TOD K P

# CASE STUDIES

## COMPILATION OF GOOD AND INNOVATIVE PRACTICES



TOD

Global Platform for Sustainable Cities

WORLD BANK GROUP

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# LEVEL 1 SCREENING

A comprehensive list of cities from low-middle income countries were shortlisted as potential candidates for case studies. This list of case studies was derived from:

- Case studies already included in World Bank publications/ workshops and presentations
- Part of GPSC/ World Bank-identified city TOD list
- Representative of the TOD framework as well as geographic distribution:
  - Scale- City/ Corridor/ Station
  - Context- Urban/ Suburban/ Greenfield
  - Mode of higher order transit- BRT/ MRT/ Heavy Rail
  - Size of city- Large and medium-sized cities (Tier 1 and Tier 2)

| LIST OF BEST PRACTICE CITIES | | |
|---|---|---|
| | 1. | Mexico City, Mexico |
| | 2. | Bogota, Colombia |
| | 3. | Lima, Peru |
| | 4. | Recife, Brazil |
| | 5. | Curitiba, Brazil |
| | 6. | Mumbai, India |
| | 7. | Delhi, India |
| | 8. | Hubli-Dharwad, India |
| | 9. | Nanchang, China |
| | 10. | Shenzhen, China |
| | 11. | Guangzhou, China |
| | 12. | Shijiazhuang, China |
| | 13. | Tianjin, China |
| | 14. | Hong Kong SAR, China |
| | 15. | Ho Choi Minh City, Vietnam |
| | 16. | Hue, Vietnam |
| | 17. | Kuala Lumpur, Malaysia |
| | 18. | Jakarta, Indonesia |
| | 19. | Addis Ababa, Ethiopia |
| | 20. | Dakar, Senegal |
| | 21. | Abidjan, Africa |
| | 22. | Johannesburg, South Africa |
| | 23. | Cape Town, South Africa |
| | 24. | Santiago, Chile |
| | 25. | Dar es Salaam, Tanzania |

# LEVEL 2 SCREENING

The following table provides the updated list of relevant case studies based on World Bank's input, case studies recommended by experts and peer-reviewers, WRI/ITDP and IBI projects that explain good practices and innovative strategies from countries at low to medium income levels. The intent is also not to duplicate existing case studies already compiled by World Bank. E.g. Kings Cross TOD, London, UK.

Relevance of the Case Study to the Scale and Development context is also provided along with relevance to specific knowledge product(s). Key criteria for selection were based on the following factors:

- Is there policy-level support for promoting TOD at one or more governmental levels- central, state, local?
- Has TOD been applied at more than one scale- City/ Corridor/ Local (neighborhood)/ Station?
- Are there any TOD projects at the station scale implemented (operational/ under construction/ tendered/ development agreement in-place)?
- Does the city/ example represent a case where the conventional planning paradigm was challenged to implement TODs (e.g. land banking, land readjustment, PPPs).

| COMPLETE LIST OF CITIES EVALUATED FOR LEVEL 2 SCREENING & RECOMMENDED CITIES FOR CASE STUDIES: | |
|---|---|
| South Asia | 1. Delhi, India |
| | 2. Hubli-Dharwad, India |
| Asia | 4. Hong Kong SAR, China |
| | 5. Shenzhen, China |
| | 6. Guangzhou, China |
| | 7. Seoul, Republic of Korea |
| America | 7. Mexico City, Mexico |
| | 8. Santiago, Chile |
| Africa | 9. Cape Town, South Africa |
| | 10. Johannesburg, South Africa |

**Disclaimer:** *The Transit-Orientated Development Implementation Resources & Tools knowledge product is designed to provide a high-level framework for the implementation of TOD and offer direction to cities in addressing barriers at all stages. As the context in low and middle-income cities varies, the application of the knowledge product must be adapted to local needs and priorities, and customized on a case-by-case basis.*

# SOUTH ASIA | CASE STUDY

## DELHI. INDIA

*Source:* Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre (UTTIPEC) 2018 ©UTTIPEC. Reproduced with permission from UTTIPEC; further permission required for reuse.

# DELHI, INDIA

## QUICK FACTS

**Geographic Context**
South Asia (India) – National Capital Region, India

**Scale**
City, Corridor, Neighbourhood, Station

**Context**
Urban, Suburban, Greenfield

**Mode of Higher Order Transit**
Metro (Delhi Metro Rail Corporation)

**Size of City (Population)**
16.7 million (Tier-1)

**Case Study Covered in WB Publication**
No

## URBAN CONTEXT

The National Capital Territory (NCT) of Delhi is the fastest growing city-region and the second most populous urban area in India. The metropolitan region spans a collection of cities and suburban settlements across the three states of Delhi, Uttar Pradesh, and Haryana. In 20 years between 1991 and 2011, the city region has grown in size from 685 to 1114 sq km, and grown in population from 8.7 to 16.3 million. The steep rise in population can be contributed primarily to migration from smaller towns and villages from across the country attracted by growing job opportunities in new developments in the outskirts of the city. This growth of working-class households was supported significantly by the first-of-its-kind metro system network developed by the Delhi Metro Rail Corporation (DMRC) in 2002. An average of 2.6 million commuters use the metro daily[1].

Much of Delhi's growth is observed along the outskirts of the city in areas like Gurgaon, Noida, Ghaziabad and East Delhi. The city at large exhibits large block sizes, low densities, segregated land uses etc. which reflects vehicle-centric planning. This has not only had catastrophic effects on the air quality of the city but has also resulted in congestion that can now essentially be described as a gridlock. In response, the DMRC began construction of the metro network in 2002. By 2018, until the writing of this study, DMRC has built over 8 lines spanning 332 km. The metro network has brought huge relief to the average commuting population. However, the sprawled nature of Delhi has made it difficult for the metro to expand its accessibility as effectively. In 2006, the National Urban Transport Policy was launched, which emphasized the importance of public transport and the need for Transit-oriented Development to leverage this investment. The Unified Traffic and Transportation Infrastructure Planning & Engineering Center (UTTIPEC), formulated to envision a unified and integrated mobility outlook for the entire region, identified a need for Transit-oriented Development (TOD) to accompany metro development in the city-region and began creating the TOD Draft guidelines in 2008.

TOD KP

## OVERALL TOD STRATEGY

The Delhi Metro Rail Corporation (DMRC) was jointly set up by the Government of India and Government of Delhi in 1995. The construction of the network was planned in 4 phases[5].

**Phase I:** A total of 65km of rail with 58 stations was planned for Phase I. Initial rail development was constrained within the Delhi limits and stations were built and opened between sDecember 2002 and November 2006.

**Phase II:** A total of 124.63 km long network with 85 stations and 10 new routes and extensions were built, out of which seven are an of the Phase I network. Color-coded lines and lines connecting to adjacent cities were created (Yellow Line to Gurgaon, Blue Line to Noida and Blue Line to Ghaziabad). These stretched from the national capital region, outside the physical limits of Delhi state, to the states of Haryana and Uttar Pradesh. At the end of Phases I and II, the cumulative total length of the network became 189.63km, including 143 stations over time. Operation of the network initiated between June 2008 to August 2011.

**Phase-III:** Consisted of 11 extensions to the existing lines and two additional ring lines (Pink and Magenta lines). This expansion included 28 underground stations and a total of 167.27km.

**Phase IV:** is expected to be complete in 2021 which totals to 100km.

The TOD Policy in Delhi was framed within the Influence Zone along MRTS corridor, designated as the **Transit-oriented Development (TOD) Zone** in the Master Plan for Delhi 2021, modified with the latest revisions in 2017. This zone comprises of all the areas lying within 500m of the metro transit corridor on either side. This area is expected to be delineated in the Zonal Development Plans to avoid ambiguity. The Master Plan incorporates TOD as a redevelopment strategy, encouraging private landowners to assemble and redevelop lands that have high TOD potential[2].

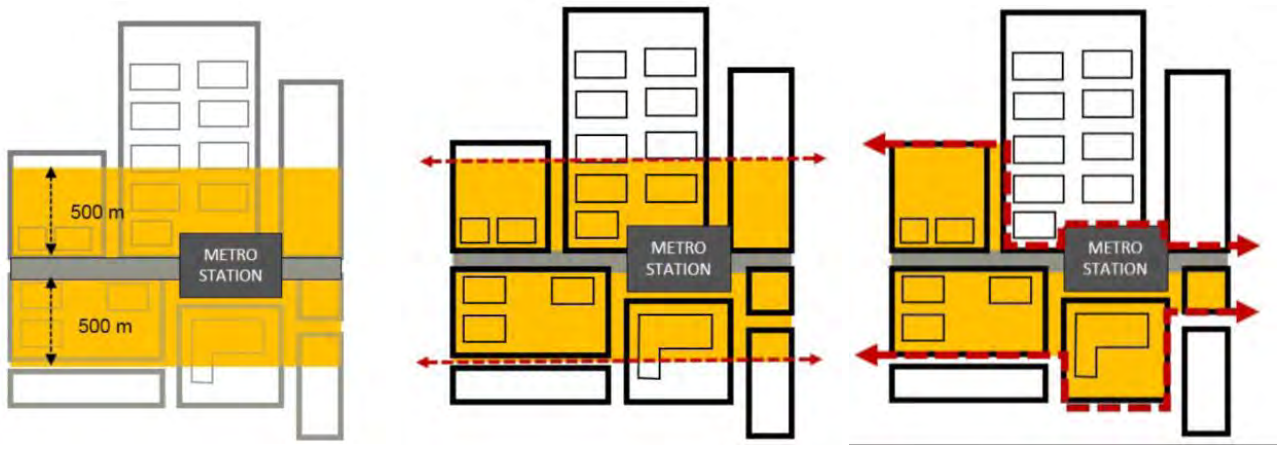


Figure 1: TOD Influence Zone Delineation | *Source*: Delhi TOD Policy Manual, 2007 ©Delhi Development Authority.

The Transit-oriented Development Principles adopted by the TOD Policy to guide the framing of regulations include:

1. Pedestrian and Non-Motorized Transport Friendly Environment
2. Connectivity and Network Density
3. Multi-modal Interchange
4. Inducing Modal Shift by easing access to public transport and dis-incentivizing private motor vehicle use.
5. Placemaking and Ensuring Safety
6. High-Density, mixed-use, mixed-income development near Stations

### INFRASTRUCTURE PROVISION FOR DENSITY

The Master Plan of Delhi 2021 suggests requirements for decentralized infrastructure and resource conservation facilities, specifically including:

- Recycling of treated wastewater with a dual piping system
- Groundwater recharge through rainwater harvesting, conservation of water bodies and regulating groundwater extraction
- Treatment of sewage effluent for recycling for non-potable uses such as gardening.
- Passive cooling systems to ensure energy efficiency
- Solar heating systems are recommended on all plots for roofs of 300sqm or above.
- Incentive FAR and ground coverage is offered for implementation of the above.

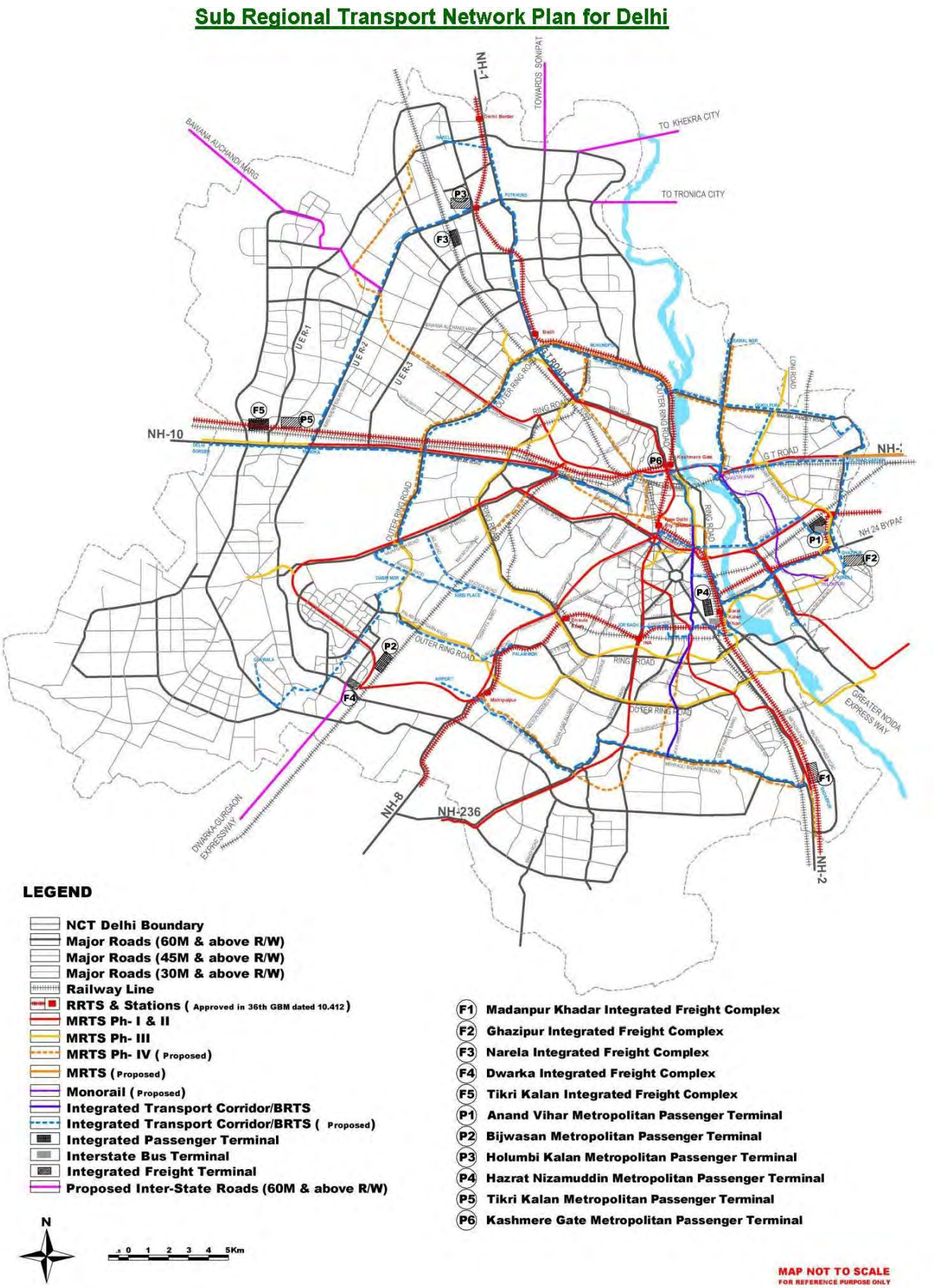


Figure 3: Delhi MRTS and Transport Corridors | *Source*: Master Plan of Delhi 2021, 2007 ©Delhi Development Authority.

## KEY ROLES AND RESPONSIBILITIES OF STAKEHOLDERS

The stakeholders involved in implementation of the Delhi TOD Policy include primarily the Delhi Development Authority (DDA), whose responsibility it is to evaluate TOD schemes and give development permissions; Competent Authority (CA) instituted under the respective State Acts, whose responsibility it is to acquire public amenity land and issue development permissions; and the Developer Entity (DE), who undertakes to participate in the TOD scheme. The roles and responsibilities of each entity during the development permitting process is shown below:


Figure 4: TOD Roles and Responsibilities Scheme | *Source*: Delhi TOD Policy Manual, 2007 ©Delhi Development Authority.

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

The TOD Policy Manual suggests design strategies for TOD that govern the Development Control Regulations incorporated in the Master Plan of Delhi 2021. The Development Control Norms include the following strategies for land parcels measuring 1 HA or more[3]:

- **FAR and Density**: Higher densities are allowed for all developments that are planned on individual or amalgamated land parcels of size of 1HA or more. A minimum mandatory Floor Area Ratio (FAR) is imposed for housing for the economically weaker section. This norm is intended to encourage land pooling as a redevelopment strategy in the TOD influence zones. Larger land parcels allow DDA to extract land for public use including open spaces and transit plazas.
- **Mix of Uses**: Minimum 30% residential use, 10% commercial use, and 10% public amenities are compulsorily required on all land parcels irrespective of their dominant land use as per the Master Plan. Within the minimum residential area requirement, the Master Plan mandates housing units to be of smaller sizes. This is intended to encourage economic diversity within transit influence zones. Smaller unit sizes allow buyers the flexibility of purchasing small units in case of budget limitations and purchasing multiple units and combining them in case of larger family sizes. However, in practice, this requirement has been the most difficult to meet, because it increases the planned density of the development substantially. This, in turn, increases the infrastructural and parking requirement for the development.
- **Road Network**: A minimum 20% of the land is required to be reserved for roads, adhering to principles of 250m c/c road density of vehicular roads and 100m c/c density of the pedestrian network. These roads will be handed over to the Government as public roads, but will be maintained and kept encroachment free by the DE.
- **Open Spaces**: A minimum 20% of the land is required to be reserved for green open spaces for public use, adhering to principles of inclusion and another 10% green space for private use. In parcels smaller than 1 HA, private open space is allowable in the form of common terraces, rooftops or podiums.
- **Public Facilities**: Public facilities like schools and health facilities are required to be provided as part of the development.
- **Green Buildings**: The built form of the development is required to achieve a minimum of 3 stars or gold rating as per the Indian Green Building Standards
- **Traffic Impact**: Is expected to be assessed and mitigated through traffic management measures.

In addition to the above norms, the Master Plan also prescribed Street Design Regulations to be followed within the streets planned in a development under the TOD scheme. The street design elements are intended:

- Promote Preferable Public Transport Use
- For Safety of All Road Uses by Design
- For Pedestrian Safety, Comfort and Convenience on All Streets
- For climatic comfort for all Road Users
- To ensure universal accessibility and amenities for all street users
- To reduce Urban Heat Island Effect and Aid Natural Storm Water Management

### FINANCIAL MODEL

There is no single financial model that can be identified in Delhi. Some of the expected sources of revenue are through the sale of FSI, external development charges (EDC) and betterment charges.

Extra FSI charges as per the Master Plan are as per standard rates, irrespective of land use/ use premises, to avoid any complications to change the use of FSI in future. This is both an advantage and a disadvantage as the uniform FSI rates for commercial and residential in Delhi, either adversely affect the affordability of residential or there are chances for the government to lose the opportunity to earn from the commercial FSI.

Though the resources of finance (direct collection and land value capture) have been identified, the use of revenue generated from TOD is not ensured through the regulations.

TOD KP

## IMPLEMENTATION STRATEGIES

### TIMELINE:

- **1991-** Region was 685 sq km with a population of 8.7 million
- **1995-** DMRC was jointly set up by the Government of India and Government of Delhi
- **2002-** Began construction on first metro network by Delhi Metro Rail Corporation (DMRC)
- **December 2002-** Phase 1 starts
- **2006-** National Urban Transportation Policy was launched
- **November 2006-** Phase 1 competes
- **2008-** UTTIPEC began creating the TOD Draft Guidelines
- **June 2008-** Phase 2 begins
- **2011-** Region was 1,114 sq km with a population of 16.3 million
- **August 2011-** Phase 2 completes
- **2017-** Modified and revised Master plan for Delhi 2021
- **2018-** DMRC metro network has 8 lines spanning 332km
- **2021-** Phase 4 expected completion

### ACTIONABLE STEPS

The TOD Policy Framework has been tested in different models of TOD pilots in Delhi, the most well-known being the Karkadooma station in East Delhi. The proposed site of the pilot TOD project of Karkadooma lies within Zone- E of the Zonal Development Plan, the land use of which is residential. More than 70% of the site falls within the 500m influence zone of two metro stations at Karkadooma, therefore the norms for 'Influence Zone' shall be applicable. The figure below illustrates three conceptual designs that follow the TOD norms[4].

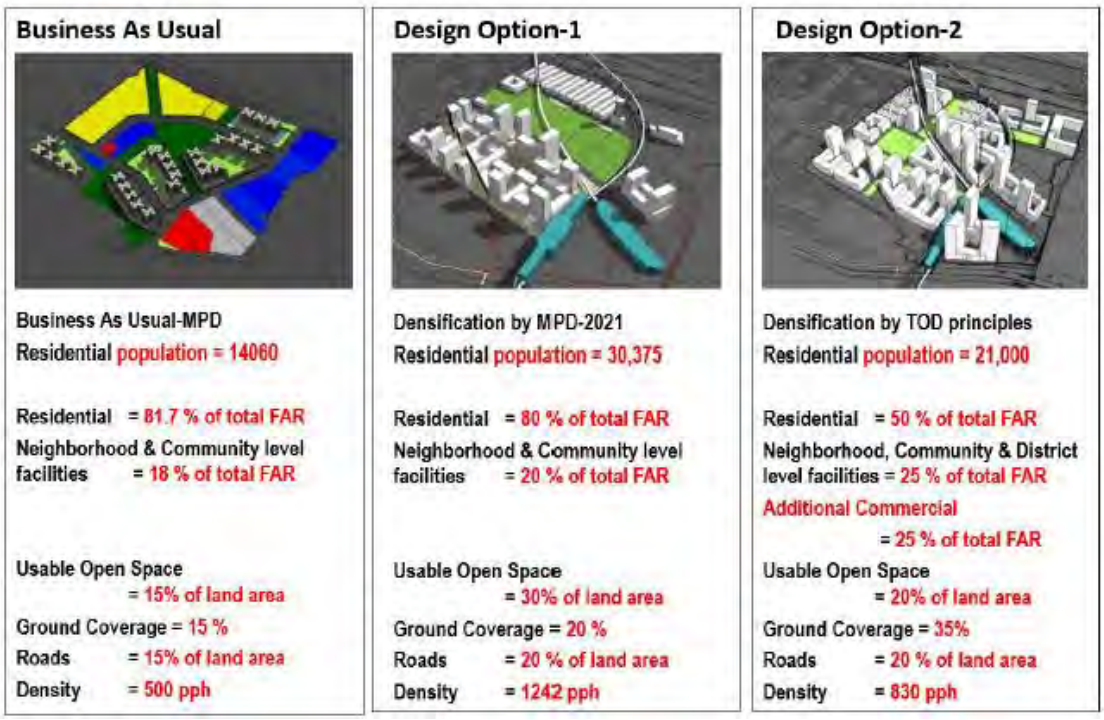


Figure 5: TOD Design Options | *Source:* Delhi TOD Policy Manual, 2007 ©Delhi Development Authority.

