders, Shenzhen Mutual Government created the Rail Transit Development Headquarters, which coordinates the various aspects of rail transit planning, design, investment, financing, construction, operation, and supervision. The secretary of the headquarters is responsible for communicating with all relevant stakeholders (Zong, Qin, and Lin 2011). The headquarters has an engineering office and an inspection office, responsible of communicating with the engineering firms for construction and inspection. When a new metro line is ready for operation, the infrastructure is handed over to the operational division of Shenzhen Metro. This example of institutional design illustrates one of the ways in which multisectoral and interjurisdictional coordination has occurred in Shenzhen for transit-oriented development (Xu 2012).

Under the Rail Transit Development Headquarters’ guidance, metro planning and land development are well coordinated. As discussed earlier (see Figure 3), Metro planning in Shenzhen happens in three levels and five stages. The three levels are system, route, and station, and the five stages are rail network planning, strategy research, construction planning, route design, and station development (Zong, Qin and Lin 2011). Metro network plans are considered in conjunction with city masterplans. Land use specifications (for example,
floor-area ratios) are also adjusted to better capture the additional value created by the metro investment, increasing the allowed density of the parcels.

The city masterplan is the platform on which to integrate all other relevant infrastructure and services, such as water, electricity, education, and health. The integration of the metro plan with the city planning process also ensures appropriate horizontal integration with other sectors.

The R+P, which adds property development to the basic work of metro projects, is another layer of complexity. The greatest challenge is to enable the metro operator to obtain land development rights. Under China’s policy of public land ownership in urban areas, the Shenzhen Municipal Government would transfer the right of way for metro infrastructure to the metro corporation free of charge, regardless of how much Shenzhen Municipal Government pays to assemble those land parcels. However, the R+P model implies that some land development rights will be used for noninfrastructure purposes, such as housing, offices, and retail space. According to the regulations of the central government, the land development rights of those “market” categories can be transferred from Shenzhen Municipal Government to the developer only through a competitive procedure involving bidding, auction, or listing.

The Shenzhen municipal government followed these central government rules in the early stages of metro development. To ensure that the metro corporation would obtain land parcels in a competitive setting, some conditions were required. For example, the selected developer was required to have experience and expertise in metro operations.

In 2013, the Shenzhen municipal government upgraded its practice to a land contribution procedure. Under this practice, the government appraises the market value of the targeted land development right, then transfers that right to Shenzhen Metro free of charge. This transfer is then recorded as a government investment in Shenzhen Metro. The state-owned Shenzhen municipal government Assets Supervision and Administration Commission, which works on behalf of the Shenzhen municipal government, performs the duties of the investor. The Shenzhen Development and Reform Commission is responsible for making annual investments and a financing plan. The Land Preparation Bureau creates lists of land parcels according to the annual investment and financing plan.

**SUSTAINABILITY**

The earliest R+P project in Shenzhen is the Qianhai Depot project. The land development rights for this project were obtained by Shenzhen Metro in 2009. Since then, Shenzhen Metro has obtained 12 additional land parcels. Four were obtained through bidding, auction, and listing, while the other eight were obtained by land value contribution, as described in the preceding section. Those 12 projects have a total land area of 109 hectares and a total floor area of 4.8 million square meters or 477 hectares (Table 2).
One impressive item is the existence of public housing in those real estate projects. Shenzhen Metro has provided 22,420 units of public housing in total, sited on top of the Qianhai Depot, the Shekou West Depot, the Henggang Depot, and the Tanglang Depot. The total floor area is 1.9 million square meters, 38.8 percent of the total floor area (Yang 2015).