Design option two was favored during the stakeholder consultation process which was conducted to prioritize civic amenities.

The stakeholders consisted of resident welfare associations, trade associations, NGOs and civic society institutions, schools and local ward counselors.

## KEY LESSONS

The following key takeaways should be derived from the Delhi example:

- The TOD policy in Delhi prescribes strict norms to follow and is, therefore, a comprehensive approach to planning TOD.
- Delhi is trying to provide affordable housing in TOD but with the strict percentage, it can restrict the market to participate.
- With regards to parking, Delhi is adopting a one-size fits-all approach even with various TOD typologies: city center TOD, suburban TOD, commercial TOD, Residential TOD.
- Even though Delhi has stringent TOD policies and urban design guidelines, there is still a lack of clarity in terms of the implementation process.

## REFERENCE


1. Delhi Metro Rail Corporation Ltd. 2018. "Delhi Metro Interchange Stations Increase to 16, Ridership Registering Steady Growth." http://www.delhimetrorail.com/press_reldetails.aspx?id=bhc0DzbE6tklld
2. Mehta, Prerna V., Neha Mungekar, and Merlyn Matthew. 2016. "Transit Oriented Development Manual – Delhi TOD Policy and Regulations Interpretation." *World Resources Institute*. http://wricitieshub.org/publications/transit-oriented-development-manual-delhi-tod-policy-regulations-interpretation
3. Delhi Development Authority. 2007. "Master Plan for Delhi - 2021." *Ministry of Urban Development.* https://dda.org.in/ddanew/pdf/Planning/reprint%20mpd2021.pdf
4. Uttarwar, P.S., and Paromita Roy. 2015. "Transit Oriented Development (TOD) Policy - East Delhi Hub - Kadkadooma TOD project." UTTIPEC. http://urbanmobilityindia.in/Upload/Conference/ae9770cd-2c9c-4599-80b6-3f0cd3a83bfe.pdf
5. Transit Oriented Development for Indian Smart Cities. 2016. "Case Studies." *National Institute of Urban Affairs (NIUA) and Foreign & Commonwealth Office, Government of UK.* https://tod.niua.org/todfisc/book.php?book=1&section=4

# SOUTH ASIA | CASE STUDY

## HUBLI DHARWAD, INDIA

*Source:* Hubli-Dharwad BRTS Company Ltd 2016. ©HDBRTS. Reproduced with permission from HDBRTS; further permission required for reuse.

# HUBLI DHARWAD, INDIA

## QUICK FACTS

**Geographic Context**
South Asia (India) – Karnataka, India

**Scale**
Regional, Corridor

**Context**
Urban, Suburban, Greenfield

**Mode of Higher Order Transit**
Bus Rapid Transit System (Hubli Dharwad BRTS Company Ltd.)

**Size of City (Population)**
0.97 million (Tier-2)

**Case Study Covered in WB Publication**
No

## CITY SUMMARY

Hubli and Dharwad are twin cities in the state of Karnataka and located at a distance of around 20km from each other. Hubli-Dharwad is the oldest city in Karnataka state with strong cultural and historical importance and is also the second-largest urban settlement in Karnataka after Bengaluru. While Dharwad is the district headquarters and Hubli is the business hub.

According to Census 2011, the city had a population of 9.43 lakhs. HDMC's population accounts for 4% of the urban population of the state and 90% of the urban population of the district. The population density in Hubli-Dharwad has been on an increase during the past three decades. The density increased from 1,837 persons per sq. km in 1971 to 4,292 persons per sq. km in 2011. However, the area of the corporation remained the same.

There is a steady and high volume of passenger traffic between the twin cities. Currently, this demand is catered by the NWKRTC through a bus-based system and private vehicles. Though buses account for only 7-11% of total traffic flow on the road between Hubli and Dharwad, they carry about 70-80% of people. A BRTS has been conceived along the P.B. road between Hubli and Dharwad, in order to meet the increased demand for ridership.

## URBAN CONTEXT

The urban character of both Hubli and Dharwad cities is found to be complex, and the old city areas in both cities have been retained their original and traditional character. They are acting as religious nodes and are with narrow streets and inefficient infrastructure services. However, in other areas, due to the availability of services, cultural attractions, proximity to city core has always been under constant development pressure and resulted in over densification. While fringe areas are exhibiting a different development pattern which is comparatively organized growth pattern. Both cities exhibit medium density with medium-rise buildings with average 3-4 storeys.

As per the Karnataka Town and Country Planning Act, 1961, the Hubli-Dharwad Urban Development Authority (HDUDA) was constituted in the year 1987 for undertaking the responsibility of physical planning, and its jurisdiction includes the HDMC area and about 10 km area beyond HDMC, to include villages that could eventually become part of the urban area in future[1].

- Disjointed City Form: Hubli Dharwad grew organically as two different cities, which were amalgamated in 1964 into a single municipal corporation. Even though their economies are interdependent, structurally these cities have remained disjointed connected only by the present-day BRT corridor. Most development between the 2 cities is sprawling in

nature, which physically divides the 2 cities and forces intense urban development outwards and away from the primary corridor.

- Urban Sprawl: Availability of large tracts of land with urbanizing potential and very little demand has led to proliferating urban sprawl. Sprawl poses a threat to the forested and agricultural lands around the city cores.

Hubli-Dharwad today stands on the brink of a reformation in urban development. There the Spatial Development Framework created as a guide for the City Development Framework (2030), seeks to address five major issues in Hubli-Dharwad's spatial and social landscape[1]:

- Lack of spatial vision for the cohesive development of the city
- Urban sprawl and fragmentation
- Increasing pressure on the natural environment infrastructure
- Spatial inequalities and the jobs-housing mismatch
- Exclusion and disconnection emanating from
- High potential underused areas
- Disconnected street networks
- Inefficient residential densities and land use diversity

The strategies towards setting the TOD framework and the implementation strategies have been adopted from the Hubli Dharwad 2030 City Development Framework. They have been summarized below.

## OVERALL TOD STRATEGY

Hubli-Dharwad area is currently undergoing rapid population growth. The proposed BRT will further fuel this growth. To cope with this, transit-oriented development is proposed along the corridor. This BRT system will minimize sprawl and will serve as a ready to use commuter system for the additional population. Also, the proposed revision of the comprehensive development plan (CDP) for Hubli Dharwad in 2015 is an opportunity to incorporate the TOD principles. Incorporating TOD into the development plan will help in delivering efficient, comfortable and affordable mobility options to its citizens. The urban cores of Hubli and Dharwad are 22km apart which is one of the primary factors defining the spatial growth pattern of the twin-city region.

Hubli-Dharwad has a road network which is dense but with constrained right-of-ways in the city cores. The two city cores are connected by PB Road, the only arterial road in the twin cities, which was also formerly a national highway. National Highway, radiating from Hubli center, including NH4, which is recently developed to bypass the traffic passing through these city cores. The constraints in road ROWs in the employment centers limits densification potential and results in congestion.

The spatial vision envisaged by the CDF 2030 is a compact polycentric city with dense urban cores linked by efficient public transport networks to mixed-use, complementary sub-centers, situated within a protected and integrated natural environment[1]. Development triggers in the area are ongoing projects like the widening of P.B. road, upcoming Hubli Dharwad BRT, Hubli airport modernization, proposed electrification and doubling of the railway line, inland container depots, goods yard along with improved Mumbai-Chennai road corridor etc. High land values in Hubli and Dharwad have led to haphazard development adjoining PB road and it needs to be streamlined to ensure optimal utilization of the road widening as well as the upcoming Hubli Dharwad BRT[1]. The City Plan (Vision 2030) promotes land use that supports transit. The Development Density Framework suggests a differential density paradigm for the city. It proposes higher densities and FAR allowances for areas with higher amenities and higher accessibility to jobs and city services. Primarily, the framework is defined with the metropolis boundary as the base.

- The Metropolis Boundary - Reimagining the Metropolis Boundary as a potential Urban Growth Boundary (UGB) allows for enforced limitations to new development outside of it. This area measures 220 sq km. However, developing the entire metropolitan area with the same density of development will lead to sprawled development. Accordingly, the next layer of density is defined, a high growth Zone measuring 83 sq km.
- High Growth Zone – Proposed Zone A – This zone includes all high demand and high opportunity areas as well as future strategic areas of growth. Within this zone, larger mix of uses and higher FAR should be proposed to enable compact and mixed-use development. The HDUDA Master Plan already recommends more intensive uses in "Zone A". It is proposed therefore that the High Growth Zone be considered for inclusion in the Master Plan as Zone A. However, unlike the Master Plan, this zone must be allowed higher FARs to accommodate the market demand.

- The final layer of the differential density is the TOD Zone, the areas within walking distance of the new BRT corridor connecting Hubli and Dharwad. TOD Zone - This zone has the advantage of access to a high capacity, high-frequency public transport system, which is expected to catalyze compact, mixed-use, and inclusive development.

The development structure of a city must be imagined in parallel with a transportation network that can support its growth and ensure equitable accessibility at all stages of growth. In addition to the BRT Corridor and the Proposed Bypass Road, a network of priority roads and corridors are identified, that contribute to the spatial strategy of growth.

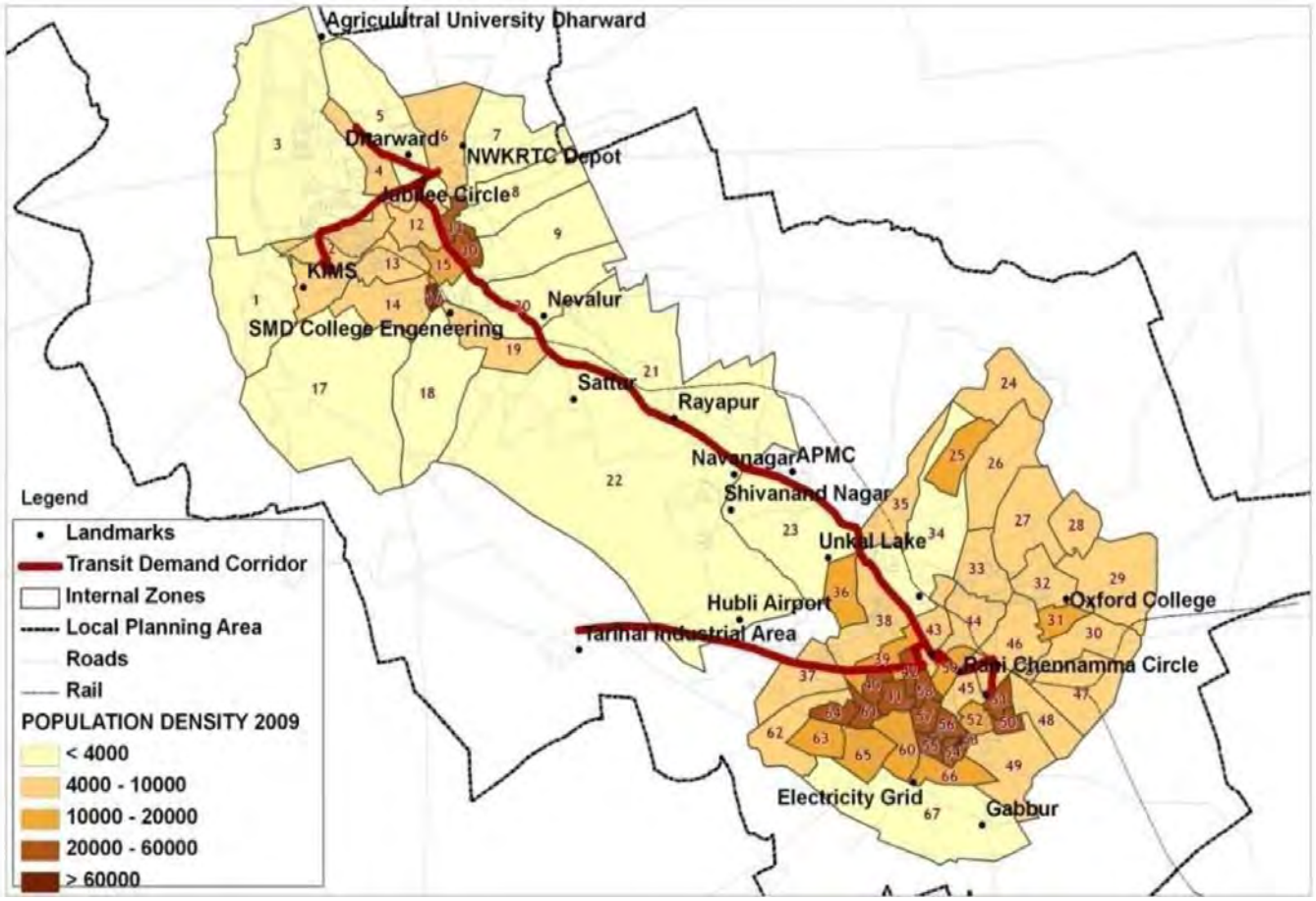


Figure 6: Density Framework for TOD | *Source:* Hubli Dharwad 2030 City Development Framework 2014 ©IBI Consultancy India Pvt Ltd.

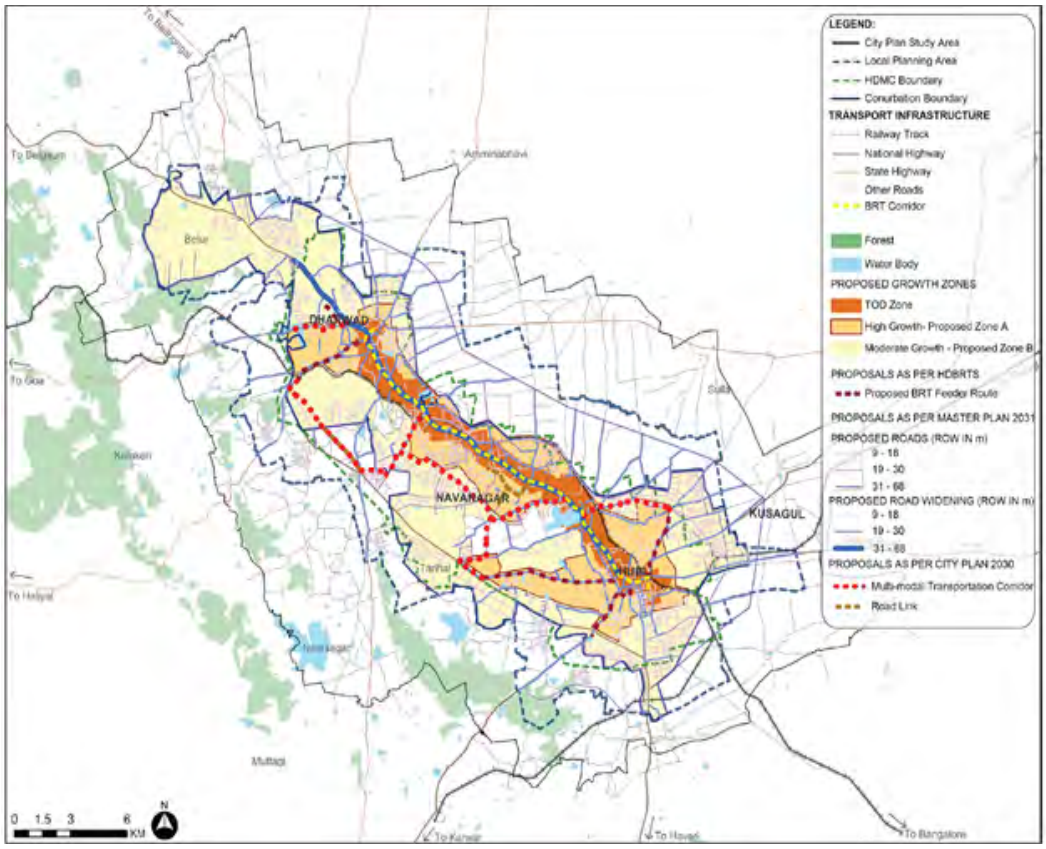


Figure 7: Proposed Transportation Framework as per Master Plan 2031 | Source: Hubli Dharwad 2030 City Development Framework by IBI Consultancy India Pvt Ltd.

## KEY ROLES AND RESPONSIBILITIES OF STAKEHOLDERS

The Hubli Dharwad 2030 City Development Framework (CDF), as the first of its kind in India, is set up to prepare Hubli Dharwad for the future by creating a vision and path for the future even before new programs at the State and Central level are introduced[1]. All potential opportunities for funding and financing can be streamlined to achieve the vision set forth in the Framework. Along with providing a larger Vision, the CDF also proposes immediate actions that the city agencies can adopt using existing sources of funds. A break-up of the CDF components and relevant implementation roles is illustrated in the figure below.

The Dharwad District Administration is envisioned as the Authority that will own the first three components of the Framework and be responsible for integration across sectors and jurisdictions. The implementation and monitoring of the Framework shall be within the scope and mandate of sector-specific and jurisdiction-specific agencies. The Primary Vision and Goals and Targets shall be monitored by a City Transformation Cell which in turn shall establish a continuous medium of interaction with the city and rural residents to enable resident inputs to inform the Framework.

While the DA shall be the Nodal Agency for the Spatial Growth Concept and Density Framework, as this will allow an integrated city-rural approach to guide economic growth in the study area, the HDUDA, HDMC, KIADB, and Gram Panchayats will be responsible to implement the proposals for setting up of growth nodes and growth corridors within their jurisdictions.

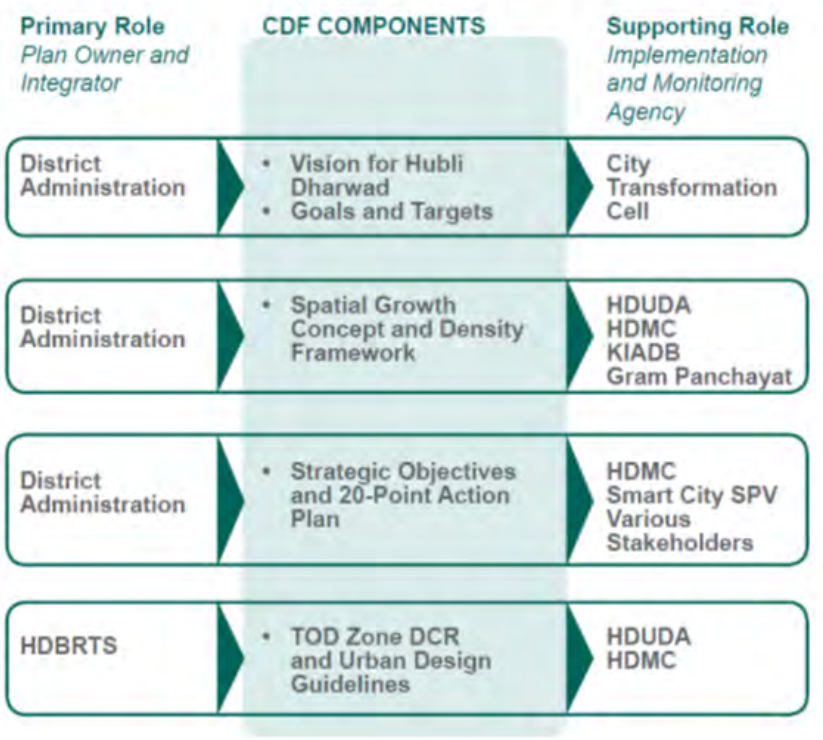


Figure 8: Proposed Transportation Policy Framework | Source: Hubli Dharwad 2030 City Development Framework 2014 ©IBI Consultancy India Pvt Ltd.

## STRATEGIES TO ENCOURAGE TRANSIT USE

The HDBRTS, under the aegis of DULT shall be the Primary Nodal Agency for the TOD Zone DCR and Urban Design Guidelines. The HDUDA shall incorporate the TOD Zone DCRs into the Master Plan, while the implementation of the DCRs and Urban Design Guidelines shall be done by a TOD Implementation Committee set up within the HDMC.

**OPPORTUNITIES**

- Compact city cores connected by a high-capacity BRTS system offers the opportunity to create more well-connected compact cores.
- A large potential for intensification exists in many underutilized areas, without sprawling to natural areas.

**FINANCING**

TOD Incentives provide an opportunity to earn increased revenues through:

- Sale of Premium FAR
- Increased revenue through property taxes levied on higher built up areas

The revenues earned through the tools listed above shall be shared between the HDBRTS and HDMC as per mutual agreement. This source of revenue shall be used by HDBRTS for operations and maintenance of the BRTS system and shall be used by the HDMC to implement crucial public realm improvements.

## IMPLEMENTATION STRATEGIES

The special regulations for Transit-oriented Development are intended to be provided to areas within walking distance of the corridor to incentivize high-density growth that can take advantage of transit and reduce reliance on private vehicles. The HDUDA Provisional Master Plan 2031 identifies a special BRT impact area which is 500m on either side of the BRT corridor and is earmarked as the TOD zone.

The lack of existing market demand in the TOD Zone will make it difficult to attract developments that are high density and mixed use. Hence the Hubli Dharwad city plan proposes the following key strategies[1]:

1. Create Statutory Regulations that encourage compact development – Decreased setback requirements and parking requirements will enable compact development in the TOD Zone. In addition FAR and other incentives should be offered for high density mixed-use developments in the TOD, the follow the urban design guidelines.
2. Institute a Land Taxation Scheme that incentivizes compact development

- Vacant Land Tax in High Growth Areas - Vacant land tax is proposed for all land parcels that are left undeveloped for a period of 5 years after implementation of the HDUDA Master Plan 2031 and the special TOD Zone regulations. Vacant Land Tax places a higher emphasis on taxing the land itself rather than on its improvements. This system will intend to incentivize compact development in areas identified for high-intensity growth and discourage land purchase and development in low growth areas.
- Higher Registration Fees in Moderate Growth Areas – high registration fees are proposed to discourage the sale of land in moderate growth areas to discourage speculative buying. Instead, Government authorities should be encouraged to purchase and bank lands near future growth nodes in moderate growth areas.

## ENDNOTES

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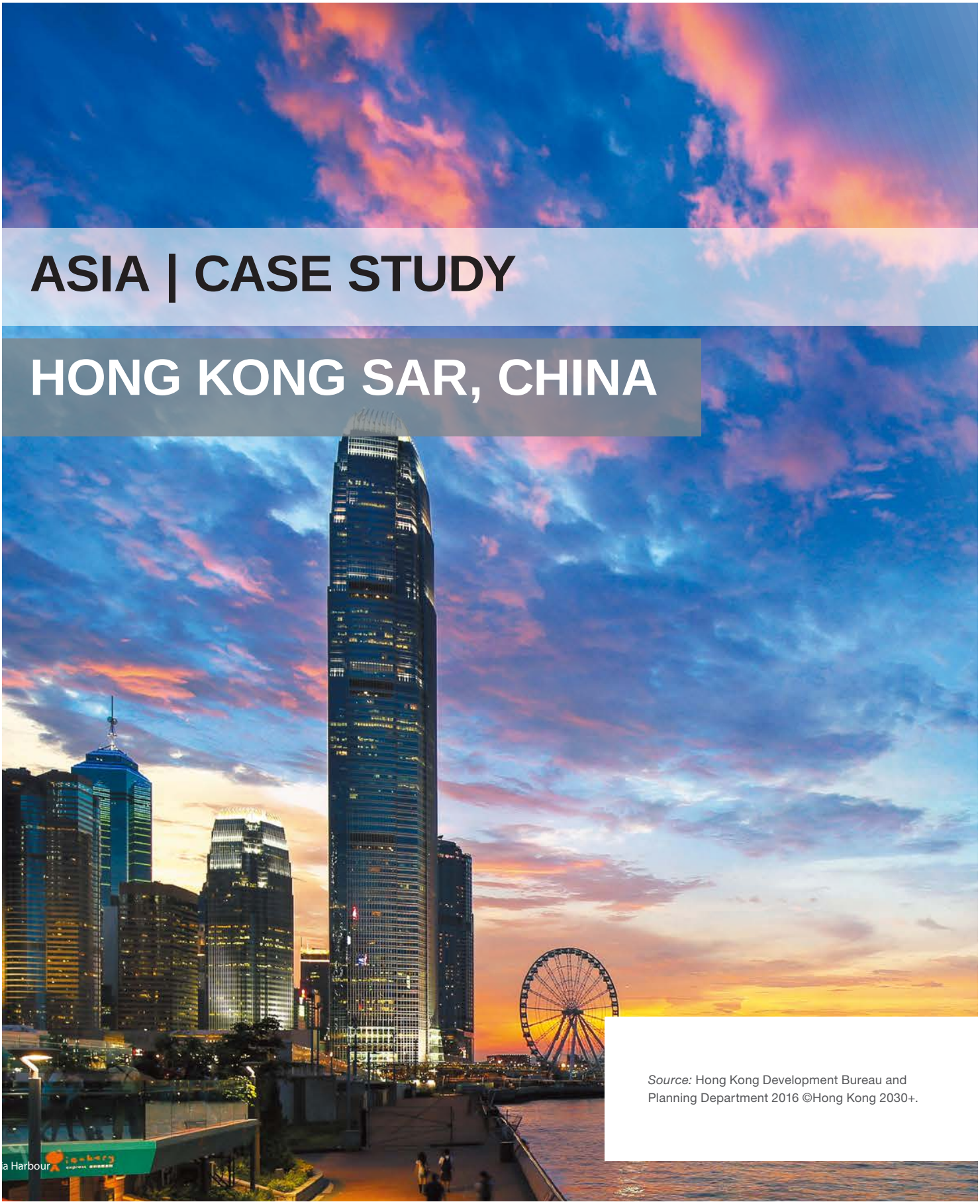
# ASIA | CASE STUDY

# HONG KONG SAR, CHINA



*Source:* Hong Kong Development Bureau and Planning Department 2016 ©Hong Kong 2030+.

# HONG KONG SAR, CHINA

## QUICK FACTS

**Geographic Context**
East Asia (China)

**Scale**
City, Corridor, Neighbourhood, Station

**Context**
Urban, Suburban, Greenfield

**Mode of Higher Order Transit**
Hong Kong MTR (Mass Transit Railway)

**Size of City (Population)**
7.4 million (Source: Census and Statistics Department, Hong Kong SAR, China (web)

**Case Study Covered in WB Publication**
Yes

## CITY SUMMARY

Hong Kong SAR, China is one of the world's leading international financial centres with a long history of designing and implementing a robust and sophisticated multimodal public transportation network. The network is estimated to move over 12 million passengers a day which includes automated people mover systems (escalators and moving pavements), two high-capacity railways, trams, buses, mini and double-decker buses, taxis, and ferries. It is estimated that public transport trips make up 90% of the daily journeys in Hong Kong SAR, China, the highest rate in the world. The Hong Kong rapid transit railway system, known as the MTR, which alone caters to nearly 4.7 million daily trips.

## URBAN CONTEXT

From the lens of urbanization and city form, Hong Kong SAR, China's compactness can be attributed largely to its constrained geography and topography consisting of several islands, hills, and the sea. While the city has some of the highest urban area densities in the world, only 30% of its total area is built-up resulting in relatively low gross densities compared to other Asian cities. Hong Kong SAR, China is estimated to have an urban area density of 26,100 people per square kilometer as compared to 31,700 persons per square kilometer in Mumbai, and 29,800 people per square kilometer in Surat (Gujarat). The city's resilience and its high quality of life index have helped in placing it as one of the top five liveable cities in Asia. On the other hand, the high cost of living expenses, housing affordability and deteriorating air quality are some of the challenges that the city continues to address through its integrated long-range planning process.

Governed under the structure of "one country, two systems", Hong Kong SAR, China has capitalized on its autonomous status and strategic location to emerge as one of Asia's leading metropolises with a strong sustainable development agenda. The integration of land use, transportation demand management and rail transit has been one of the hallmarks of Hong Kong SAR, China's evolution as a compact city with one of the most profitable mass transit systems in the world. In Hong Kong SAR, China, all lands are public-owned (except the land on which St John's Cathedral stands) and the government can lease or grant the land to public entities.

Hong Kong SAR, China's "Rail + Property" development model has enabled the city to maximize the limited area available for development in and innovative and aesthetic manner while at the same time enable its transit agency to generate revenues to finance investments in transit infrastructure and high-quality public realm design. In addition to this successful development

model, Hong Kong SAR, China's transportation demand management strategies such as car registration fees and transit-first policies have also played a substantial role in making Hong Kong one of the success stories of Transit-oriented Development in the world.

The MTR is financed, constructed and operated by the Mass Transit Railway Corporation (MTR)- currently serving as a private entity with Hong Kong SAR, China's administration serving as a large shareholder.[8] The following discussion highlights some of the key elements of Hong Kong's successful experience with creating transit-oriented development communities with a special emphasis on MTR's integrated property and rail development model within the organizing framework: enabling governmental policies, planning and design processes, use of innovative financial investment tools, and supporting implementation mechanisms.


Figure 9: Hong Kong's Railway Network in 2021 | *Source:* Hong Kong Railway Development Strategy 2014 TOD Design Options ©Hong Kong Transport and Housing Bureau.


Figure 10: MTR Stakeholder Roles | *Source:* MTR Corporation Limited 2014 ©MTR.

## OVERALL TOD STRATEGY

The R+P development model is a cooperation between public and private interests using the TOD concept to concentrate development around a new MTR stop. The government hands out development rights around the station to the railway company, who in turn develops the land and can gain profit from the rising property values. By using this strategy the huge investments in new rail lines can be returned by profits from property development.

The initial investment in Hong Kong's mass transit system was limited to a 20 kilometer stretch, constructed in 1972. In the early years, two agencies were charged with operating the rail service- Mass Transit Railway Corporation (MTR) and Kowloon- Canton Railway Corporation (KCRC). In 2000, MTR was partially privatized with no subsidies received from the government in theory. Subsequently, in 2007, MTR merged with Kowloon-Canton Railway (KCR) Corporation. Through its development control legal framework, transit-first policies and a shareholding in the MTRC, the government of Hong Kong has successfully created an environment that provides financial flexibility and development control which ensures public interest related to transit-oriented developments in the city.

The following table outlines some of the key enabling policies and legal framework used in support of transit and property development[9]:

| | Policy: Land Development[9] | Key Features |
|---|---|---|
| 1 | Grant of exclusive property development rights of the station areas to MTRC in exchange for its commitment to provide and improve mass transit railway as an essential mode of public transportation. | Incentive-based approach to encourage the corporation to plan and develop sites in a financially viable manner by "internalizing" benefits from rail and property development; Eliminates the costs associated with land banking and acquisition |
| 2 | Established MTRC as an independent corporation with government as a major shareholder to strengthen the role of transit agency as the single entity to serve as the master planner, property developer and property manager as well as generate revenues to sustain the transit service. | Government's commitment to remain as the majority shareholder of the MTRCL after the privatization for at least 20 years and own no less than 50% of shares and votes of the MTRCL; Lower transaction costs with single entity as opposed to multiple agencies |
| 3 | Permit joint ventures in real estate development with private sector investment in TODs | |
| 4 | Use of Transfer of Development Rights combined with commitment to encourage redevelopment of existing areas rather than allowing for suburban development | |

Table 1: *Source:* IBI Group

The supporting public transportation system policies that have enabled TOD projects to flourish in Hong Kong's case include[6]:

| Policy: Land Development[6] | Key Features |
|---|---|
| **Limiting private car ownership and usage** | Initial registration tax ranging from 35% to 100% of the vehicle cost. |
| | High fuel tax |
| **Transit service coordination and protection (1980s)** | White Papers on transportation policy |
| | Prohibited direct competition by other PT/feeder modes along the rail routes |
| **Service proliferation and competition (1990s)** | Railway Development Strategy, which set out development plans for four new rail lines or extensions. |
| | White Papers on transportation policy |
| **Service rationalization and consolidation** | Public transport interchanges are a required component of new railway stations to facilitate inter-modal feeder services |
| | Increase the proportion of rail-based public transport journeys from 33% in 1997 to 40–50 |

Table 2: *Source:* IBI Group

Hong Kong's planning system comprises development strategies at the territorial level and various types of statutory and departmental plans at the district/local level. In 1996, a consolidated plan known as the Territorial Development Strategy (TDS), the highest hierarchy of town plans, came to fruition. It provides a board, long-term framework on land use, transport and environmental matters for the planning and development of the territory.

In addition to acting as the transit operator and real estate developer, MTR has a significant role in the master planning and controlling the development processes in collaboration with the private sector. MTRC works in close collaboration with the city planners to define various parameters of station area planning from the time any plans to extend or construct new rail transit lines are proposed. These parameters include:

- Transit Alignment;
- Station Locations;
- Land values;
- Density potential;
- Financial returns;
- Long-term planning objectives; and
- Land use mix based on market demands and zoning constraints.

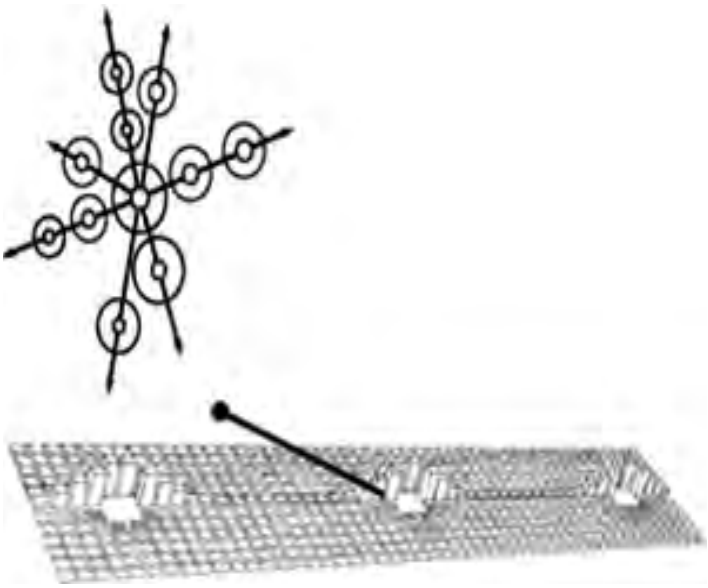


Figure 11: TODs as a "Necklace of Pearls" | *Source:* UC Berkeley 2010 ©UC Berkeley Center for Future Urban Transport. Reproduced with permission from Transport and Housing Bureau; further permission required for reuse.

## KEY ROLES AND RESPONSIBILITIES OF STAKEHOLDERS

Tang et al. (2004) identified the following four key elements behind the R+P approach in their study of the Integrated Rail-Property Development in Hong Kong[9]:

1. Policy. Favorable government support of transit and land-use integration, expressed by land grants and financial assistance to MTRC;
2. Process. Forward-looking planning, management, and control procedures that ensure an efficient approach from project inception to completion;
3. Project. High-quality real estate projects that appeal to tenants, shoppers, and transit users; and
4. Organization. An entrepreneurial entity that balances the financial interests of investors with larger societal goals.

The main agencies involved in shaping urban development policy and its integration with transit services in Hong Kong include:

- Land Development Corporation

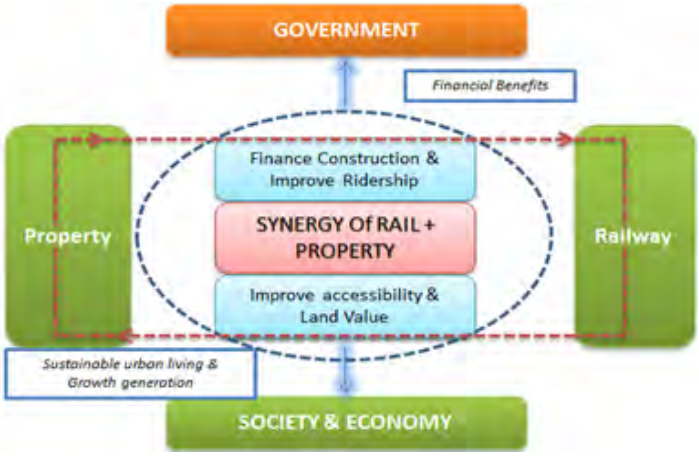



Figure 12: Institutional Mechanism of "R+P" Model | *Source:* MTR Corporation Limited 2011 ©MTR. Reproduced with permission from Transport and Housing Bureau; further permission required for reuse.

The LDC, founded in 1988, negotiated in length with owners to acquire land and to demonstrate that it was aquired in a fair and reasonable manner before applying to the Secretary for Planning, Environment and Lands for compulsory land resumption. The LDC was replaced by the URA in 2001.

- Urban Renewal Authority (URA)- statutory government agency;

The URA was established in May 2001 under the Urban Renewal Authority Ordinance, to replace the Land Development Corporation, as the statutory body to undertake, encourage, promote and facilitate urban renewal of Hong Kong, with a view to addressing the problem of urban decay and improving the living conditions of residents in old districts.

- Mass Transit Railway Corporation (MTRC)- statutory corporation with government as a majority stakeholder listed on the Hong Kong stock exchange;

Originally established in 1975, to "construct and operate, under prudent commercial principles, an urban metro system to help meet Hong Kong's public transport requirements[8]"; MTR was re-established in 2000 as MTR Corporation Ltd. MTR Corporation is involved in businesses outside of transportation, including residential and commercial development, property leasing and management, advertising, telecommunication services and international consultancy services.

- Hong Kong Housing Society- Founded in 1948, the Hong Kong Housing Society is the second largest public housing provider in Hong Kong. It is a major urban renewal agent, which began its Urban Improvement Scheme (UIS) in 1974. Under the scheme, dilapidated buildings in the urban areas were acquired/resumed and redeveloped into modern housing blocks.

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

MTR's transit-oriented development (TOD) model follows the 'network of pearls' urban development model, which designates widely spaced transport hubs connected through a fast transit network. Majority of the new R+P projects are defined by well-design station area plans that ensure "seamless integration" with its surrounding neighborhoods. Each station area is unique and varies by virtue of its contextual relationship with surrounding properties. Cervero and Murikami (2008) classify the R+ P projects into five broad typologies[8]. These include:

- High-Rise Office (HO): high-rise, predominantly office uses on small sites;
- High-Rise Residential (HR): high-rise, predominantly residential uses on small sites;
- High-Rise Residential (HR): high-rise, predominantly residential uses on small sites;
- Mid-Rise Residential (MR): medium-density, predominantly housing projects on medium-size plots;
- Large-Scale Residential (LR): predominantly residential uses on large sites with comparatively low plot ratios; and
- Large-Mixed Use (LM): mixture of housing, offices, retail, hotels, and others on large sites with medium plot rate.

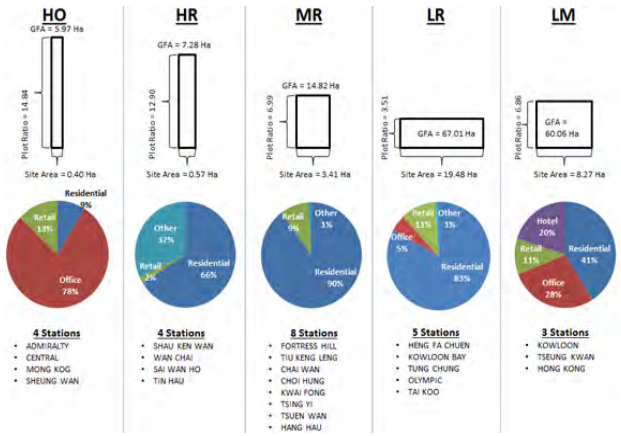



Figure 13: Classification of MTR Stations according to the Built-Environment Type and key clustering variables | *Source:* UC Berkeley 2010 ©UC Berkeley Center for Future Urban Transport. Reproduced with permission from Transport and Housing Bureau; further permission required for reuse.

**Station Area Planning and "Podium" Development**

As discussed above, the 2nd and 3rd generations of MTR property developments have exerted a strong focus on pedestrian integration and connecting with the surrounding communities. The figures shown below illustrate the conceptual model followed by MTR in some of its recent property developments as some of its large-scale developments were raised public concerns related to alienating the surrounding neighborhoods, creating wall effects with towers that reduce air ventilation and increasing housing costs within these developments.

One of the typical station architecture styles representative of Hong Kong's development in the last two decades or so, is the "podium development" model[16]. The podium model involves building above the railway station, a "podium" retail level that can be accessed through the street level. Residential and commercial towers often sit on top of the podium level that are accessible from the station and the street level. The podium's roof is also seen in many instances serving the dual function of a landscaped park with community facilities for the residents.