### TABLE 2. SHENZHEN METRO REAL ESTATE PROJECTS ABOVE TRAIN DEPOTS

<table>
<thead>
<tr>
<th>Mode of land acquisition</th>
<th>Plot</th>
<th>Land area (hectares)</th>
<th>Floor area (hectares)</th>
<th>Land price ($ billion)</th>
<th>Inclusion of public housing?</th>
<th>Project name</th>
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<td>80.79</td>
<td>0.11</td>
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<td>0.29</td>
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<td>Langlu Home</td>
</tr>
<tr>
<td></td>
<td>Shekou West Depot</td>
<td>6.37</td>
<td>11.03</td>
<td>0.11</td>
<td>Yes</td>
<td>Longrui Home</td>
</tr>
<tr>
<td></td>
<td>Shenda Station</td>
<td>0.98</td>
<td>9.78</td>
<td>0.10</td>
<td>No</td>
<td>Technology Building</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>45.43</strong></td>
<td><strong>123.75</strong></td>
<td><strong>0.75</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land value contribution</td>
<td>Qianhai hub</td>
<td>20.01</td>
<td>133.01</td>
<td>2.04</td>
<td>Yes</td>
<td>Qianhai hub</td>
</tr>
<tr>
<td></td>
<td>Henggang Depot</td>
<td>14.62</td>
<td>32.2</td>
<td>0.17</td>
<td>Yes</td>
<td>Kam Sheung Garden</td>
</tr>
<tr>
<td></td>
<td>Mangrove Bay MTR Station</td>
<td>6.83</td>
<td>45.2</td>
<td>0.94</td>
<td>No</td>
<td>Mangrove Bay</td>
</tr>
<tr>
<td></td>
<td>Chegong Temple Hub</td>
<td>0.66</td>
<td>11.58</td>
<td>0.29</td>
<td>No</td>
<td>Huitong Building</td>
</tr>
<tr>
<td></td>
<td>Shenzhen North station</td>
<td>3.96</td>
<td>31.59</td>
<td>0.42</td>
<td>No</td>
<td>Huijiang Business Center</td>
</tr>
<tr>
<td></td>
<td>Antuo Mountain Parking Lot</td>
<td>13.55</td>
<td>53.34</td>
<td>1.29</td>
<td>No</td>
<td>Antuo Mountain</td>
</tr>
<tr>
<td></td>
<td>Tanglang F Block</td>
<td>4.28</td>
<td>12.77</td>
<td>0.26</td>
<td>No</td>
<td>Tang Lang</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>109.44</strong></td>
<td><strong>477.44</strong></td>
<td><strong>6.15</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Websites and news releases of Shenzhen Metro.
Shenzhen Metro developed relatively small projects, such as the Shenda Station project, by itself. For larger projects, Shenzhen Metro partnered with other real estate developers. The Tanglang Depot project was developed by a joint venture with a real estate developer. The Henggang Depot and Qianhai Depot projects were contracted to a third party. In 2018, Shenzhen Metro became the largest shareholder of Vanke Group, one of China’s biggest real estate developers. Since then, real estate projects have typically been carried out by joint ventures between Shenzhen Metro and Vanke.

**PRIVATE-SECTOR PARTICIPATION**

Private-sector participation has been sought in China to relieve the government’s fiscal burden on infrastructure investment. It is also viewed as a means to improve projects’ operational efficiency (Papajohn et al. 2010). To encourage public-private partnership in metro development, the central government makes an exception to the upper limit of 60-percent debt-to-assets ratio. If the project is trusted to a corporation under a franchise, this upper limit can be removed. So far, Hong Kong MTRC is the only private participant in mainland China’s metro development. Both the successes and failures in mainland China can help inform the public-private partnership environment.

R+P projects are complicated. The Tiara project mentioned earlier is a legacy of a much larger planned R+P program. In 2005, Hong Kong MTRC and Shenzhen municipal government planned to carry out an R+P program along Line 4 involving 80 hectares of land. This initial agreement was rejected by the central government, which was worried that too much land had been handed over to Hong Kong MTRC. Eventually, Hong Kong MTRC received only 8.9 hectares of land for the Tiara project.

Starting from its involvement in Shenzhen, Hong Kong MTRC has tried to expand its R+P business to other Chinese cities, including Shenyang, Tianjin, Beijing, Chengdu, and Hangzhou (Table 3). In these cases, Hong Kong MTRC created a joint venture with a local state-owned enterprise (SOE) that received a franchise of 20 to 30 years from the city government. None of these plans has yet materialized. Some of them reached the stage of a formal contract but they were discontinued for various reasons (Ke et al. 2011).
Shenzhen’s Futian District, landmarked by the Ping An Finance Center, which is the city’s tallest skyscraper, illustrates its capacity to integrate transportation, land, property development, and green space.