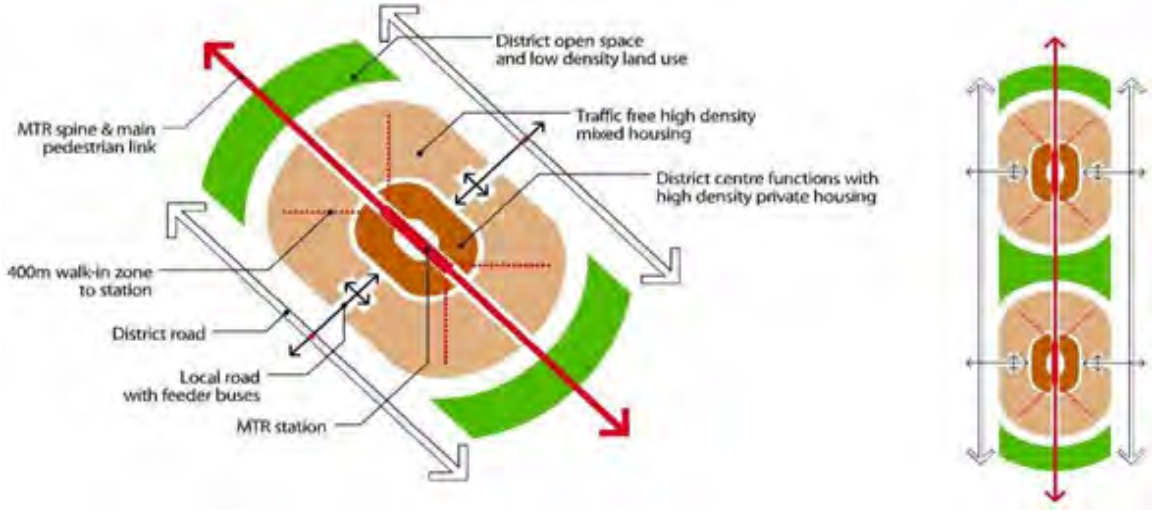



Figure 14: Overview of MTR's concept of R+P Development | *Source:* MTR Corporation Limited 2011 ©MTR. Reproduced with permission from MTR; further permission required for reuse.

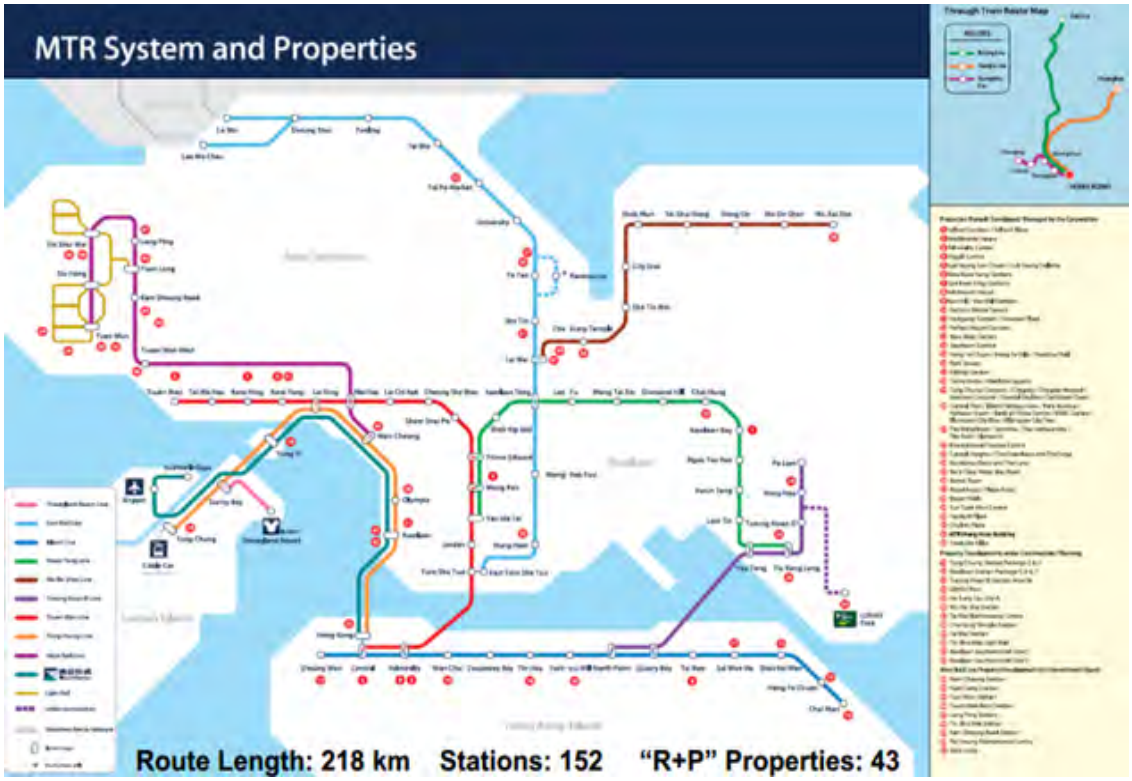

Figure 15: Podium Development Typologies in Hong Kong | Source: Dr. Sujata S. Govada ©UDP International. Reproduced with permission from Transport and Housing Bureau; further permission required for reuse.

**Invest: Rail + Property (R+P)-Hong Kong's Joint Development Financing Model**

Since all lands are owned by the government in Hong Kong and leased to the private sector on a 50-year lease (renewable once for the same time period),

MTR receives assistance from the government in the form of land grants and development rights. This implies that MTR has to function as a self-sufficient entity able to generate its own revenue for operation maintenance and infrastructure improvements.

Since its inception in the late 1970s, MTR has focussed on leveraging its property assets as a source of revenue by undertaking diverse real estate development projects in the lands surrounding above the transit stations. MTR's strategy to pursue integrated property development has been the driving force for attracting the right mix of residential and employment densities that continues to improve the viability of its public transit system serving its dense urban cores. What helped Hong Kong apply the principles of value capture so effectively was the "combination of high population density, public land ownership,




| | Office (sq.m.) | Retail (sq.m.) | Others (sq.m.) | Residential (units) | Total GFA (million sq.m.) | Residential/ Commercial ratio |
|---|---|---|---|---|---|---|
| Urban Line | 234,898 | 299,363 | - | 31,366 | 2.6 | 78% |
| Airport Express Line | 611,877 | 306,571 | 316,473 | 28,473 | 3.5 | 65% |
| Tseung Kwan O Line | 5,000 | 105,814 | 63,030 | 30,414 | 2.3 | 93% |
| East Rail Line | 67,541 | 113,238 | 113,491 | 4,771 | 0.7 | 60% |
| West Rail Line | 95,800 | 145,130 | 50,346 | 19,206 | 1.8 | 84% |
| Ma On Shan Line | - | 65,193 | 38,191 | 10,314 | 0.9 | 88% |
| Light Rail | - | 53,117 | - | 9,108 | 0.6 | 91% |
| Kowloon Southern Link | - | - | - | 1,500 | 0.1 | 100% |
| | 1,015,116 | 1,088,426 | 581,531 | 135,152 | 12.5 | |

Figure 16: MTR System and Properties | *Source:* MTR Corporation Limited 2014 ©MTR. Reproduced with permission from MTR; further permission required for reuse.

and low automobile dependency". The R+P programme could be divided into three stages:

**1st Generation:** This initial stage of the R+P programme used solely a financing mechanism to recover the transit infrastructure investment costs and yield a net profit from nearby property developments as single-use properties above new stations along its Urban Line.

**2nd Generation:** The 2nd generation of the programme was influenced by Hong Kong's growth as a financial hub in the global market resulting in large-scale foreign-direct investments and international property developers.[10] During this phase, the development models transitioned from single-use properties to "mixed-use, pedestrian-oriented town developments examples of place-making" along the new Airport Express and Tseung Kwan O line extensions, also aimed to better connect jobs near the airport with residential areas concentrated in the traditional urban core.[10]

**3rd Generation:** The 3rd and the present generation of the R+P programme coincides with the opening of the fifth MTR subway line are more typical of "greenfield TODs" built on undeveloped or reclaimed lands from the sea, encompasses a diverse set of urban and suburban areas (in the New Territories). These sites encompass nearly 62 hectares and are planned based on unique station typologies that are context-sensitive and integrate innovative architectural and urban design concepts to create new destinations for the growing city. The most recent of such developments was the large Pop Corn shopping centre development which was built in conjunction with Tseung Kwan O station.

As mentioned earlier, the R+P model is one of the most successful joint development models in contemporary urban planning practice in terms of achieving the economic, social and growth management goals envisioned through implementation of TODs. In Hong Kong's case, this principle has also enabled the MTR to be classified as one of the most profitable transit systems in the world. The financial mechanism for the R+P development is relatively simple- MTR receives from the government the right to purchase 50-year leases on lands and in return pays a land premium to the government on a "Greenfield no railways basis" . Next, the MTR invests in the transit infrastructure and develops the property either on its own as a developer or in partnership with the property developer. With time, the property values increase because of its proximity to the rail transit network and its integration with the station. The increment in values is captured by MTR to invest in new infrastructure as well as offset the maintenance and operation costs.

In some cases, for example on lands with technical complexities such as development above stations, MTR generally sells the land only after having built the foundations and thus undertakes a part of the construction activities as an alternative profit source. In addition to selling development rights, MTR generally negotiates a share in the future property with the selected developer and profits and/or receives a co-ownership. MTR has also been successful in developing a strong portfolio of residential and commercial real estate projects that the agency has constructed, leased and rented. Finally, MTR often remains involved in the development as a property manager, generating additional incomes that way. At the end of 2011, MTR owned and rented over 85,000 residential units and 750,000 m² of commercial and office spaces in Honk Kong.

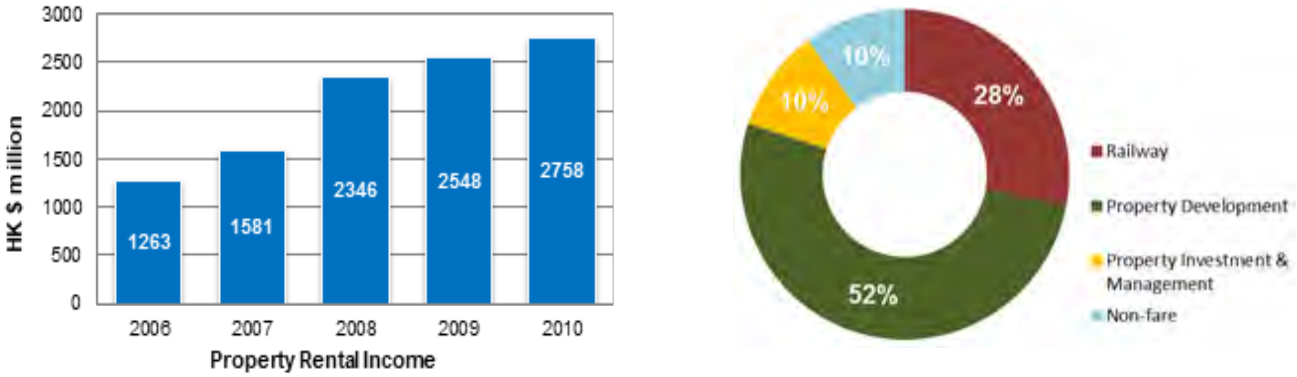



Figure 17: Property Rental Income, MTR (Left) and MTRC Revenue 2001-2005 Average (Right) | *Source:* MTR Corporation Limited 2014 ©MTR. Reproduced with permission from MTR; further permission required for reuse.

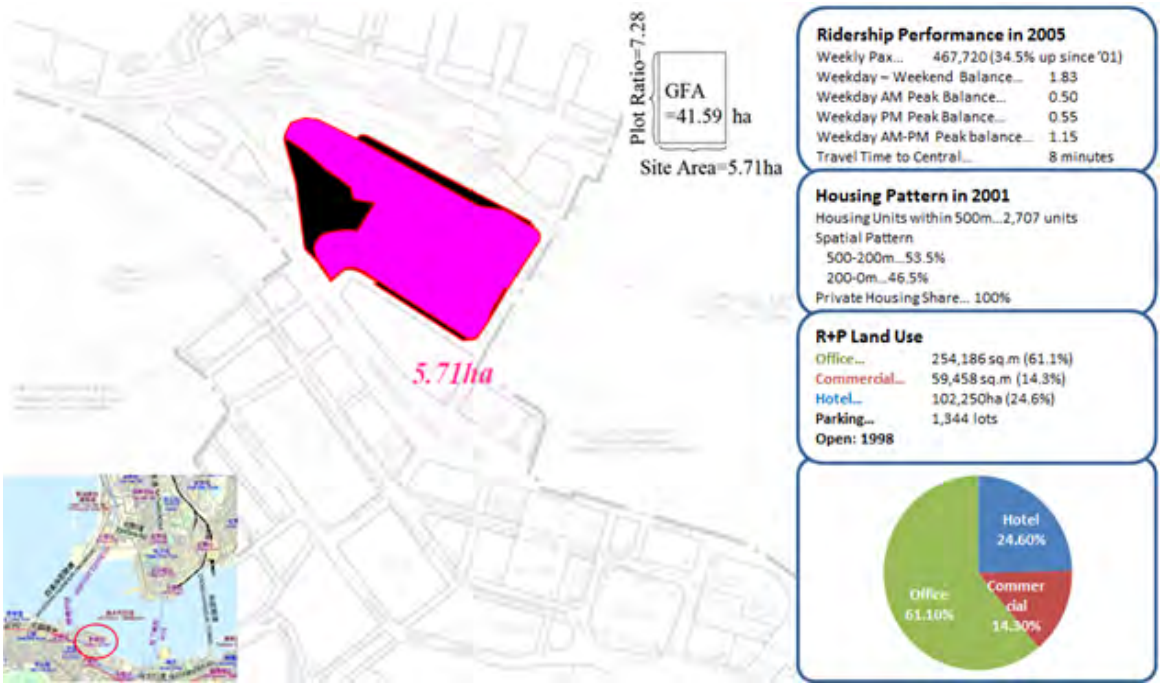



Figure 18: A case summary of Hong Kong's Rail + Property development | *Source:* UC Berkeley 2010 ©UC Berkeley Center for Future Urban Transport. Reproduced with permission from Transport and Housing Bureau; further permission required for reuse.

## INFRASTRUCTURE PROVISION FOR DENSITY

To help create capacity for sustainable growth, which is one of the building blocks proposed under Hong Kong 2030+, a smart, green and resilient city is proposed. It focuses on the scope that are relevant to land use planning, mobility and infrastructure in the built environment and is particularly applicable to new development areas and new neighbourhoods where comprehensive planning is more feasible.

Three building blocks of the territorial development strategy are proposed for achieving the vision and overarching planning goal. These building blocks are translated into spatial terms in a conceptual spatial framework.


Figure 19: Hong Kong's Railway Network in 2021 | *Source:* Hong Kong Development Bureau and Planning Department 2017 ©Hong Kong Development Bureau and Planning Department.

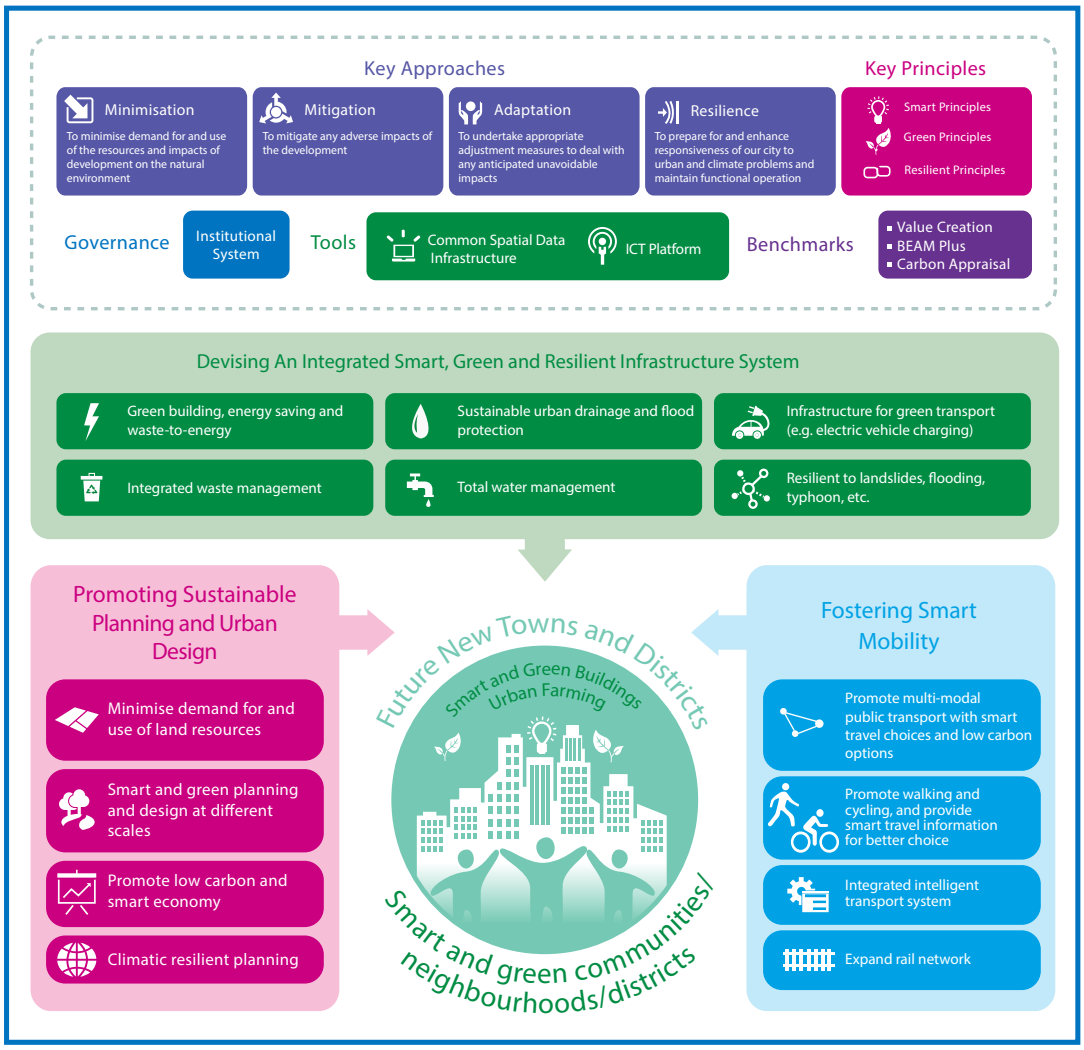



Figure 20: Smart, Green and Resilient City Framework for the Built Environment | *Source:* Hong Kong Development Bureau and Planning Department 2017 ©Hong Kong Development Bureau and Planning Department.

## IMPLEMENTATION STRATEGIES

Tang et al. (2004) identified the following four key elements behind the R+P approach in their study of the Integrated Rail-Property Development in Hong Kong[9]:

1. Policy. Favorable government support of transit and land-use integration, expressed by land grants and financial assistance to MTRC;
2. Process. Forward-looking planning, management, and control procedures that ensure an efficient approach from project inception to completion;
3. Project. High-quality real estate projects that appeal to tenants, shoppers, and transit users; and
4. Organization. An entrepreneurial entity that balances the financial interests of investors with larger societal goals.
5. From a perspective of defining the roles and relationships of these agencies pertaining to the "R+P Development Model", the following illustrations provide a summary of the institutional arrangement and functions that have ensured successful implementation of TOD projects in Hong Kong[11].

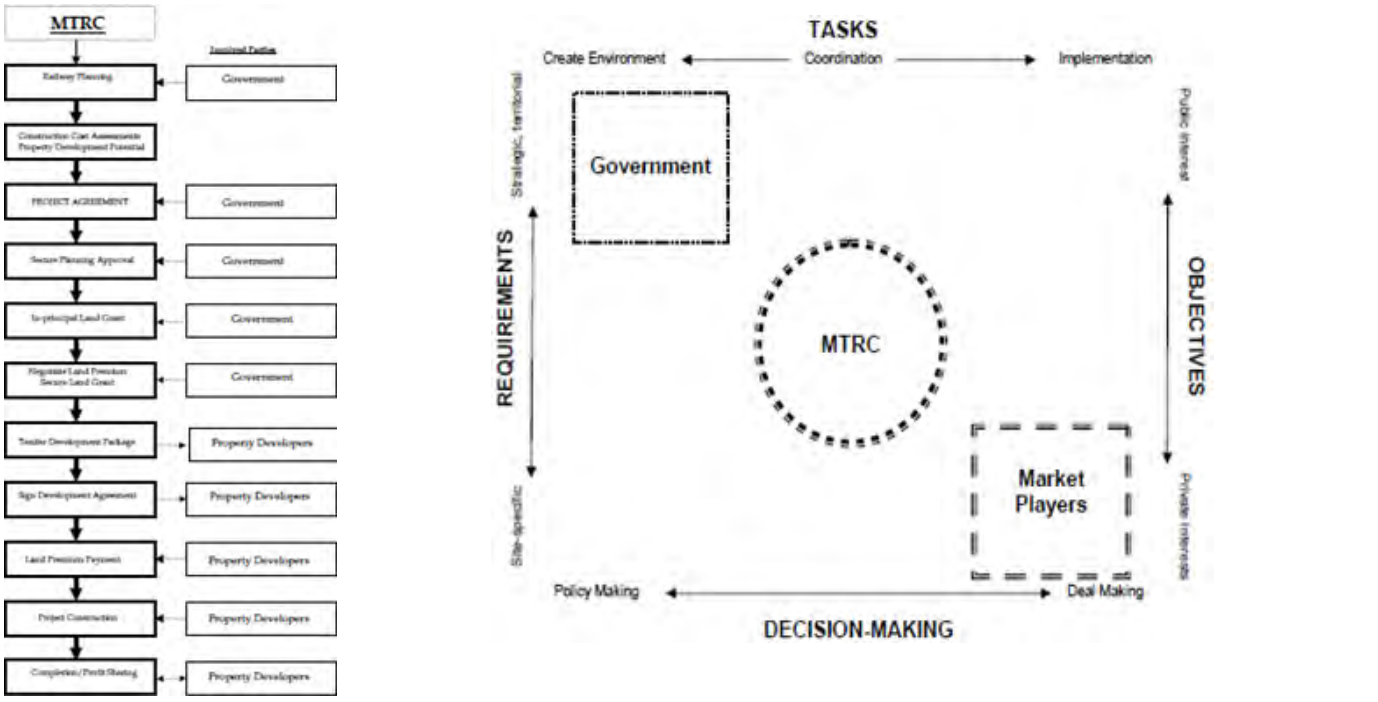



Figure 21: Institutional arrangement for R + P Development Model | *Source:* MTR Corporation Limited 2011 ©MTR. Reproduced with permission from Transport and Housing Bureau; further permission required for reuse.

## KEY LESSONS LEARNED AND BEST PRACTICES

**Lessons Learned from Hong Kong applicable to Global cities**

An important lesson from the Hong Kong experience is that integrating transit with land-use can yield the finances needed to support TOD. The use of "Value Capture" as an infrastructure financing concept that seeks to capture land value created by new infrastructure, particularly transit. Value capture is effective in financing transit infrastructure, particularly in dense and congested settings. This is due to the high perceived importance for improved accessibility and an institutional capacity fit to support transit. Accessibility benefits present enormous opportunities for recapturing some of the value created by transit investment in land values and effectively supplement the traditional forms of revenue for transit systems, like fares.

The study by Tang et al. (2004) on Study of the Integrated Rail-Property Development Model in Hong Kong confirm the positive relationship between property development and MTR ridership as follows[9]:

a. High population concentrations and densities are associated with high MTR station ridership.

b. Private housing units clustered around MTR stations tend to exert a greater impact on the ridership than public housing.

c. Mixed land uses, compact environment and exciting street-level activities in the existing urban districts promote MTR ridership.

d. New development districts with attractive design, commercial facilities and efficient pedestrian connections along rail corridors enhance MTR ridership. Pedestrian connections must be convenient, direct, safe and pleasant for these developments to be successful and to increase property values.

The R+P program applied by the MTR Corporation in Hong Kong has been central to the success of Hong Kong in developing its rail system. The R+P program enabled MTR Corporation to capture real estate income to finance part of the capital and running costs of new railway lines, and to increase transit patronage by facilitating the creation of high-quality, dense and walkable catchment areas around stations.

The following three key concepts applied in the R+P program are essential to the program success and can be adopted by global

cities with railways as the trunk transit mode, by taking the transit-oriented development mechanisms to help finance new rail lines[14] :

**Financial Sustainability Approach:** The value for a rail company to only under-take those rail investments that can achieve a targeted rate of return (after factoring government support, in the form of land rights provided at before-rail price, used in a R+P program, or cash subsidies) to be financially sustainable.

**Market-driven Approach:** The need to plan development along each rail line comprehensively, with multiple stakeholders and partners, and to define the scale and timing of such developments based on market demand, location characteristics and institutional capacity.

**Risk management approach:** The value for a railway company to bring in relevant expertise and transfer a large part of commercial risks to private developers through PPPs and transactions with external partnerships.

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# ASIA | CASE STUDY

## SHENZHEN, CHINA

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# SHENZHEN, CHINA

## QUICK FACTS

**Geographic Context**
East Asia (China)

**Scale**
City, Corridor, Neighbourhood, Station

**Context**
Urban, Suburban, Greenfield

**Mode of Higher Order Transit**
Metro (Transport Commission of Shenzhen Municipality & Shenzhen Metro Group)

**Size of City (Population)**
11 million (Tier-1)

**Case Study Covered in WB Publication**
No

## URBAN CONTEXT

China's population is rapidly urbanizing, with 70% of its citizens expected to be living in urban areas by 2030[3]. Shenzhen is no exception, with a rising population of 11 million and the fastest urbanization rate in Eastern Asia.1 With such fast growth and a large urban realm, the provision of adequate and readily available public transportation is an essential part of combating and avoiding the congested road conditions that result in large populations. Metro integration within large cities is known as an effective, but expensive method of providing public transit.

Shenzhen is one of China's most rapidly growing cities in terms of economy and urbanization. With over 11 million people residing within the city in the Guangdong province, its large urban extent allows for a fairly low population density of over 2,000 people per square kilometer.1 This is substantially smaller when compared to its counterparts in Asia. Shenzhen has become one of the frontier cities that is leading the economic growth of China as the first of the nation's five Special Economic Zones (SEZ).2Special economic zones receive allowance from the government for more flexible, free market-oriented economic policies. Shenzhen is unsurprisingly designated as an SEZ, as after less than twenty years of development, it has transformed from a small fishing village to one of the largest metropolises in China.

In the 1990s, the economy in Shenzhen continued to grow exponentially, with a significant increase in secondary industries. The market-oriented policies allowed for foreign investment, which has led to continuous growth in the manufacturing industry.

With such immense growth, Shenzhen has started to design and develop a new development strategy for the city called the "Shenzhen 2030 Urban Development Strategy." Amongst this strategy is a focus on public transit, emphasized at the city's most major form of infrastructure development moving forward. In meeting this goal for improved public transit, the city began its strategic planning of a metro in 1998. The resulting metro and its funding methodology remain a model for transit implementation in Asia.

TOD K P

# OVERALL TOD STRATEGY & CITY STRUCTURE

## IMPACT ON URBAN FORM

The improved convenience, accessibility and quality of life allowed for by transit attracts development, intensification and investors to the rail corridor. The R+P funding mechanism is largely dependent on using the consequent increase in land value to incentivize the involvement of private stakeholders. The scarce availability of land in Shenzhen, due to its hilly topographic nature, allows for continued high housing prices. It is this scarcity which motivates the joint development undertaken by Shenzhen, SZMC and MTR.

The first phase of subway development was guided by government investment. Lacking experience with substantial transportation infrastructure projects like the metro, Shenzhen failed to capitalize on integrating property development with public transit development. In the Chinese context, the notion of transit-oriented development has yet to become supported by planning policy. The inflexible nature of Chinese planning policy does not allow the integration of transit and property development, and measures such as up-zoning for high-density development surrounding the rail corridor are not triggered by transit creation. The lack of integration of the interrelated systems led to the first phase of development largely ignoring land value, as the time-consuming nature of changing policy to support TOD would have led to too many delays.[4]

The second phase of the metro development was much more cognizant of subsequent increases in land values and used this to incentivize the SZMC to assist in funding the rail development. Special auctions of land were used to ensure that the metro company would receive land at a discounted price. Moreover, land concessions were refunded to the company as capital investments, which gave SZMC use of the land for no charge, while also allowing the value captured after the construction of the metro to be kept by the company.[3]

Finally, in the third phase of metro development, land-equity investments were engaged in place of capital investments. This agreement granted undeveloped land along the corridor to a third-party, thereby incentivizing involvement through the promise of land-value appreciation. In the case of the MTR, land premiums were shared 50/50 between the private entity and the government, in exchange for a build-operate-transfer agreement (BOT). [3]

Overall, the strategy for utilizing land values in funding the metro construction after establishing an R+P mechanism involved creating value, realizing that value and recycling it. Creating value involves the strategic siting of routes, stations and updating zoning parameters to allow for more profitable transit-oriented development along the rail corridor. This value must then be realizes by transferring land use rights to the involved stakeholders in exchange for joint development of the subway that captures land value premiums for the land developed after the metro construction. Finally, these land values can be recycled by using the land value appreciated to fund future transit and urban design projects that will further increase land values.


Figure 22: Land Value's integral role in the R+P funding Progress | *Source:* World Resources Institute 2017

## FINANCIAL MODEL

In the context of Shenzhen, the rapid growth and economic affluence the city is experiencing lends to the application and viability of Metro-led transit-oriented development (TOD). As a central manufacturing city, connectivity to surrounding metropolitans in the Pearl Delta River Region could be improved with the introduction of a metro system. Specifically, the strategy looked to improve connection with Hong Kong SAR, China. To justify such a large undertaking, the innovative funding approach of Rail + Property (R+P) funding was experimented with, a trailblazer of its kind.

R+P funding not only encourages both state-owned and private metro companies to participate in R+P projects, but also uses innovative land-use rights transaction methods to overcome current barriers within the land-leasing system.[3] During the early stages of R+P implementation, it was realized the R+P was a new concept for local developers and led to increased costs and risks for private companies[3]. Particularly impacted was local metro company—Shenzhen Metro Group. To incentivize SMG, the local government reduced its cost and risk burdens through a complex financial arrangement[3]. The R+P financial scheme in the context of Shenzhen can be separated into three phases: government-led capital investment, auctions with special conditions and land-concession fee reimbursement, and land equity investment.[3]

The first, government direct investment, was scaled back to reduce public costs and to place a larger onus on private companies to invest. The Shenzhen city government, Reform and Development Commission, and Planning Commission proposed to decrease of government investment in capital costs from 70 to 50 percent, forcing the metro company to use bank loans and property development to make up the difference.[3]

Consequently, the government used special auctions to transfer land to Shenzhen Metro. Traditionally this land would have to be auctioned in an open, public auction.[3] However, the city ventured to pilot special auctions for R+P development projects. Special terms restricted the number of bidders, ensuring that Shenzhen Metro would obtain the land at a low price.[3]

Finally, land concession fees paid by the metro company were diverted to fund capital investments for the subway. This complex method allowed the city to grant land-use rights to the subway company free of charge, while also allowing Shenzhen Metro inherit the land premiums captured in the future.[3]

This three-phased financial scheme was not only an incentive for private entities to become involved, but also reduced the costs and risks undertaken by the government. Through a build-and-transfer (BT) arrangement for property development, construction risks were minimized and the private stakeholders were held accountable for their involvement in the project team. The implementation of R+P is vital to the success of the Shenzhen metro project and is a financial strategy that could improve the viability of metro projects going forward. [3]

## KEY STAKEHOLDERS & GOVERNMENT RELATIONSHIPS

Traditionally, the onus for large infrastructure projects, such as this, falls on the government and public to fund and implement. However, this case study exemplifies the beneficial shift from government-led to mixed-model funding of public transit projects. Shenzhen's exploration with R+P includes a partnership between the government and key stakeholders, the Shenzhen Metro Group and the MTR Shenzhen Corporation. Both private entities shared in the responsibility of financing the metro through an incentivized approach that captures the future land value and resources following the completion of the project.

The Shenzhen Metro Group Co. (SZMC) was enacted in 1998 as a large-scale proprietor under the control of the state-owned Assets Supervision and Administration Commission of the Shenzhen government. Creating the state-owned private entity allowed responsibility for metro expansion, construction and operation to be held in the private sector. Today, the private entity is responsible for the continued operation of the metro system it constructed and looks to continue to improve the safety and comfort of existing services.[5]

The MTR Shenzhen Corporation was the second stakeholder in the construction of the Shenzhen Metro. The corporation is Hong Kong SAR, China's major rail developer, as well as a significant land developer. Their role in the metro construction was incentivized by offering them pre-rail value for land abutting the rail corridor, lending to profitable and discounted development for the corporation.

The evolution of the Shenzhen Subway's financing mechanism has benefited from more than 10 years of efforts by the Shenzhen city government, dramatically altering the process of obtaining capital investment for large infrastructure projects. Instead, a flexible mechanism of cost recovery was created that made infrastructure costs a shared public-private investment and revenue generator.[3] This approach was effective in incentivizing the subway company to participate in R+P programs and ensuring the financial sustainability of subway projects. R+P development leverages the partnership between the public sector, transit companies, and developers for a collaborative financing and development scheme. By capturing the land value appreciation that follows transit projects, R+P can successfully finance large infrastructure investments without long-term debt for stakeholders.[3]

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

The success of Shenzhen's R+P planning can also be attributed to a streamlined and coordinated planning process that integrates multiple disciplines. Shenzhen borrowed from Hong Kong SAR, China's experience to streamline the details of the different phases of rail transit plans and to adjust its planning process.[3] This adjustment allowed for the creation of synergies between rail transit plans and the overall urban planning process, paving the way for successful TOD.

The coordination between land-use and transit plans in Shenzhen occurs at the route level by bundling zoning revision with transit planning.[3] Specifically, once the route plan of new metro lines is determined, an independent market analyses can be conducted and land-use surveys can pinpoint vacant lots with high development potential. The planning institute can then collaborate with the metro company and other governmental departments, to shortlist land lots for joint development. The zoning of these properties will be discussed by stakeholders to reach a consensus. Normally, the FAR of developable sites near metro stations is increased significantly, and more diverse land uses are permitted. This draft route plan with zoning proposals will be then submitted to the municipal planning committee (led by the mayor of the city) for further deliberation.[4]

Despite this innovative process, Shenzhen's integrated planning experience remains limited, when compared with Hong Kong SAR, China. As the "master planner and designer," the MTR Corporation is actively engaged in the entire urban planning process, whereas in Shenzhen they play a weaker role in the planning process and only route-level plans are determined.[3] This late-stage engagement may lead to missed opportunity for joint development, thereby restricting the extent to which transit plans could be optimized.[3] Thus, to fully achieve designs that reflect transit-oriented development, the policy framework that allows for integrated land use and transit planning must be advanced.

## INCLUSIVITY & AFFORDABLE TOD SYSTEMS

The Songgang rolling stock depot is a typical example of the R+P development occurring in the suburbs of Shenzhen (Type 1). It is located near Bitou Station along Line 11 and borders Shenzhen and Dongguan. The depot covers an area of 42.09 hectares and is zoned as a "special control zone," based on future anticipation for subway construction[4]. In line with the aspirations of local communities, this land will not only be served by public transit services, but will be equipped with mixed uses and community facilities.[4]

These include[4]:

- Affordable housing on land above the rolling stock depot—FAR 2.0.
- Schools and residential housing east of the depot—FAR 3.0.
- Commercial and office developments near Bitou Station—FAR 6.0

Along with the renewed affordability of R+P housing along the rail corridor, using the metro costs only 2 yuan for the first 4 kilometers of travel. While this is accessible, riders from more affordable and periphery locations in Shenzhen may experience higher metro costs, as prices vary based on distance. This potential lack of affordability further justifies the integration of TOD design strategies like active transportation with the metro system. Adaptations and inclusions such as improved walkability could assist in keeping the metro system as affordable as possible.[4]

## IMPLEMENTATION OF SOLUTION

### APPROXIMATE TIMELINE

- **1998**- City began strategic planning of a metro. Shenzhen Metro Group was enacted
- **December 2004**- Metro service began
- **June 2011**- 5 more lines were opened
- **2016**- Line 7,9,11 Opened
- **2030**- Planed completion target

### ACTIONABLE STEPS

- Identify needs/ Take Inventory
- Create Strategy Plan (Phases)
- Identify Key Stakeholders
- Find Funding
- Mitigate Competition
- Optimize/ Utilize Land Value
- Create Design Strategies to Encourage Transit Use

## KEY LESSONS LEARNED AND BEST PRACTICES

### SUMMARY

Shenzhen's metro system is a precedent for effective metro implementation, as its funding methodology improved the affordability of the mode for local governments and allowed for a public-private partnership in funding transit.

Although the Shenzhen metro construction may not be a perfect example of TOD, it shows definite strives towards becoming transit-oriented and its R+P funding strategy stands as an exemplary model for increasing the viability of metro systems within low-mid income cities.

### ROADBLOCKS AND WAYS TO IMPROVE

In the Chinese context, the notion of transit-oriented development has yet to become supported by planning policy. The inflexible nature of Chinese planning policy does not allow the integration of transit and property development, and measures such as up-zoning for high-density development surrounding the rail corridor are not triggered by transit creation.

To improve from a situation like this they largely ignoring land value at the beginning phases, as the time-consuming nature of changing policy to support TOD would have led to too many delays. Then they established an R+P mechanism involved creating value, realizing that value and recycling it.

### KEY LESSONS

The following key takeaways should be derived from the Shenzhen example:

- R+P funding uses innovative land-use rights transaction methods to overcome current barriers within the land-leasing system.
- The successful transition from a State-owned subway company to Private-owned subway companies.
- Streamlining and coordinating the planning process by integrating transit planning, land use planning and financial planning allowed for the creation of synergies between the series of rail transit plans and the overall urban planning process.

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# ASIA | CASE STUDY

## GUANGZHOU, CHINA

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# GUANGZHOU, CHINA

## QUICK FACTS

**Geographic Context**
East Asia (China)

**Scale**
City and Corridor

**Context**
Urban

**Mode of Higher Order Transit**
BRT and Metro

**Size of City (Population)**
25 million (Tier-1)

**Case Study Covered in WB Publication**
Yes

## URBAN CONTEXT

Guangzhou is the capital of Guangdong province and the third-largest city in China with over 14.5 million residing within in. Located North of Hong Kong SAR, China along the Pearl River, the city is rapidly growing in density, with nearly 1,800 people per square kilometer. The city is well-known as both a commercial center and a bustling port city with a sprawling population.[2]

As one of China's largest metropolitans, meeting the demands of a rapidly growing population places a burden on Guangzhou's public resources and services. The drive towards being a developed and world-class city required the strategic thinking that led to the initiation of the Bus Rapid Transit system. Particularly, Zhongshan Avenue is the corridor that links the most rapidly growing districts within Guangzhou. At its most western point, the Tianhe District on Zhongshan Avenue is home to intensive growth and densification, with large-scale high-rise development and a new rail station residing within it. At the end of the 22.5 km corridor, the Huangpu District is also dense and nature and urbanizing to include large high-rise communities and developments. With the urbanization and intensification occurring along Zhongshan Avenue, updating the transit networks to support this growth will be vital to the city's prosperity and overall efficiency.[2]

Prior to the introduction of the Guangzhou Bus Rapid Transit (BRT) system, congestion, gridlock and overcrowding, were words that characterized the former public bus system of China's Guangzhou. The city of over 14.5 million residents was tasked with the difficult challenge of reforming the flawed transit system to more effectively serve the users along Zhongshan Avenue, a central truck road, particularly.[4] Adopting a method of relieving the high demand placed on the bus and road systems along the corridor was a necessary adaptation to improve the efficiency and success of their transit systems. These challenges led way to the creation of Guangzhou's Bus Rapid Transit (BRT) system, which would soon become one of the most successful of its kind in Eastern Asia. The 2011 Sustainable Transport Award winner for innovative transport solutions, Guanzhou's BRT is a leader of its kind. Executive Director of the Institute for Transportation and Development Policy has stated "Guangzhou's transformations are nothing short of amazing… The new BRT system is changing perceptions about bus-based and high-quality mass transit. We hope all cities, not least those in the US, will be inspired by these examples".[5] A good example of successful transit-oriented development (TOD) and BRT implementation, the system is a prime illustration of the success transit can bring a city.

Although Guangzhou is void of specific policy promoting development along the BRT corridor, in practice, the city's planning authorities are more inclined to allow higher-density developments in recognition of the need for improved traffic conditions. The authorities are also open to relaxing minimum parking standards in light of the BRT's presence.

## OVERALL TOD STRATEGY & CITY STRUCTURE

A BRT system was determined to be the most economical and timely method to overcome the shortcomings of the city's transportation networks. The alternative, building a metro system, posed the challenge of huge capital costs and delays in resolving congestion. Enacting this strategy was not without its challenges, as authorities had to overcome decades' worth of disjointed and piecemeal transportation planning within the city's street network. Years of slow service and delays on the bus system also left negative perceptions of bus transit with city residents.

Despite the circumstances, Guangzhou successfully opened its 22.5-kilometre BRT corridor in February of 2010.[2] It was structured with the goal of reducing congestion on one of the city's busiest roads, Zhongshan Avenue. With aims of improving the overall efficiency of the existing bus system, combatting congestion and its environmental impacts and changing public perception, the BRT represented a step towards transit-oriented development. Today, the Guangzhou BRT boasts of 850,000 average weekday riders, making it the busiest bus corridor in Asia (and the second-busiest bus corridor in the world, after Bogota).[2] The Guangzhou BRT's passenger flows are more than three times than those in other BRT systems within Asia.

To achieve such success in their BRT system, Guangzhou used careful planning and analysis to justify such a large-scale system. With twenty-six stations along a 22.5 kilometer stretch of the city's most congested roadway, the strategic approach includes express routes, designated bus lanes, direct metro connections and higher-capacity buses.1 Moreover, the system would support some of the world's highest flows and capacity, with buses arriving at stations every ten seconds during peak hours. Demand analyses played a large role in designing the system, with each BRT station designed to have separate east and westbound waiting platforms located on corresponding sides of the bus lanes. Their sizes have been calibrated to meet modeled demand and the needs of bus operations. Some stations are as short as 55 meters while Gangding, the busiest station in the world at 55,000 daily riders, is 250 meters long (the world's largest) and has multiple pedestrian bridges for access. [2]

The construction of the system was phased, with the first phase completed in February of 2010. Paired with the improvement of active transportation networks and supplementary transit systems along the BRT corridor, the approach proved to be the relief required for the congestion experienced along Zhongshan Avenue.

Figure 23: Gangding Station before (left) and after (right) the implementation of the BRT | *Source:* ITDP 2011 ©ITDP. Reproduced with permission from ITDP; further permission required for reuse.