Source: BINGFENG WU/ Moment via Getty Images.
<table>
<thead>
<tr>
<th>CITY / YEAR</th>
<th>NATURE OF CONTRACT</th>
<th>PROJECT</th>
<th>GROSS FLOOR AREA (M2)</th>
<th>CURRENT STATUS</th>
<th>DEVELOPER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shenyang / 2009</td>
<td>Cooperative development agreement</td>
<td>The real estate surrounding Shenyang Metro Lines 1 and 2</td>
<td>-</td>
<td>Discontinued</td>
<td>Shenyang MTR.: MTRC shares accounted for 49%; Shenyang government accounted for 51%</td>
</tr>
<tr>
<td>Shenzhen / 2011</td>
<td>Formal contract</td>
<td>Shenzhen Metro Line 4 (Tiara)</td>
<td>About 206,167</td>
<td>Completed</td>
<td>MTRC (Shenzhen)</td>
</tr>
<tr>
<td>Tianjin / 2013</td>
<td>Formal contract</td>
<td>Land use right of the North Canal Station, Tianjin Metro Line 6</td>
<td>About 60,000</td>
<td>Discontinued</td>
<td>Tianjin City Railway Port Construction Co. Ltd.: MTRC accounts for 49%; Tianjin Underground Railway Group Co. Ltd. accounts for 51%</td>
</tr>
<tr>
<td>Beijing / 2017</td>
<td>Letter of Intent</td>
<td>Property development of the Beijing Metro Daxing Line North Extension, Nanzhao Road Depot</td>
<td>-</td>
<td>No progress</td>
<td>-</td>
</tr>
<tr>
<td>Chengdu / 2018</td>
<td>Memorandum of understanding</td>
<td>Joint development around stations along the Chengdu Metro</td>
<td>-</td>
<td>No progress</td>
<td>-</td>
</tr>
<tr>
<td>Hangzhou / 2018</td>
<td>Memorandum of understanding</td>
<td>Joint development at the Hangzhou West Railway Station</td>
<td>-</td>
<td>No progress</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: News releases of Hong Kong MTRC and relevant city governments.
This difficulty might be attributed to city government’s leadership changes and the relatively low price of real estate in Chinese cities compared to that in Hong Kong SAR, China. Based on a survey conducted in both mainland China and Hong Kong SAR, China, one study found that the factors that should be considered to establish partnerships between Hong Kong and the mainland include equitable allocation of risks, judicious government control, transparent and efficient procurement process, project economic viability, and available financial market (Cheung et al. 2012).

Another factor that helps explain the difficulty of completing these projects is the competition from local SOEs. For example, after it completed Line 4, Hong Kong MTRC made no progress in Shenzhen, but the R+P practice it had deployed has nevertheless been widely used in Shenzhen. Although both Shenzhen Metro and Hong Kong MTRC say they want to work on more projects, Shenzhen municipal government has favored its own SOE. Among the 35 mainland cities with metros in operation, more than 20 have implemented joint development projects, all with the local SOE as the developer. For example, Shenzhen Metro built and operates Shenzhen Metro Line 6 and will develop Changzhen depot block. Tianjin Metro is undertaking Tianjin Line 6’s property development.

The success of SOEs in the R+P projects can be explained in alternative ways depending on perspective. For example, a personal relationship between the leaders of the SOE and the city government (Wang, Zhu, and Chen 2017) is one plausible explanation, while another is the ability of SOEs to qualify for bank loans to finance expensive infrastructure projects (De Jong et al. 2010). Also an SOE has an advantage in that during project implementation, it has the opportunity to renegotiate the contract with the city government with updated cost and revenue information. Of course, this relationship between the city government and local SOEs may also raise issues of accountability and transparency.

**RISK MANAGEMENT**

A major factor could be the different ways risk management is dealt with by state-owned and private businesses. The profit-driven Hong Kong MTRC must have access to enough land around a metro station to develop and sell it for a profit, whereas Shenzhen Metro, which does not need to turn a profit, can accept much less land.

The key question for a R+P project is the amount of land the city government must give to the developer to make the project financially viable. This decision is always based on imperfect information. Whereas the engineering cost of the project can be estimated with a certain confidence, the future profit from the real estate market is much more difficult to estimate and depends on the land supply that the local government controls. Packaging metro and real estate projects together further increases this complexity.
Hong Kong MTRC is an overseas corporation listed in the Hong Kong Stock and Security Market, which implies a conservative risk appetite. To lower project risks, it tends to seek more land than the local metro corporation. However, local government leadership tends to be hesitant to allow this, since too much land for Hong Kong MTRC might trigger rent-seeking questions and endanger political careers. By contrast, the local SOEs are much more flexible, usually willing to sign a contract even if their internal estimates point to an insolvency, as well as to incorporate social needs such as public housing into their projects.

**BOX 3. THREE STAGES OF METRO PLANNING**

Shenzhen is ready to start its fourth stage of rail transit development. The funding for the expensive metro projects has moved from cash contribution to land contribution, and this has also paved the way for the integration of transit investment and land development. Table 4 summarizes the stages.