## KEY STAKEHOLDERS & GOVERNMENT RELATIONSHIPS

In achieving such a successful implementation of the BRT system, stakeholder collaboration of both public and private entities was vital. Preliminary planning for a BRT system in Guangzhou began in 2003 by the Guangzhou city government. With no exemplary high-capacity BRT systems in China, the city was considering other corridors with significantly high congestion. To help with this the government enlisted the aid of The Institute of Transportation and Development Policy (ITDP) and Guangzhou Municipal Engineering Design and Research Institute (GMEDRI) for the planning and design. The two groups drafted the concept plan and carried out demand analyses and corridor comparison. They also drew up the operational and traffic plan, which included opening the BRT to more than one bus operator and allowing the buses to run both inside and outside the BRT corridors. The overall infrastructure funding for the project was provided by the Government of the People's Republic of China. Once the plans were constructed they were run by the operating agency GZ BRT Management Company and seven private bus companies.[7]

### FINANCIAL MODEL

Capital costs for the Guangzhou BRT project reached 950 million Yuan (USD 103 million), which although high, is about one-twentieth of the per-kilometer costs of the alternative, a metro expansion.[2] The cost-effective investment was a more efficient way of increasing capacity and did not lead to increased consumer costs, due to significant government subsidy to reduce fare prices. The consequent benefits and cost-saving measures initiated through the BRT, including reduced operating costs, time savings, and reduced emissions and thereby emission credit and reduced consumer trip and health costs would pay for the project in just one year. The financial return on this initial government investment justifies the use of the BRT as a resolution for the congestion issues faced in Guangzhou.

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

Public and green space improvements along the BRT corridor became a priority after its initiation. Guangzhou began implementing a greenway improvement project in 2010, creating hundreds of kilometers of green corridors across the city. This scheme saw the restoration of the Donghaochong Canal, an ancient canal that dates back to the Song Dynasty, which several BRT routes serve. The effort is part of a major project to clean up waterways around the city, including several canals connecting with the BRT corridor.

Additionally, cycling has received higher priority, with fully-separated and updated bicycle lanes built along both sides of the entire BRT corridor. Bicycle sharing programs have been enacted along the corridor, offering over 5,000 bicycles to citizens and thereby reducing motorized trips by over 7,500 daily, according to the ITDP.[1] The corridor also offers safe, free bike parking along the bus route. Pedestrian safety and comfort was also prioritized through the enactment of the BRT in Guangzhou, with the addition of new street crossings, pedestrian bridges connecting BRT stations to adjacent buildings and, whenever possible, seamless urban design and architecture that lend to a more comfortable walking experience. These investments have significantly improved perceptions of pedestrian safety and the quality of the walking environment.[2]

| | |
|---|---|
| Aggregate yearly operating cost savings | 93 million yuan (USD 14 million) |
| Value of aggregate time savings (2010) | 158 million yuan (USD 24 million) |
| Average yearly value of certified emission credits | 25 million yuan (USD 4 million) |
| Aggregate consumer savings on trip cost in 20 10 | 672 million yuan (USD 103 million) |
| Yearly reduction in health costs from respiratory illness | Unknown |

Table 3: Annual value created by the BRT System | *Source:* ITDP 2011 ©ITDP. Reproduced with permission from ITDP; further permission required for reuse.

### INFRASTRUCTURE PROVISION FOR DENSITY

Although the Donghaochong Canal restoration project was not directly coordinated with the BRT project, improvements in this area and in public spaces and pedestrian facilities along the BRT corridor will help retain high levels of transit passengers, by ensuring that corridors for accessing BRT by walking and cycling are attractive and vibrant. A similar transformation of a drab streetscape into a spectacular public space was achieved through the restoration of the Lizhiwan Canal, which also opened in 2010. These serve as examples of the shift towards transit-oriented development and corridor improvements in Guangzhou, as a shift towards improving the image and functionality of the BRT corridor has come to exist.

Until recently, the Donghaochong Canal was a polluted ditch running mostly under an elevated expressway. Uncontrolled urban development had encroached on the banks of the canal, and buildings were periodically flooded when waters overflowed the banks, sometimes spilling sewage into adjacent residential and commercial properties. Starting in 2009, a 3-kilometer stretch of land along the Donghaochong Canal was cleared and turned into a greenway, featuring world-class walking and cycling facilities and popular new green public spaces. In the surrounding area, more than 329,000 square meters of new commercial real estate is being developed.[3] The Donghaochong Canal Museum, housed in two historic villas, recently opened providing information on the canal and its history. The greenway project attracts people to live, work, and play and has become a popular free swimming area in the summer.

Figure 24: The Donghaochong Canal before and after restoration efforts to improve the vital public space along the BRT corridor. | *Source:* Far East BRT Planning Co., Limited ©Far East BRT Planning Co. Reproduced with permission from Far East BRT Planning Co.; further permission required for reuse.

## INCLUSIVITY & AFFORDABLE TOD SYSTEMS

Along with improved modal options for BRT users, affordability has also significantly improved with the creation of the BRT system. Bus fares have undergone substantial simplification and restructuring as a part of a citywide low-fare program. Previously most bus fares were 2 Yuan (USD 0.30), though some longer routes had fares as high as 5 Yuan. As of 2010, all route fares cost 2 Yuan, a deliberate attempt by city government to subsidize and make the BRT system more accessible to all citizens. Also, within the BRT system, riders are allowed free bus transfers, whereas outside the BRT system they must pay a second fare to transfer. Smart Cards provide frequent BRT users a discount as well: after the first fifteen rides in a month subsequent fares are 1.2 Yuan. All of these changes have the effect of decreasing the average fare price for BRT riders.[2]

However, not only low-income households are enjoying the benefits of the project. Higher-income households along the BRT corridor, often car owners, initially opposed the BRT, fearing traffic conditions would worsen because of the reduced road space for cars. Contradictorily, the BRT has improved not only bus speed and travel time, but also private car speeds and travel time. With an encouraged and incentivized use of public transit, less private vehicles on the road has been beneficial for both the BRT system and those who decide to travel by private vehicle.

For those without cars, the BRT system has significantly enhanced regional accessibility by reducing the amount of time needed to travel around the city. It has also reduced travel costs, as users can transfer for free from BRT buses to other buses serving different routes. The system bodes well for lower-income households by allowing them simple access to the city center, while retaining their lower-value property on the periphery of the city. This increased affordability can be attributed to the success of the overall system.

# IMPLEMENTATION OF TRANSIT ORIENTED DEVELOPMENTS

### APPROXIMATE TIMELINE

- **2003-** Preliminary planning for a BRT system began
- **2005-** Conceptual plan, demand analysis & corridor comparison[6]
- **2006-** Phase 2 planning; traffic, operational and design planning; & demand analysis for Phase 1[6]
- **2007-2008-** Implementation planning & design[6]
- **2009-** 3km stretch along Donghaochong Canal was cleared and turned into a greenway
- **2010-** First phase of construction completed February

### ACTIONABLE STEPS

1. Identify needs/ Take Inventory
2. Conduct Analysis of Area
3. Create Strategy Plan (Phases)
4. Identify Key Stakeholders
5. Find Funding
6. Optimize/ Utilize Land Value
7. Create Design Strategies to Encourage Transit Use
8. Market to Encourage Active Transport

# KEY LESSONS LEARNED AND BEST PRACTICES

### SUMMARY

A good example of successful TOD and BRT implementation, the system is a prime illustration of the success transit can bring to a city. The success of the project will undoubtedly bring transit-oriented development that intensifies and urbanizes the city along the Zhongshan corridor, lending to a more environmental and social-inducing urban form. Evidence from around the world shows that when high-quality transit service is in place, it encourages denser, more mixed-use land uses, setting a land use pattern more conducive to walking, biking, and transit in place of automobile trips. If this investment in multi-modal transportation encourages even a very small fraction of the several million people who live along the Zhongshan corridor to forgo a car purchase the impacts on GHGs is very large.[4] Further, if local developers capitalize on these alternative transport assets and build dense, walkable, mixed-use housing developments with low parking ratios, the impact will grow larger than estimated here and be better sustained over time.

### ROADBLOCKS AND WAYS TO IMPROVE

Enacting this strategy was not without challenges, as authorities had to overcome decades' worth of disjointed and piecemeal transportation planning within the city's street network. Years of slow service and delays on the bus system also left negative perceptions of bus transit with city residents. The methods used to improve were careful planning and analysis to justify such a large-scale system. Demand analysis played a large role in designing the system. The project also supports a comprehensive approach to transportation planning in rapid-growth scenarios, as congestion cannot be resolved without a balanced modal share and shift in user attitude.

### KEY LESSONS

The following key takeaways should be derived from the Guangzhou example:

- Adopting a method of relieving the high demand placed on the bus and road systems existing along the corridor were a necessary adaption to improve the efficiency and success of their transit system
- The Guangzhou BRT boasts 850,000 average weekday riders.
- Public/ Private Partnership.
- Exemplifies modal connectivity and encourages active transportation as a supplementary mode, with updated cycling and pedestrian infrastructure that is both safe and of world-class design.

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# ASIA | CASE STUDY

## SEOUL, REPUBLIC OF KOREA

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# SEOUL, REPUBLIC OF KOREA

## QUICK FACTS

**Geographic Context**
East Asia (Republic of Korea)

**Scale**
City, Neighbourhood, Station and Corridor

**Context**
Urban and Suburban

**Mode of Higher Order Transit**
BRT and Metro

**Size of City (Population)**
25 million (Tier-1)

**Case Study Covered in WB Publication**
Yes

## URBAN CONTEXT

With over 22 million residents and a population density of 10.4 million inhabitants over a land area of 605 square kilometers, Seoul is one of the largest and fastest growing mega-cities in the world. Amongst this population, only a small percentage of Koreans have access to a car (2 per 1,000 persons) as of 1970. Although ownership has increased vastly over the last 30 years, with 215 of every 1,000 currently owning a vehicle, this increase can be attributed to the inadequate transit provision within Seoul.[1] The result of such demand is a burdened bus system, characterized by both high passenger volumes, lengthy ride durations and distances and reduced bus speeds. Demand greatly outweighing the public provision of transit, a drive towards transit-oriented development (TOD) became a necessity to solve the overwhelming congestion and declining bus quality experienced in the city.

Until 1974, Seoul was almost entirely dependent on bus services with intensive congestion, passenger volumes and trip distances. This encouraged the creation of an urban rail system. Seoul's first metro line was enacted in 1974 and has since grown to a total of 487 km in 2004 with close to 400 stations.

The rail network in Seoul is now one of the largest in the world and carries 8.4 million passengers per day—more than twice the daily passenger volumes on the New York subways and the London underground. [6]

The main problem, however, was poor bus service, which, in turn, encouraged increasing car use. Although it did not deal with the core problem of unregulated private bus firms, the Seoul Metropolitan Government made several attempts to improve bus service and ridership. The first curbside bus lanes were installed in 1984 and expanded to 89 km by 1993, 174 km by 1994, and 219 km by 2003.[4] The network of reserved bus lanes helped speed up bus travel somewhat, but it did not succeed in raising bus use. Clearly, more drastic changes were necessary. Hence, Myung-Bak Lee, the former mayor of Seoul, implemented more pressing reforms that involved generating car-dominated areas, reclaiming space for pedestrians, and fully integrating a BRT system supported by policy interventions and technical advocates. Due to such high densities, the Seoul metropolitan government over the years has also aggressively sought to decentralize growth, mainly in the form of building master-planned new towns sited on the region's periphery.

TOD KP

## OVERALL TOD STRATEGY & CITY STRUCTURE

Over the past several decades Seoul has followed a pattern of American-style sprawl with a rise in private automobile ownership. However, population densities in Seoul have historically been and remain high by global standards.[5] The city of Seoul itself, along with the port city of Incheon and surrounding Kyunggi Province, constitute the Seoul Metropolitan Area (also called the Seoul National Capital Area), with more than 23 million inhabitants—the world's second-largest urban agglomeration.[5] In 2006, Seoul and Incheon combined had the sixth-highest population density in the world (16,700 people per square kilometers).[5]

The deep reform of public transport in Seoul has been a major step towards retaining its competitive edge. The former Mayor of Seoul, Myung-Bak Lee, led the charge of reinvesting in Seoul. In 2001, Lee ran for mayor of Seoul, largely on a platform of reinvigorating the central city as means of creating a more sustainable yet productive city.[3] His platform called not only for expanding public transit services, but also for reducing the ecological footprint of private cars by reclaiming urban space consumed by roads and highways. "Why scar the interior of the city," he reasoned, "to funnel suburbanites to office jobs in the core?"[3]

### INFRASTRUCTURE PROVISION FOR DENSITY

A major culprit was the network of elevated freeways into central Seoul—facilities that severed longstanding neighborhoods, formed barriers and created visual blight[5]. Although freeways provided important mobility benefits, Lee recognized that those benefits had to be weighed against their nuisance effect.

Public transit had to be substantially expanded and upgraded to absorb traffic. The city did so by extending subway lines and creating seven new lines of exclusive median-lane buses (stretching 84 kilometers, later expanded to 162 kilometers) and 294 kilometers of dedicated curbside bus lanes.[3]

### LAND TENURE & LAND VALUE CAPTURE

The freeways to greenways conversion created higher market demands. The greenways along the TOD corridors further boosted land value and development activity along these busy corridors. When the elevated freeway existed housing prices within three kilometers fell.[2] This shows the previous blight that Mayor Lee spoke about. When the freeway was convert to a greenway the housing prices within 2km of it rose as much as 8%. [2] More high-value industries and commercial parcels also came to the corridors near the greenway. This spoke volumes for the community's values. Quality of place won over a car dominance.

## KEY STAKEHOLDERS & GOVERNMENT RELATIONSHIPS

The former Mayor Lee, and the Seoul Development Institute (SDI) were crucial in enacting far-reaching reforms for Seoul's public transit system. When elected in June 2002, Lee promised to improve the public transport system in Seoul and commissioned a series of comprehensive studies performed by the research division of SDI.[4] The studies resulted in recommendations for the modernization of the metro and bus fare structures and payment systems, better integration of bus and metro services, an expanded network of reserved bus lanes, and a complete overhaul of the organization and operation of bus services.[4] The transport specialists at SDI, led by Dr. Gyengchul Kim and Dr. Keeyeon Hwang, were the main technical advocates for these changes, while Mayor Lee and his staff provided the necessary political support.[4]

Elevated Freeway

Urban Greenway

Figure 25: Freeway to Greenway Conversion[2] | *Source:* The World Bank 2013 ©Seoul Metropolitan Government 2003. Reproduced with permission from WB; further permission required for reuse.

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

One of the first major changes was an entire redesign of the bus network to integrate more than 400 different bus routes. All bus services are now grouped into four types, color-coded for passenger ease.

To coordinate bus services, the Seoul Metropolitan Government set up a new Bus Management System (BMS) using advanced intelligent transport system (ITS) technology. Global positioning system (GPS) terminals located in every bus now permit a central bus control center to monitor all bus locations and speeds, adjust the number of buses per route, communicate with bus drivers, and provide real-time information to passengers.[4] The new BMS facilitates more dependable bus service and optimizes service distribution by adjusting bus assignments and schedules to conform to travel demands.[1]

In addition to the complete redesign of the route network, the system of dedicated bus lanes was expanded from 219 km to 294 km, with more expansions planned.[4] Most significant, however, is the development of a true BRT network with dedicated center bus lanes, high-quality median bus stops, real-time information integration and state-of-the-art buses.[3]

The Seoul Metropolitan Government now views BRT as a much more economical and efficient way to provide public transport services than metro expansion, which can take many years to construct and requires large capital investments.

Nevertheless, the extensive rail system in Seoul remains the backbone of public transportation. Better integrating bus services with the metro is, therefore, essential. Bus routes and stops have already been relocated to facilitate simple transfers between modes. The city is currently in the process of building 22 additional transfer centers as well.

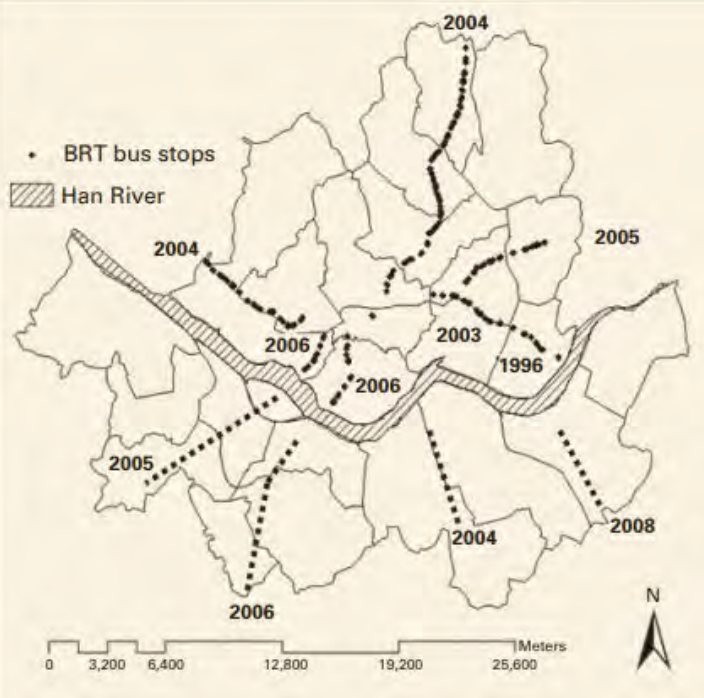


Figure 26: Bus Rapid Transit Corridor in Central Seoul[2] | *Source:* The World Bank 2013 ©World Bank. Reproduced with permission from WB; further permission required for reuse.

## IMPLEMENTATION OF TRANSIT ORIENTED DEVELOPMENTS

### APPROXIMATE TIMELINE[6]

- **1953-** First public bus began services
- **1970-** Only 2 in every 1000 people had access to a car
- **1974-** Seoul Conducted its first metro line, 8km long
- **1984-** First curbside bus lanes were installed
- **1993-** Bus lanes expanded to 89km
- **1994-** Bus lanes expanded to 174km
- **2001-** Myung-Bak Lee ran for mayor on the platform of reinvigorating the central city as means of creating a more sustainable yet productive city
- **June 2002-** Lee was elected and promised to improve the public transport system
- **2003-** Bus lanes expanded to 219km
- **December 2003**- Results from studies performed by SDI were published recommending coordination and modernization of the metro and bus systems.
- **January 2004-** Mayor Lee conducted public relations campaign to explain the benefits of reform
- **July 2004-** Start date for implementation of reform
- **2004-** Metro line expanded to 487km and bus lanes expanded to 294km
- **July 2009-** Metro line 9 opened for operation

### ACTIONABLE STEPS

1. Identify needs/ Take Inventory
2. Create Strategy Plan (Phases)
3. Establish Policies
4. Identify Key Stakeholders
5. Optimize/ Utilize Land Value
6. Create Design Strategies to Encourage Transit Use
7. Market Plan

## KEY LESSONS LEARNED AND BEST PRACTICES

The dramatically altering reforms of July 2004 completely restructured bus services in Seoul and increased demand-based control over routes, schedules, and other aspects of service. An integrated metro and bus system allow for seamless transition between modes and a far superior overall public transport system. Central to the reforms was the introduction of an entirely new system of fully-separated BRT routes.

Studies have proven that BRT systems around the world can provide excellent express service at a fraction of the cost of new rail systems. The experience with BRT in Seoul has been a resounding success.

### ROADBLOCKS AND WAYS TO IMPROVE

One roadblock appeared right after the major reform in which there was tremendous service disruption, public discontent, and political uproar. A smooth transition to the completely new bus routes, fare structure, and fare payment system required more time. In particular, there should have been a trial period to test the reforms on a selective basis instead of immediately adopting them system-wide. Mayor Lee created campaigns to inform the citizens about this major reform however he only ran the campaign for six months prior to the start date. To improve this in the future, more time and effort to distribute the appropriate information to the public before implementing the reforms should be planned.

### KEY LESSONS

The following key takeaways should be derived from the Seoul example:

- Mayoral-led efforts
- Minimized network of elevated freeways
- Both BRT and metro lines were exponentially increased in length
- Integrated Intelligent Transportation Systems (ITS)
- Created 400 bus routes and constructed 22 major transfer centers.

## ENDNOTES


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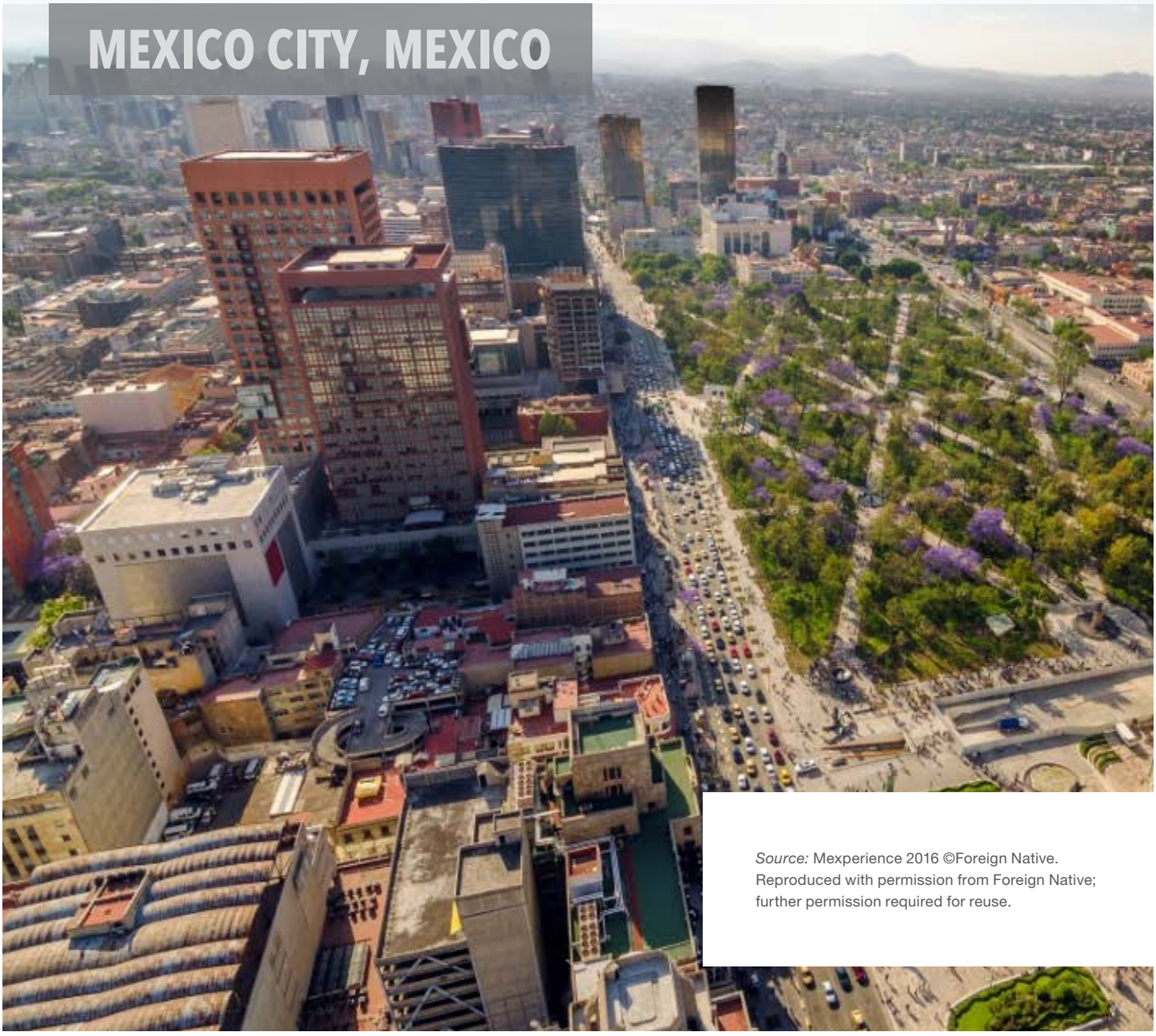
# AMERICAS | CASE STUDY

## MEXICO CITY, MEXICO



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# MEXICO CITY, MEXICO

## QUICK FACTS

**Geographic Context**
South America (Mexico)

**Scale**
City, Corridor, and Station

**Context**
Urban

**Mode of Higher Order Transit**
BRT Metrobus and Metro

**Size of City (Population)**
21.4 million (Tier-1)

**Case Study Covered in WB Publication**
Yes

## URBAN CONTEXT

Mexico City, the capital of Mexico, is home to over 17 million people and a population greater than any other city in North America. The city has a population density of approximately 8,400 people per sq. kilometer and is growing by 2.5% annually.[1] With such an immense population and an urban area that is gradually becoming denser, various issues have come to arise as a result. Congested travel modes, significant pollution and smog, and unsafe transit systems are each a result of the growth Mexico City has been experiencing. In order to combat these adverse effects, in 2005, Mexico City created a Bus Rapid Transit (BRT) system called Metrobus.

Metrobus is the world's sixth busiest BRT system and is a continually-expanding system which now carries more than 300 million passengers a year across 125 kilometers and six lines of exclusive bus lanes.[8] Compared to the jitney bus services that BRT replaced, travel times in BRT corridors have fallen by 40 percent and there are 30 percent fewer accidents. In addition, 15 percent of drivers in corridors served by BRT reportedly have switched to public transit.[4]

The improvements have also produced modest reductions in emissions of greenhouse gases and smog.

The Metrobus greatly enhanced the public sector's direct involvement in the planning of key transportation services and administrative faculties, which had suffered throughout previous decades. This outcome is arguably just as—if not more—important than BRT's impacts on mobility, safety, and pollution. Mexico City's surface transit industry has transitioned from a system dominated by an unruly and unmanageable set of independent, small-scale operators concerned only for personal gain. Instead, a professional, modernized, faster, safer, environmentally-conscious system replaced jitney service improving the experiences of millions that rely on public transportation in their day-to-day lives.

TOD KP

## OVERALL TOD STRATEGY & CITY STRUCTURE

Mexico City generated a quick-to-implement, modest, and yet highly visible programmatic success on key corridors in the city. In 2005, Metrobus opened and replaced 350 standard buses with 97 BRT vehicles, owned by both private and public companies.[6] The project consists of two components, the first being the construction of a mass transit corridor along Insurgentes Avenue, integrated with traffic management for private vehicle travel. The system would include various elements for more efficient and comfortable travel including: exclusive bus lanes, upgraded pedestrian facilities leading to stations and low-polluting buses to replace the former polluting and low-capacity vehicles. The second component of the project would be the monitoring of the system and the creation of cycling linkages and new corridors to create a more integrated system. [6]

The approach towards implementing the BRT system was particularly complicated for Mexican officials, as existing, independent bus and jitney providers were highly resistant to the movement, as it would essentially put them out of business. The independent operations being undertaken prior to the BRT can be characterized as unruly and unmanageable, with operation sacrificing service standards for revenue.[5] The shift towards greater public control over transit allows for a focus on achieving transportation best practices that are beneficial socially, economically and environmentally. Reaching this point of public-sector control required strategic compensation, negotiation and persuasion at times. Initially, the government granted private operators compensation, which financially onerous, was replaced with guaranteed income in the new BRT system. Moreover, when financial methods were unsuccessful in inducing collaboration with jitney operators, city officials used rivalry groups to outflank operators that were not cooperating and threaten to move forward with new partner's instead.[5] This strategic approach to combating BRT opposition proved successful.

The siting of Mexico City's first BRT system was also strategic in its creation. Although ridership was projected to be lower, BRT implementation began Insurgentes Avenue, on the basis that it was located in a very prominent area and that political negotiations with the independent bus operators were likely be simpler. This allowed for a less-costly and quick example of visible BRT success in the city, paving the way for subsequent corridors to be expanded to match the successes of Insurgents.

### INFRASTRUCTURE FUNDING

In addition to the submission of opposition, the strategy towards BRT financing would prove both beneficial and forward-thinking for Mexico City. Projected to cost over USD49.4 million, a combination of public, private and carbon financing methods were used.[8] Specifically, with regard to carbon financing, Mexico City government intended to use the purchase of greenhouse gas emission reduction to finance the project, as well as Clean Development Mechanism (CDM) revenues. With the objective of reducing carbon emissions through the introduction of the BRT, this financing method proved to be viable and resulted in more funding than anticipated for the Metrobus. Over 35,000 tons of carbon dioxide are reported to have been reduced annually due to the new BRT system.[6]

## KEY STAKEHOLDERS & GOVERNMENT RELATIONSHIPS

Essential to the success of Mexico City's BRT system was the mayor-led drive for control over the existing transportation system in Mexico City. Gaining control over the formerly unmanaged private sector service providers, through compensation, negotiation and when unsuccessful, credible threats, allowed for public transit to be expanded to actually include the public sector. The project overall can be characterized as government-led, with the strategic integration of private entities to assist in financing and operating the system.

The planning, management and construction financing were largely provided by the Mexico City government. Internalizing infrastructure costs allowed for large-scale capital financing to be taken care of, while vehicle provision and fare administration were contracted to reputable private entities, RTP and CISA.

The newly elected Mayor, Lopez Obrador, strategically timed changes to Mexico City's bus service to solidify public support, by pushing the agenda for both BRT and highway expansion, exemplifying an agenda of balanced transportation.[5] This assisted in quieting the car-supportive voters that would normally have opposed the project. Policy objectives of safety, enhanced air quality, environmental sustainability and urban redevelopment of distressed areas of the city led the drive and appeal for the project.

This government intervention was paired with the creation of a new public entity, Metrobus, and partnering with private entities RTP and CISA, which would operate and maintain operations of the BRT. This allowed for safer and more professional operation of the public transit system that provided fair and objective fare systems to residents. As well, the city expanded the financial benefits of public-private partnership arrangements beyond original bus and jitney owners to generate more widespread industry support for the changes.[5] Providing the public bus operator with the opportunity to act as a participant in the creation of the first BRT line, city officials gained the support of public sector workers, accessed their experiential wisdom, and reduced the number of new buses requiring financing.

Public and private entities involved also strived to be transparent with and cognizant of the citizens that would be utilizing the system. To understand whether a mandate for change existed within Mexico City's residents, public consultation booths across the city were used to gain an impression of locals' thoughts and opinions on a potential BRT system. By using a comprehensive approach, inclusive of the various stakeholders, Mexico City was able to introduce a system that was widely supported and successful as a result.

TOD KP

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

Mexico City implemented tried and true policy templates from other cities, as well as, leveraging external resources to help catapult new ideas for transport onto the public agenda. Environment Minister Claudia Sheinbaum developed the BRT proposal with the support and advice of a global network of sustainable transport researchers, funders and development agencies. In designing their BRT system, Mexico City was driven by the mayoral political agenda of supporting a balanced transportation system.[5] With this said, future developments intend to address cycling networks and the extension of the BRT corridor to better integrate these modes. With over 855,000 passengers daily, Metrobus has been successful in ensuring a shift from a car-dominated modal preference.[4] Ridership has instead switched to transit, as well as cycling which has been seamlessly integrated into the BRT system with the 2010 creation of EcoBici. EcoBici is a bike sharing program created to increase the popularity of bike commuting in Mexico City, with over 6,000 bikes and 250 stations dispersed amongst the city as of 2015.[3] The widespread system is efficient and simple to use and was strategically launched near transit stations to encourage multi-modal travel. With the intention to expand the system even further in 2018 and to improve bike infrastructure to support EcoBici, cycling is likely to be a large influence in discouraging car travel in Mexico City.

To encourage this increased transit use, which has resulted in a reduction of car use by 15%, focusing on the environmental aspect of transportation was an important driver.[4] Formerly plagued by smog and pollution, the BRT system aimed to mitigate these adverse effects and reduced the amount of harmful air pollutants riders were exposed to be 2-3 times. Accident rates were also significantly reduced by up to 30%. Providing a safer and healthier system to its citizens was one important factor to improving their use of transit.[4]

Additionally, upgrades to the stations and fleet of buses being used allowed for greater capacity and comfort for riders. Overcrowding and congestion discourage ridership, thereby combating these issues is vital to encouraging transit use. The use of vehicles with a 160 passenger capacity versus the smaller standard buses in the past system was beneficial to tackling the issue of crowding.[6] Moreover, the improved efficiency that arose from the BRT system was a vital determinant in encouraging a shift for private car use to public transit. Commute time have been reported to have seen reduction of up to half an hour and buses are strategically timed to arrive at high frequencies of up to 56 per hour during peak times of the day.[6] In scenarios where public transit becomes the more efficient option, it is unsurprising that the modal shift moves in its favor.

Tepalcates Central Station (Before)

Tepalcates Central Station (After)

Figure 27: MetroBus Station Design | *Source:* New York City Global Partners Innovation Exchange 2012 ©Metrobus.

## INCLUSIVE & AFFORDABLE TOD SYSTEMS

Inclusivity and affordability are also essential parts of improving the appeal of public transit. In the case of Mexico City's Metrobus, all paper tickets and cash payments have been removed from the system and payment occurs solely with the use of rechargeable fare cards.[2] This method of payment, although efficient, has its shortcomings, in that only some of the stations have card recharge stations. It also costs citizens 10 pesos to initially purchase the card, which has impacts on the system's affordability. Each ride costs 6 pesos, which includes as many transfers as need be and use of all five BRT lines.[2] The ability to travel at such lengths and with unlimited transfers has the effect of improving the affordability of the transit line for riders that travel from periphery neighborhoods to the inner city. While the system may not be as largely subsidized comparably with examples in Asia, for instance, the price is by no means a complete barrier to public transit use.

In the spirit of transit-oriented development, including affordable housing in the developments that result along the BRT corridor is being emphasized to cater to the diverse population using the system. One example is the IntegrARA Iztacalco development which is less than a quarter mile from a BRT line and is reusing a greyfield industrial site to create 720 affordable housing units.[7] The development includes courtyards, recreational spaces, cycling facilities and mixed-use, high density buildings to create a neighborhood closely resembling best practices of transit-oriented development. By catering to a broad range of income levels and providing a mix of private and public spaces with close access to both the BRT and metro corridors, the development makes living near transit an affordable option.

## IMPLEMENTATION OF TRANSIT ORIENTED DEVELOPMENTS

### APPROXIMATE TIMELINE [9]

- **June 2005-** Metrobus Bus Rapid Transit (BRT) began operations- Line 1 Phase 1
- **March 2008-** Opening of Line 1 Phase 2
- **December 2008-** Opening of MetroBus Line 2
- **2010-** EcoBici, bike sharing program, was created
- **May 2010-** Start of construction of Line 3
- **February 2011-** Opening of Line 3
- **April 2012-** Opening of Line 4
- **November 2013-** Opening of Line 5
- **2015-** EcoBici had 6,000 bikes and 250 stations in Mexico City
- **January 2016-** Opening of Line 6
- **February 2018-** Opening of Line 7
- **2018-** Expand EcoBici system further and improve bike infrastructure.

### ACTIONABLE STEPS

1. Identify needs/ Take Inventory
2. Create Strategy Plan (Phases)
3. Identify Key Stakeholders
4. Find Funding
5. Mitigate Competition
6. Optimize/ Utilize Land Value
7. Create Design Strategies to Encourage Transit Use

## KEY LESSONS LEARNED AND BEST PRACTICES

### SUMMARY

Mexico City's implementation of a BRT system is well-known as best practice in the TOD development realm. With clear improvements to efficiency, environmental impact, rider satisfaction and capacity, the system has been a success. Mexico City was successful in their use of public-private partnerships and environmental reduction as methods of financing the large capital cost infrastructure project. Mexico City involved not only private corporations, but the bus operators and drivers as well, which allowed for a diverse investment group to buy-in to the project. Moreover, by focusing on the environmental aspects of transit provision, the city was able to capitalize on carbon emission reduction costs to finance the project, whilst also improving their ecological footprint.

### ROADBLOCKS AND WAYS TO IMPROVE

A major roadblock while implementing the BRT system was the independent bus and jitney providers were highly resistant to the movement, as it would essentially put them out of business. The independent operations being undertaken prior to the BRT can be characterized as unruly and unmanageable, with operation sacrificing service standards for revenue. The way that they improved this situation was first by compensation, negotiation and persuasion. When financial measures were unsuccessful city officials used rivalry groups to outflank operators that were not cooperating and threatened to move forward with new partners instead.

### KEY LESSONS

The following key takeaways should be derived from the Mexico City example:

- Project consisted of two components- Construction of a mass transit corridor and then monitoring the system and creating cycle linkages and new corridors.
- Metrobus greatly enhanced the public sector's direct involvement in the planning and territorial management of key transportation services.
- Over 35,000 tons of carbon dioxide are reduced annually due to the new BRT system.
- Increased transit use resulted in a 15% reduction in car use.
- Accident rates have been reduced by to 30%.
- Less than a quarter mile from a BRT line 720 affordable housing units were created.

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# AMERICAS | CASE STUDY

## SANTIAGO, CHILE

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# SANTIAGO, CHILE

## QUICK FACTS

**Geographic Context**
South America (Chile)

**Scale**
City and Corridor

**Context**
Urban

**Mode of Higher Order Transit**
BRT and Metro

**Size of City (Population)**
6.3 million (Tier 2)

**Case Study Covered in WB Publication**
Yes

## URBAN CONTEXT

Santiago, Chile, the capital city of Chile, is one of the most densely populated cities in the Americas. With a population of over 7 million people, it is the most populous city in Chile, with a density of almost 9,000 people per square kilometer.[1] The population is dispersed across a large urban area, which continues to increase in its extents and population annually. Transportation in Chile has be known to be lengthy and inefficient, with safety and passenger treatment receiving very low priority. Between the absence of fare integration with other transport services or with the subway, higher demand than provision, the poor treatment of passengers and a high accident rate, the transit system does not provide an environment that encourages its use.[3] Commuter resentment against the system was rising and according to a survey conducted in 2003, the bus system was voted the city's worst public service.[3]

Persistent and severe complaints prompted intervention from the government of Chile to overhaul the city's public transport system with a metro and bus-based integrated system, focused on including a high-tech centralized control system. An entirely new transport industry structure was conceptualized and financed through an international bid for tenders.

The resulting system of a seamlessly integrated BRT and metro lends to the ideals of transit-oriented development (TOD) that are being emphasized in planning and development practices currently. A system of efficiency, passenger comfort and safety for both riders and the environment has resulted from necessary interventions.

## OVERALL TOD STRATEGY & CITY STRUCTURE

Transantiago, the public transport system in Santiago, Chile is comprised of a bus rapid transit (BRT), feeder bus lines and a metro system. It completed its fourth year of operation in February 2011. Prior to Transantiago's implementation, the city's public transport system proved to be problematic. The system was fully privatized and run by 3,000 independent operators, using a fleet of converted trucks, unfit for public transport.[3] Since 2001, the buses enabled 43 percent of the motorized trips in the city.[3]

Santiago's overall strategy to improving the shortcomings of these systems was an integrated multi-modal system inclusive of a BRT and an expanded Metro network. BRT development involved the creation of 18.8 km of segregated corridors, 4.6 km of new road connections, 62.7 km of road and pavement improvements, and construction of about 70 bus stops.[3] The bus fleet was made up of 1,200 new low-floor articulated trunk buses, 1,500 conventional trunk buses and 2,300 feeder buses.[3] The expansion of the metro network expansion included construction of 66 km of tracks and 68 stations at a total cost of USD $2.4 billion. About 45 km of tracks were built between 2000 and 2006, enhancing the ability of the system to deliver 830,000 trips per day. Another 21 km were built after 2006 which enabled 254,000 additional daily trips.[3] The integration of cycling facilities and bike sharing within public transit is also planned for enhancement, to allow for active transportation options with the modal split.

Integration of transit services involved the installation of a unified financial system, contactless fare cards, and the construction of two inter-modal stations. The system allowed for the integration of information systems for operational control and data collection, investment estimated at USD $30 million.[3]

Overall, the implementation of Transantiago was based on two objectives: complementation and integration. Complementation related to the enhancement of both the BRT and Metro systems to better complement each other and create a multi-modal system. Integration references the development of a single-fare system of both bus and Metro. Through these underlying objectives, a system that serves over.

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

Santiago has utilized a variety of design strategies to ensure the increased and continued use of their transit services upon their expansion. A main driver in ridership is the seamless integration of the BRT and Metro systems. With a unified fare system which uses contactless fare cards, transferring between modes is efficient and affordable.[3] In the case of Santiago's two inter-modal transit stations, riders do not even have to leave the confines of the station to transfer between modes. This increased accessibility and convenience for riders is a vital influence in their use of the full transit system, all modes included.

Essential to furthering Metro and BRT integration was the introduction of connected cycling infrastructure within transit systems. Formerly, Santiago had very few cycling networks separated or on their roadways, which was mitigated in 2007 with a plan to introduce 690 kilometers of bike lanes throughout both rural and urban areas.[2] Still in its implementation phases city-wide, examples of inclusion in districts of the city have come to exist. For example, the district of Providencia engaged in a public bike system as of 2009, which has grown from an initial 1,000 bikes to over 4,000. Costing only USD2.00 monthly for unlimited trips of up to an hour, the system caters to a broad range of citizens from 14 to 80 years of age.[2] Compared to other South American cities, Santiago is reported to have the best cycling integration as shown in the table below. With heightened and simplified access to and from transit stations via bicycle, citizens' willingness to use transit rather than private vehicles has improved.

| | Santiago | Montevideo | Quito | Florianopolis | Score per item |
|---|---|---|---|---|---|
| Bicycles allowed on board only off peak (3) any time (4) special facilities (5) | 0 | 1 | 1 | 0 | 2 |
| Bicycle ease access to public station/stops | 2 | 0 | 1 | 0.1 | 3.1 |
| Public Bicitaxis and/or bicycles access to stops and stations | 1 | 0 | 0 | 0 | 1 |
| Cycling facilities at stations/stops, lifts, ramps, etc. | 2 | 0 | 0 | 0.6 | 2.6 |
| Educational facilities that encourage use of bicycles | 2 | 1 | 2 | 0.3 | 5.3 |
| Other policies that promote cycle friendly culture. Ex. Coordinating agency for public transport and cycling. | 2 | 1 | 0 | 0.3 | 3.3 |
| **General quality** | **10** | **5** | **4** | **2.3** | |

Score explanation: 0: there is nothing, 1: minimum facilities, 3: reasonable quality facilities 5: broad existence of high quality facilities and high level of integration

Table 4: Santiago's cycling integration statistics when compared to similar Latin American cities.[2] | *Source:* Paolo Jiron ©UN Habitat. Reproduced with permission from UN Habitat; further permission required for reuse.