**TABLE 4. STAGES OF INTEGRATED PLANNING IMPLEMENTATION**

<table>
<thead>
<tr>
<th></th>
<th>FIRST STAGE</th>
<th>SECOND STAGE</th>
<th>THIRD STAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length of line</strong></td>
<td>About 22 km</td>
<td>About 157 km</td>
<td>About 255km</td>
</tr>
<tr>
<td><strong>Total investment (US$)</strong></td>
<td>0.24 billion</td>
<td>1.54 billion</td>
<td>3.15 billion</td>
</tr>
<tr>
<td><strong>Investment and financing model</strong></td>
<td>Government contribution: 70% (cash) Enterprise finance: 30%</td>
<td>Government contribution: 50% (cash) Enterprise finance: 50%</td>
<td>Government contribution: 50% (land) Enterprise finance: 50%</td>
</tr>
<tr>
<td><strong>Integration development</strong></td>
<td>Rail separated from land</td>
<td>Transit-oriented development</td>
<td>Practice of R+P</td>
</tr>
<tr>
<td><strong>Rail network planning and design</strong></td>
<td>Engineering-led</td>
<td>Planning-guided</td>
<td>Planning-guided</td>
</tr>
</tbody>
</table>

*Source: Yang 2016; and related materials.*

**The first stage: Lack of integration (by 2005)**

In 1996, the Shenzhen municipal government made its first plan for a metro system. The plan included nine metro lines, which were included in the second version of the city's masterplan. The alignment of the metro lines and station placement was mainly based on criteria such as engineering feasibility and cost control but not closely coordinated with land development. When the first 22 kilometers of track were constructed, Shenzhen Metro received a large cash grant from Shenzhen municipal government's general revenue, which was 70 percent of the total investment. It financed the remaining 30 percent with a bank loan, for which Shenzhen municipal government provided a guarantee.
The second stage: Transit-oriented development as a value-capture tool (2005–11)

The appearance of transit-oriented development as a widely accepted concept in China comes from not only its transport benefits, but also from its potential as a value-capture apparatus (World Bank 2018). The more Shenzhen municipal government’s land parcels around metro stations appreciate in value from metro investment, the higher the capability of Shenzhen municipal government to fund the metro investment. Therefore, in metro planning practice in China, city governments tend to place some metro stations in underdeveloped land parcels. The sales of land right around those stations contributes to the government revenue (Yang et al. 2016). Since the metro system is funded by the city government, a value-capture mechanism therefore is built into the public land ownership.

This value-capture mechanism not only has impacts on station placement, but also on development density in the station areas. Parcel value depends on its building potential (including floor area). As a result, development density bonuses, ranging from 20 percent to 80 percent of the baseline density, have been typically granted to land parcels in proximity to stations. However, with this approach, the city government was able to fund only 50 percent of the total investment cost in cash.

At this stage, the city government began to experiment with the R+P model. The major purpose was to replace cash contributions with land contribution. MTRC’s Tiara project in Hong Kong SAR, China was the experimental example.

The third stage: Rail and property (R+P) development (2012–18)

Shenzhen municipal government favors the R+P model because it relieved the government from the need to provide cash contributions to metro projects. The land development rights obtained by the metro corporation can be used to leverage a bank loan. Shenzhen Metro also supports this approach because it is eager to get involved in the booming real estate market. To enable a smoother transfer of land development rights from the city government to the metro corporation, the city government implemented the approach of land contribution. During this stage, the city government still funds 50 percent of the total cost, but only in the form of a land contribution. This R+P approach enables the metro corporation to develop real estate projects above the stations, over the train depots, or in proximity to a station exit. Those projects are well designed and integrated with the metro infrastructure.
The central government of China has strict entry standards for cities interested in constructing metro systems, primarily driven by a desire to lower city governments’ fiscal uncertainties. The two most representative and authoritative documents for the control of urban metro system issued by the central government of China are the “Notice of the General Office of the State Council on Strengthening the Construction and Management of Urban Rapid Rail Transit,” issued in 2003, and the “Opinions of the General Office of the State Council on Further Strengthening the Planning and Construction Management of Urban Rail Transit,” issued in 2018 as an amendment to the former.

Both documents have minimum requirements on municipal annual revenue. In 2003, the required minimum amount was $1.4 billion, which was increased to $4.2 billion in 2018. The minimum GDP requirement has also increased, from $14 billion to $42 billion. The 2018 document also requires that the urban population be a minimum of 3 million and that the planned metro line have a predicted peak daily volume of at least 0.7 million riders per kilometer of track at the beginning of metro operation. Finally, the city government’s contribution should be more than 40 percent of the total assets, and the government cannot use debt to finance that 40 percent. After the introduction of the 2018 regulation, a few metro projects that did not meet the 40 percent asset requirement were suspended. Cities that were warned by the central government for their debt risk also had their metro projects postponed.

In addition, the central government made a few stipulations regarding social justice or environmental issues, called “risks to social stability.” In August 2012, the central government’s “Interim Measures for Social Stability Risk Assessment of Major Fixed Assets Investment Projects of the National Development and Reform Commission” stipulated that the feasibility study report of urban rail transit projects, including heavy and light rail, should include a risk analysis of social stability.

The Shenzhen Metro, which is responsible for the metro development and operation, tends to be subject to relatively soft budget constraints. As explained earlier, the corporation is completely owned by the Shenzhen municipal government. As long as the expenditure is assessed to be reasonable, the city government will cover all finance deficit.

Notes:

a Office of Central Government notice no. 81
b Office of Central Government notice no. 52
c Issued by the National Development and Reform Commission as No. 2492.
GLOBAL ENVIRONMENTAL BENEFITS: OUTCOMES AND SCALE-UP

Metro investment and transit-oriented development have been widely recognized as types of projects that generate positive environmental outcomes, including global outcomes such as a reduction in greenhouse gas emissions. They reduce automobile trips by substituting private trips with trips using public transportation. The cluster of urban activities around metro stations further reduces automobile ownership and driving by improving access to metro services and to urban amenities throughout the city.

Reducing greenhouse gas emissions by restructuring transportation systems and land use density to encourage mass transit ridership, as well as carbon-free mobility such as walking and bicycling, is one of the four major steps cities can take to slow climate change, as described in the synthesis report.

Below we describe the environmental benefits of Shenzhen’s metro investment.

Compact development and land preservation

Shenzhen is a densely populated area of only 1,997 square kilometers. Half of this area is under preservation because of its topography, including steep slopes and water bodies. The remaining half supports a population of about 20 million. This limited supply of land makes land preservation more challenging in Shenzhen than in other top-tier Chinese cities such as Beijing, Shanghai, or Guangzhou. The investment in metro systems and the clustering of urban activities around stations are vital to the future of the city.

Shenzhen’s database of buildings records every building in Shenzhen, with information on building footprint, year of construction, amount of floor area and usage category. It is used to illustrate development around stations. The map in Figure 4 shows the buildings around the Hongshan metro station, which is on Line 4. The maps have a one-kilometer radius. The station, which opened for service in 2011, was built on land that was undeveloped before metro construction. By 2018, the land around the station was almost fully developed with high-rise buildings.

The ability of the metro stations to attract development can be calculated with a citywide analysis. Using the Gradient Promotion Decision Tree model, we estimated the nonlinear relationship between the volume of newly added floor area in relation to its distance to the nearest metro station. As can be seen in Figure 5, the building increment decreases with distance, and the influence reaches a plateau at 1.4 kilometers. This shows that the implementation of transit-oriented development policy in Shenzhen has had the expected effects on construction and density.
Figure 5  Built-up area around Hongshan metro station, 2008 vs. 2018

Reduction in automobile trips

In 2018, public transit ridership made up more than 60 percent of motorized trips in Shenzhen during rush hours. The average daily metro ridership reached 5.19 million, which is 49 percent of the total public transit ridership. This increasing share of metro ridership should be attributed to the metro investment and transit-oriented development.

Modelling estimates illustrate how the clustered development around metro stations might affect metro ridership. We related metro’s ridership data (station by station) with different ratios of floor area around the station. After controlling for other relevant variables such as the number of bus lines at station proximity, we found a clear distance-decay effect in the rate of trip generation by different types of building usage (Kong and Yang 2018). When the walking distance to a metro station increases, the trip generation rate for metro ridership decreases. Comparing different types of buildings, the generation rate for commercial and retail (e.g. restaurants and entertainment) buildings decreases much faster. (Figure 6) This relationship between the metro trip generation rate and distance to metro stations indicates that high-density development clustered around stations will significantly increase metro ridership.
Financing

When planning for metro projects in China, city governments have sited metro stations in relatively underdeveloped places, with an expectation that development would quickly follow once station locations were announced and the metro was in operation. Behind this planning practice is a pressure to fund metro projects with land lease revenue (Yang et al. 2016). This practice has expanded in Shenzhen as the investment needs for metro development have increased.

Composite combination of revenue resources for metro investment

Before the land value-capture approach was adopted, metro financing in Shenzhen was mainly circumscribed by “cash” contributions. During the first stage of metro investment, Shenzhen municipal government covered 70 percent of the $0.24 billion total cost for the 22 kilometer system with cash from its general revenue. The system’s second stage expansion included 157 kilometers
of track at a total cost of $1.52 billion, but in this case 50 percent was covered by cash contributions from the local government. Despite enjoying relatively high revenues, Shenzhen municipal government is feeling the fiscal pressure stemming from its heavy and continuous metro investment, with the total cost for the third and fourth stages of the system’s expansion being much higher than earlier costs. For example, metro construction of the third stage is estimated at $3.13 billion. High upfront expenditures on engineering and construction would curtail fiscal space available for other expenditure items. It was in this fiscal context that Hong Kong MTRC was engaged and an R+P approach was established.

**Direct investment from overseas**

In earlier decades, foreign direct investment served as a big stimulus for China’s economic development. Hong Kong MTRC became the natural choice when Shenzhen opened its metro system for overseas investment. The company was selected to construct Metro Line 4 and operate it for 30 years, after which the metro line will be transferred to Shenzhen municipal government. While Hong Kong MTRC met the service standards set by the local government, its construction costs were significantly lower than Shenzhen Metro’s own estimate (Luan et al. 2014).

Hong Kong MTRC and Shenzhen municipal government then signed a memorandum stating that MTRC would continue to work on Line 6. For this new project, the company and the municipality would form a joint venture in which Hong Kong MTRC would take 49 percent of the ownership (Luan et al. 2014). Unfortunately, Hong Kong MTRC did not reach an agreement on the government’s contribution to the project, and it eventually withdrew, leaving Shenzhen Metro to carry out the Line 6 development by itself.

**Borrowing from financial markets**

The Shenzhen Metro also obtained funds for metro construction from the financial market. Since 2010, Shenzhen Metro has used a financial lease to make $0.4 billion by selling expensive equipment. Besides, Shenzhen Metro has a $5 billion quota for commercial paper and super and short-term commercial paper.3 A medium note of $1.4 billion has been issued to get money from the financial market. Shenzhen Metro has also obtained a quota of $1.4 billion for an enterprise bond, which is one of the longest-term financing tools.

Shenzhen Metro also received a cross-border loan of $0.2 billion in Hong Kong SAR, China because of the relatively low financing cost there. It also received $0.79 billion for six metro projects from a special bond issued by the China

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3 A SCP (super and short-term commercial paper) is defined as a bond with a term of 270 days (9 months) or shorter that is issued in the inter-bank bond market by a nonfinancial corporation that has enterprise capacity and a high credit rating, usually AAA.
Development Bank and the Agricultural Development Bank of China (SZMC 2019). The Shenzhen Metro has built a preferred financing model to balance financial sources among capital market instruments, export credits, and bank loans to obtain money at a lower cost (SZMC 2019).

**EVOLUTION OF R+P BASED FINANCE**

China’s public land ownership provides the opportunity to use a land value-capture approach for metro financing. Shenzhen municipal government can capture appreciated land value stemming from metro investment, with land lease revenue. This approach requires the city government to collect land lease fees from the land developer first and pass them to the metro corporation. The switch toward R+P is a new approach to finance metro investment with land development rights. The exact format of operation depends on how the land development right is transferred. The metro corporation receives land development rights with directional bidding, auction, and listing. Figure 7 describes the flow of the benefits.

First, Shenzhen municipal government picks up the parcel to be transferred to Shenzhen Metro. After Shenzhen Metro wins the land development right, it pays Shenzhen municipal government a fee to lease the land. Shenzhen municipal government transfers this money to the State-owned Assets Supervision and Administration Commission, which represents Shenzhen municipal government on SOE investments. The State-owned Assets Supervision and Administration Commission then invests this amount into Shenzhen Metro.

To ensure the metro corporation could win the parcel, the bidding process requires the bidder to have expertise in metro operation. But this method may be suspected of violating relevant regulations for land markets. The circular flow of a big amount of money fulfils a central government regulation but is unnecessary from a pragmatic perspective. For these reasons, the land value contribution approach (in Figure 8) was viewed as more direct and more efficient and is the selected method in Shenzhen today.
As Figure 8 describes, in the land value contribution approach, the appraisal agency estimates the market price of the land, and then Shenzhen municipal government transfers its land development right to Shenzhen Metro and receives a corporate share in return. The land development rights can then be used to leverage bank loans. The proceeds of the development projects can be used to fund the construction of the metro line and to subsidize its operation. This direct approach helps to alleviate the financial pressure on both Shenzhen municipal government and Shenzhen Metro.

**THE BALANCE SHEET OF SHENZHEN METRO**

In 2016, Shenzhen Metro's total gross revenue reached $1.75 billion and its net profit reached $5.6 million. In 2017, its total gross revenue exceeded $2 billion and its net profit reached $6.6 million (Shenzhen Metro 2018), showing an impressive growth rate. To a certain extent, Shenzhen Metro has achieved self-financing, but it is worth noting that its debt ratio has increased to 40 percent, and it still faces very large debt pressure, as Shenzhen is still expanding its metro network. In addition, the $6.6 billion profit includes an investment income of $1 billion from Shenzhen Metro's development partner Vanke, one of China's biggest real estate developers, which is not a stable income.

For comparison, Hong Kong MTRC’s total revenue and net profit in 2016 was $5.8 billion and $1.3 billion (MTRC 2017) and in 2017, $7.1 billion and $2.1 billion.
billion respectively (MTRC 2018). Hong Kong MTRC’s total revenue and net profit are several times that of Shenzhen Metro’s because it not only serves Hong Kong SAR China but also has a few markets in mainland China and other countries.

In terms of the composition of Shenzhen Metro’s revenue, transport operation accounts for 25 percent, and revenue from property development is 65 percent. For Hong Kong MTRC, transport operation accounts for more than 30 percent, and property development revenue accounts for 50 percent (Table 5).

A further comparison of the margins suggests that Shenzhen Metro’s rail operation is not as profitable as that of Hong Kong MTRC. The margin of rail operation for Shenzhen Metro is -35 percent and property development is 63 percent, while Hong Kong MTRC’s has a 9.1 percent margin from rail operations, and 80 percent from property development. This comparison suggests that there is large room for Shenzhen Metro to improve its rail operational efficiency.

Caution is advised in assessing the operational efficiency of China’s metro systems and the profitability of its R+P programs. The amount of government subsidies should not be used as a straightforward indicator for assessing performance of the Shenzhen Metro because the system is not designed to eliminate subsidies or make profits. Although the R+P programs in Hong Kong SAR, China are designed to make Hong Kong’s MTRC operation self-sustaining, their counterparts in mainland China have been used, from the very beginning, to finance metro investments and relieve city governments’ fiscal pressure. Land parcels were capitalized to replace city governments’ cash contributions, rather than to use real estate revenue to subsidize metro operations, even though the model has that potential.

Typical metro corporations in mainland China shoulder many nontransportation social functions. For example, Shenzhen Metro provides a significant percentage of floor area for public (rental) housing on behalf of the city government. It is also asked to provide employment opportunities for special groups,

<table>
<thead>
<tr>
<th>TABLE 5. COMPARISON BETWEEN SHENZHEN METRO AND HONG KONG MTRC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SHENZHEN METRO</strong></td>
</tr>
<tr>
<td>Total gross revenue, 2016</td>
</tr>
<tr>
<td>Net profit, 2016</td>
</tr>
<tr>
<td>Transport operation as percent of revenue</td>
</tr>
<tr>
<td>Property development as percent of revenue</td>
</tr>
<tr>
<td>Transport operation as percent of revenue</td>
</tr>
<tr>
<td>Property development as percent of revenue</td>
</tr>
</tbody>
</table>

Source: Shenzhen Metro 2018; MTRC 2018.
including veterans. Social functions like these naturally increase the cost of Shenzhen Metro. The increase in development activities around the metro line allows the metro corporation to provide increased social functions. As a result, it is not accurate to look at the metro corporation’s operational efficiency based only on the amount of the subsidies.

Conclusion

Massive urbanization and rapid motorization have brought significant challenges to urban China. The need to reduce urban–rural disparities, to connect passengers and goods across city boundaries, and to streamline multimodal movement has motivated China to upgrade its planning institutions and polices (Yang and Fang 2015).

As the pressure to mitigate the traffic and environment impacts of urban growth becomes central and investments in expensive metro systems soar, China has furthered its efforts in integrated planning, especially in transport and land use.

SHENZHEN WAS A PIONEER OF INTEGRATED PLANNING IN CHINA

Today, 35 Chinese cities have metro systems. Most of these cities have adopted measures to promote transit-oriented development, with development density bonuses granted to projects in the proximity of metro stations. In addition, more than 20 of those cities have adopted a rail-plus-property (R+P) development model. The feasibility and effectiveness of this planning and development choice needs to build on preexisting institutions and policies for integrated planning, particularly institutions for transportation planning and land development planning.

In past decades, Shenzhen has served as a role model for other Chinese cities, partially benefiting from its special legislative power awarded by the central government. Shenzhen started implementing integrated planning and management for different transportation modes years ahead of the central government’s regulation on the matter, which now requires all city governments to create a multimodal decision-making center. Shenzhen has also exercised a joint municipal bureau for land use plans and city masterplans, two decades ahead of the central government’s requirements to consolidate these two plans with a unified spatial planning framework and a consolidated decision-making center.

The City of Shenzhen, therefore, stands as a pioneer not only in industrial and technological development, but also in China’s planning innovations. The city itself is a metropolitan area, defining metropolitan boundaries by the commuting...
shed of the people travelling to the core city area for work. The establishment of the SEZ four decades ago helped to develop the core area of Shenzhen City. The consolidation of the former SEZ and non-SEZ areas has since helped the city government strengthen its planning and development control over the former non-SEZ area and to employ a unified framework for planning and development control over the whole metropolitan city. While Shenzhen follows national procedures in planning practice, particularly in its practice in integrated transport and land use planning, the city has also innovated in infrastructure finance and land development, which has inspired China’s central government as well as other local governments.

**R+P AS A DEVELOPMENT PRACTICE OF INTEGRATED PLANNING**

The R+P practice in Shenzhen was introduced by Hong Kong MTRC. But Shenzhen soon created its own version of R+P projects, conditioned on China’s land institutions for land ownership and the transfer of land development rights. Shenzhen Metro has partnered with real estate developers to work on various real estate projects, either above metro facilities or in proximity to metro stations. This practice not only helps to densify developments near stations but also helps to fund metro development and public housing. It also boosts transit ridership and preserves green space.

Shenzhen’s experiment with R+P shows how infrastructure development, land development, and the finance sector can work together for transportation and environmental benefits. While the transport and environmental impacts are relatively easy to understand, the underlying financing model requires a bit more analysis. From the government perspective, there is a trade-off between land and cash contributions. The city government needs to fund metro investment. In a business-as-usual scenario, the city government would fund the metro system with cash from its general revenues. However, the practice of public land ownership in China enables the city government to replace cash contributions with land development rights. The market value of the granted land development right can then be used to leverage bank loans, which fund the engineering cost of the metro and the associated real estate projects.

From the perspective of the metro corporation, participation in the lucrative real estate market allows it the possibility of evolving from a subsidy-dependent transit corporation to a profit-making entity. In the early stage, Shenzhen Metro created its own real estate division, Shenzhen Metro Real Estate Group Co., Ltd. As the real estate project has become more complex and more market-oriented, Shenzhen Metro has become the largest shareholder of Vanke, one of China’s largest real estate developers. The development activity has thus been shifted to
Vanke, with Shenzhen Metro itself focusing more on property management and creating Shenzhen Metro Property Management Development Co., Ltd.

City governments in mainland China used to employ the combination of operational revenues and local government subsidies to fund metro operations. In recent years, they have seen the positive effects brought about by transit-oriented development and R+P programs. The integration of transit investment, land development, and finance has not only enhanced city government’s ability to move metro projects forward but also enabled better outcomes for urban transport, land preservation, and emissions reductions.

REPLICABILITY

Shenzhen’s practice of integrated transport and land development has been followed by many other Chinese cities, with adjustments to their respective local contexts. Most Chinese with metro systems have adopted practices similar to transit-oriented development. Those cities include Beijing, Shanghai and Guangzhou. The model followed by Shenzhen Metro might be replicated in other countries with state control of land and state-owned companies.

To better understand the replicability of the R+P model in mainland China, one needs to understand the differences between the Hong Kong SAR, China version of R+P and its counterpart in mainland China. First, Hong Kong MTRC’s gradual withdrawal from real estate development in Hong Kong does not suggest that R+P will lose its popularity in mainland China. The political situation in Hong Kong SAR, China is different. After years of R+P practice in mainland China, Hong Kong MTRC has been under pressure to step down its efforts in the real estate market and focus on metro operation (Aveline-Dubach and Blandeau 2019). The for-profit Hong Kong MTRC competes against other real estate developers who view its participation in the real estate market as unfair because it receives preferential treatment from the government.

Metro corporations in mainland China are not under pressure to make a profit from the development of transit or of residential/commercial properties near stations. In fact, many develop public housing alongside market housing. They may receive a land parcel through a bidding procedure, rather than get a negotiated price. These metro corporations are still developing their capacity as transit operators, and typically they partner with local developers for the real estate component of the R+P projects.

It is also worth noting that the stagnation of Hong Kong MTRC’s R+P programs in mainland China does not suggest that R+P is losing favor in Chinese cities. As mentioned earlier, about two-thirds of cities with metro operations have tried their own R+P programs.
Density

**Figure 10**

**POPULATION DENSITY, 2000**

Municipal
- Maximum: 46,417 people/km²
- Minimum: 1 person/km²
- Average: 792 people/km²
Figure 11
POPULATION DENSITY, 2017

Municipal
Maximum: 85,690 people/km²
Minimum: 1 person/km²
Average: 4,409 people/km²

Figure 12
Overlay of density levels, 2000–2017
REFERENCES


Currency exchange rate: 1 USD = Y 7.14 (September 2019).
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.