Moreover, a continued focus on ensuring Transantiago is expanding to meet demand ensures efficiency and capacity, which are both drivers for heightened ridership. Santiago, Chile is reported to have the highest rail extension growth of all Latin American countries, with over 60km of rail expansion anticipated as shown in Figure.[2] In addition, simple design measures such as; colored bus lanes to avoid private vehicle incursion and delays in travel, lighting inclusion within bus stops for safety purposes and environmental policies that reduced emissions up to 20%.[3] These strategies, although seemingly minuscule, have large impacts on the efficiency and comfort of public transport systems in Santiago and can be attributed to greater rider satisfaction.

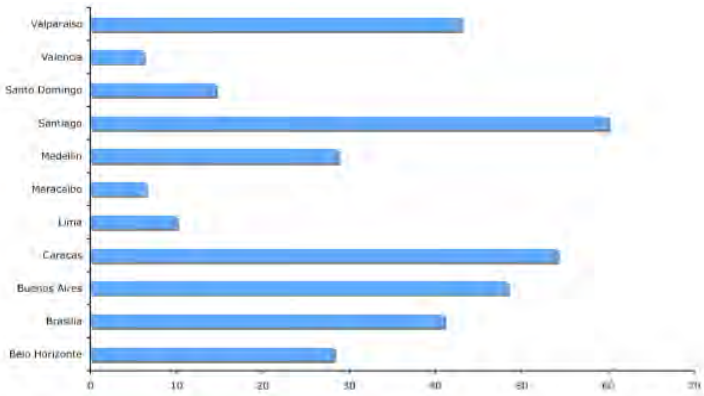


Figure 28: The rail expansion (in km) expected for various Latin American countries, Santiago leading the expansion trends.[2] | *Source:* Paolo Jiron ©UN Habitat. Reproduced with permission from UN Habitat; further permission required for reuse.

## KEY STAKEHOLDERS & GOVERNMENT RELATIONSHIPS

Essential to the implementation of Transantiago were the various stakeholders that played a role in its road to fruition. Developed under the mandate of the Urban Transportation Plan for Santiago (PTUS), a Presidential Advisory Commission was enacted to create an institutional framework for implementing the project. The commission consisted of the Ministers of Public Works and Housing, the Santiago Metropolitan Region, Transport Under-secretary, Environmental Commission Director and the Metro leaders.[2] Each with different priorities and focuses with regards to transportation, different perspectives were brought to the planning process and an integrated framework of a variety of urban priorities was developed.

The overall infrastructure funding was raised multiple ways. Forty-five percent of it was raised through public-private partnerships. Whereas, the remaining infrastructure was founded by the Ministry of Housing and Urbanism.[4]

The PTUS was eventually restructured and replaced with Transantiago, still led by the presidential advisors. The lack of lower-level stakeholder integration, in this case, can be described as one of the biggest downfalls to the project. With only high-level organization leaders engaged, local authorities, citizens and operating staff were not advised. Instead, the Presidential Advisory Commission had sole control, which led to a lack of accountability, coordination and efficiency.[2] Decentralizing the responsibilities with regards to public transit and including lower-level actors represents a much more effective institutional framework. Best practices from other contexts should be considered in this case for future success with public transit.

TOD KP

# INCLUSIVITY & AFFORDABILITY IN TOD SYSTEMS

Offering more adequate public transportation is a step in the right direction in terms of offering equitable and accessible transport for all. Based on factors such as cost and safety of transit options, Santiago is working towards improved inclusivity in Transantiago. With regards to fare affordability, Transantiago costs USD$0.74 per ride paid via contactless fare cards. Statistically, lower income groups are more likely to walk, but compared with higher-income groups, use the bus more often and are not likely to drive private vehicles as shown in figure.[2]

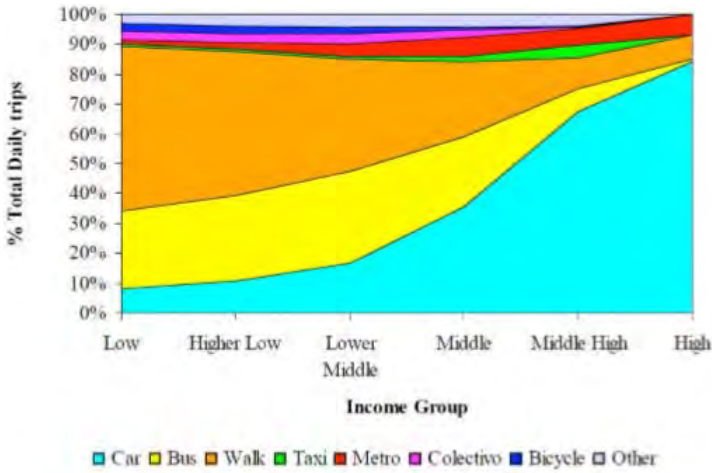


Figure 29: Modal share by income level in Santiago, Chile.[2] | *Source:* Paolo Jiron ©UN Habitat. Reproduced with permission from UN Habitat; further permission required for reuse.

To be derived from the above figure is the lower use of metro when compared to the BRT, as well as the tendency for lower-income households to walk instead. These statistics can lend to a question of affordability in the system. Although the fare seems insignificant when compared to North American comparable cities, in the context of Santiago, the underlying avoidance of public transit should be studied to consider possibilities for public subsidy.

Additionally, with regards to TOD, affordable housing has become a larger priority for the city since the 1990s, as shantytowns and slum housing were a prevalent option for lower-income households. To mitigate the effects of this unhealthy and inadequate housing type, conditioned planning has emerged in Santiago. This form of land use planning allows urban development to expand beyond city limits on a case-to-case basis, allowing residential development to spill out into the peripheries of the city.[2]

The issue with this form of housing development is its lack of connectivity and self-sufficiency, often creating instances of urban islands on the city periphery. Although this allows for larger areas for social housing and more affordable land, transportation in the future must better link these areas to allow for true TOD. As well, the creation of separated low-income districts is a concept that has been largely refuted in present times, as these locations amplify crime and safety concerns and are likely to be disproportionality exposed to health hazards when compared to middle and high-income groups. Strategic mixing of different income groups and better transportation integration with these periphery locations should be considered for development in the future.

# IMPLEMENTATION OF TRANSIT ORIENTED DEVELOPMENTS

## APPROXIMATE TIMELINE

- **2000-** Metro network expansion started
- **2001**- Buses enabled 43% of the motorized trips in the city
- **2003-** Bus System was voted worst public survey
- **2006-** Added 21km to existing 45km of metro network
- **2007-** Plan was mitigated to add 690lm of bike lanes through rural and urban areas.
- **2009-** Providencia engaged in a public bike system
- **2011-** Transantiago completed fourth year of operation

## ACTIONABLE STEPS

1. Identify needs/ Take Inventory
2. Create Strategy Plan (Phases)
3. Identify Key Stakeholders
4. Conduct Inter-Agency Collaboration
5. Find Funding
6. Optimize/ Utilize Land Value
7. Create Design Strategies to Encourage Transit Use

# KEY LESSONS LEARNED AND BEST PRACTICES

## SUMMARY

Santiago is the resulting system of a seamlessly integrated BRT and metro lends to the ideals of transit-oriented development(TOD) that are being emphasized in planning and development practices currently. A system of efficiency, passenger comfort and safety for both riders and the environment has resulted from necessary interventions.

A positive lesson to be taken from the case study is the concept of modal integration. Route re-organization was a complex technical problem (requiring a supply-demand balance for a social optimum), but allowed for Metro and BRT interaction. Strives towards also including cycling networks within this system will further the integrated nature of Transantiago. Ensuring a range of modal options not only allows for variety, but affordability and convenience in transit systems, and thus moving this agenda forward in other contexts will be essential.

## ROADBLOCKS AND WAYS TO IMPROVE

Although Santiago created a widely used and integrated BRT and Metro system with Transantiago, the project had various roadblocks that should be learned for in applying BRT and Metro systems to other contexts. The first of these roadblocks was the lack of inter-agency collaboration in the planning of the system. In theory, this advisory commission provided an organized method of involving various government agencies, however, the tactic failed to include lower-level agencies and public input. A way to improve from this aspect of the project is the need for institutional coordination, which the project was successful in achieving, but also the inclusion of those that will use, operate and interact with the transit system on a daily basis. Another roadblock of the project is its potential concerns with regards to affordability, both with regards to fare and housing around the corridor. A way to improve this would be to develop transit with social issues and inclusivity in mind. This should be a priority in all context.

## KEY LESSONS

1. The following key takeaways should be derived from the Santiago example:
2. Santiago's overall strategy for improving the shortcomings of these systems was an integrated multi-modal system inclusive of a BRT and an expanded Metro network.
3. Transantiago was based on two objectives: complementation and integration
4. Affordable housing includes strategic mixing of different income groups and better transportation integration.

# ENDNOTES


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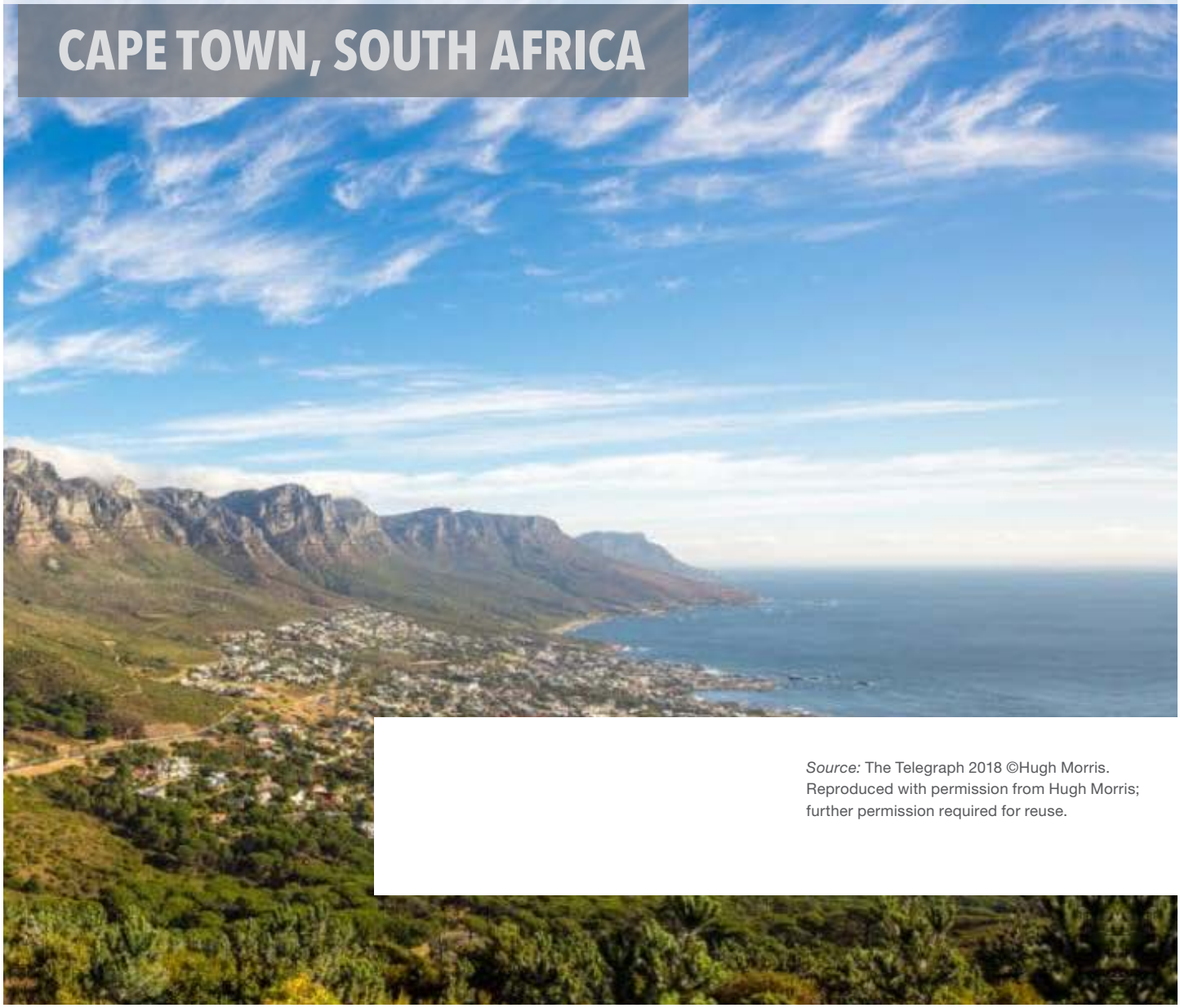
# AFRICA | CASE STUDY

## CAPE TOWN, SOUTH AFRICA



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# CAPE TOWN, SOUTH AFRICA

## QUICK FACTS

**Geographic Context**
Africa (South Africa)

**Scale**
City, Neighbourhood, and Corridor

**Context**
Urban and Suburban

**Mode of Higher Order Transit**
BRT

**Size of City (Population)**
3.7 million (Tier 2)

**Case Study Covered in WB Publication**
Yes

## URBAN CONTEXT

Cape Town, South Africa is the second largest city in South Africa, after Johannesburg, with a population of over 3.7 million people. [1] The population is dispersed across close to 2500 square km of land, providing for a population density of 1,480 per square km, which is also lower than that of Johannesburg. [2] By 2030 the population is projected to only increase slightly to about 4.3 Million.[5] Unique to the South African context, when comparing it to other low-mid income cities, is its quite high proportion of citizens living under the poverty line. Over 36% of Cape Town's citizens are below the poverty line, with 4 % having no access to electricity and almost 10% without access to sanitation. [2] With such a high proportion of its citizens in need of social assistance, the 2010 World Cup in South Africa provided a valuable opportunity to the city to improve its social services, specifically adequate public transportation for low-income households.

At the national level, 12 cities were chosen to receive extra support to upgrade and integrate all modes of public transport to better host the event. Nine of the 12 cities were host cities to World Cup events, including Cape Town and Johannesburg among other cities. The BRT in Cape Town is still functioning and can be considered to be Africa's second system after Johannesburg's Rea Vaya.

TOD KP

## OVERALL TOD STRATEGY & CITY STRUCTURE

The MyCiTi service forms part of an economic development strategy reliant on integrated transportation in the City of Cape Town (CoCT) in South Africa. In 2010, MyCiTi opened two pilot routes for the 2010 World Cup. The following year, the City of Cape Town began full services on MyCiTi's 16km corridor, rated bronze-standard. [4] The system continues to expand and servces the city center and airport.

MyCiTi began operations in May 2010, shortly before the FIFA World Cup, providing a shuttle service from the Civic Centre to Cape Town International Airport. It also included a temporary route around the City Bowl for the World Cup specifically. The first proper Bus Rapid Transit (BRT) phase (Phase 1A) opened in May 2011.[4] Characterized by features beyond those of traditional bus services, such as exclusive bus lanes, frequent timetables and an automated fare system, MyCiti is Cape Town's version of Bus Rapid Transport (BRT). It is an unprecedented public transport venture for the city, implemented in the hope of providing greater mobility to the majority of the population. [4]

By 2015, MyCiTi provided a BRT service and feeder services in most areas of the city, including low-income areas disadvantaged by their distances from the amenities and employment opportunities concentrated in the center. [4]

In addition to the BRT, concurrent ITDP work has included bringing the Access Africa program to Cape Town. This program intends to allow health care workers to visit more patients daily by providing bicycles to low-income health care workers who traditionally would work long hours and only access patients by foot. [4]

## KEY STAKEHOLDERS & GOVERNMENT RELATIONSHIPS

The Institute of Transportation and Development (ITDP) began working in the City of Cape Town in 2002, initially focused on building support for the concept of BRT. They would become one of the largest and most vital stakeholders in driving the improvement of public transportation in Cape Town. Through workshops and the exchange of international best practices – particularly bringing in experts involved in the implementation of Bogota's gold-standard TransMilenio – support for the BRT grew. [4] In 2007, ITDP joined the team creating the business plan and financial model for the MyCiTi BRT, and helped guide the project to success.[4]

As part of the process, ITDP assisted with the formalization of Cape Town's existing informal public transport industry, empowering small business owners to enter the formal market and transform into competitive companies. [4] Like in Johannesburg, the BRT system is now operated by companies comprised of former taxi operators. [4]

That said, MyCiTi service was largely a public funded initiative. One can argue that the success of the BRT necessitates greater integration of private sector participation at the outset, rather than the private sector waiting to see the success of the system.[4] The time horizon for such a scheme – which aims to have connected the entire city by 2030 – must take into account the long and difficult processes of navigating land changes, poor spatial legacies, uncertainty surrounding the minibus taxi industry, and major shifts in societal attitudes towards public transport.

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

The MyCiTi Integrated Rapid Transport system was very unique compared to other BRT systems in the sense that it incorporated all the other motorized and non-motorized transport methods that had already existed in the area into one cohesive new system instead of replacing them. By doing so MyCiTi was able to design a system that encompassed a passenger's entire journey, including arriving to the bus system from over 50m away, to easily being able to board the vehicles, and to be able to report any problems that may have occurred along the way. The system paid specific attention to accessibility to all. The stations provide level, seamless boarding onto vehicles through the use of dedicated boarding points, wheelchair accessible toilets, and wide entrance gates. The new fleets include low floor kneeling vehicles with level entry and wheelchair seating. They also have created "Kassel Kerbs" which allows drivers to position their vehicle close to the bus stops without tire damage.[5]

Along with accessibility, MyCiTi has also planned the wayfinding of the area to help encourage usage. In each station is equipped with audio LED screens and service information in a wide variety of formats. Outside the station is door to station infrastructure to lead the way from anywhere in town. They did this by providing tactile signage, tactile paving, and dedicated customer support staff to help lead the way.[5]

Due to the incredible design of the stations, the influence is spreading the rest of the city. The growth in commuter numbers, private developers and local businesses is bringing value to the area and encouraging public growth, public investment, and new development to occur.

## INCLUSIVE & AFFORDABLE TOD SYSTEMS

Many sources point to the BRT system's potential as representative of a healthy democracy. Such a characteristic, similar to environmental benefits, the mixing of different backgrounds, or more equitable access to amenities, all of which are important barriers to Cape Town's prosperity, hasn't been evaluated through a cost-benefit analysis or other quantifiable measures. To paraphrase a comparison by Enrique Peñalosa, who championed the BRT system when he was the mayor of Bogotá in Colombia, a city now renowned for its thriving public transport system: "that thirty people on a bus can zoom past a Maserati with one person in, because thirty people should get thirty times the space as one person, no matter how much money they make. That's true democracy." [3]

With such vast poverty experienced in Cape Town, achieving a truly democratic system of transport is an essential priority going forward. With simple necessities such as sanitation and electricity unachievable for many South African households, public subsidy and increased affordability of transit should be explored to encourage heightened use. Without this affordability, modal preferences will remain dominated by cars (for higher-income households) and walking or cycling (for lower income households).

## IMPLEMENTATION OF TRANSIT ORIENTED DEVELOPMENTS

### APPROXIMATE TIMELINE

- **2002-** The Institute of Transportation and Development (ITDP) began work in Cape Town
- **2007-** IDTP created business plan and financial model for MyCiTi BRT
- **2010-** Opened two pilot routes to operate during 2010 World Cup
- **May 2010-** MyCiTi began operations
- **May 2011-** Bus Rapid Transit (BRT) Phase 1A opened
- **2015-** MyCiTi provided a BRT service between 8 cities with additional feeder services
- **2030-** Goal year for entire city to be connect with MyCiTi

### ACTIONABLE STEPS

1. Identify needs/ Take Inventory
2. Establish Transportation Department
3. Create Strategy Plan (Phases)
4. Identify Key Stakeholders
5. Find Funding
6. Integrate Existing Operators with New Operators
7. Optimize/ Utilize Land Value
8. Create Design Strategies to Encourage Transit Use

## KEY LESSONS LEARNED AND BEST PRACTICES

### SUMMARY

The 2010 World Cup in South Africa provided a valuable opportunity to the city to improve its social services, specifically adequate public transportation for low-income households. Building a BRT system through MyCiTi was not enough on its own. It was essential that it was affordable for all. Without this affordability, modal preferences would remain dominated by cars for the higher income households and walking and cycling for the lower income households.

### ROADBLOCKS AND WAYS TO IMPROVE

Underlying the issue of low ridership levels was the greater challenge of how effectively BRT can operate within Cape Town's urban form. The roadblock of implementing BRT in a city characterized by long travelling distances for residents, meaning less revenue than in other denser cities, as well as peak periods when buses are virtually empty on their return trips.

Ways to improve to a successful BRT system is the concerted effort to develop urban areas around transit-oriented principles. Measures such as zoning land for dense, high-rise development around BRT corridors and constraining development further away from them would increase the ridership needed for BRT in Cape Town to be as impactful as possible.

### KEY LESSONS

The following key takeaways should be derived from the Cape Town example:

- Over 36% of Cape Town's citizens are below the poverty line
- The BRT system is now operated companies comprised of former minibus taxi operators.
- MyCiTi service was largely a public funded initiative
- Access Africa program was also incorporated, providing bikes to low-income health care workers

## ENDNOTES


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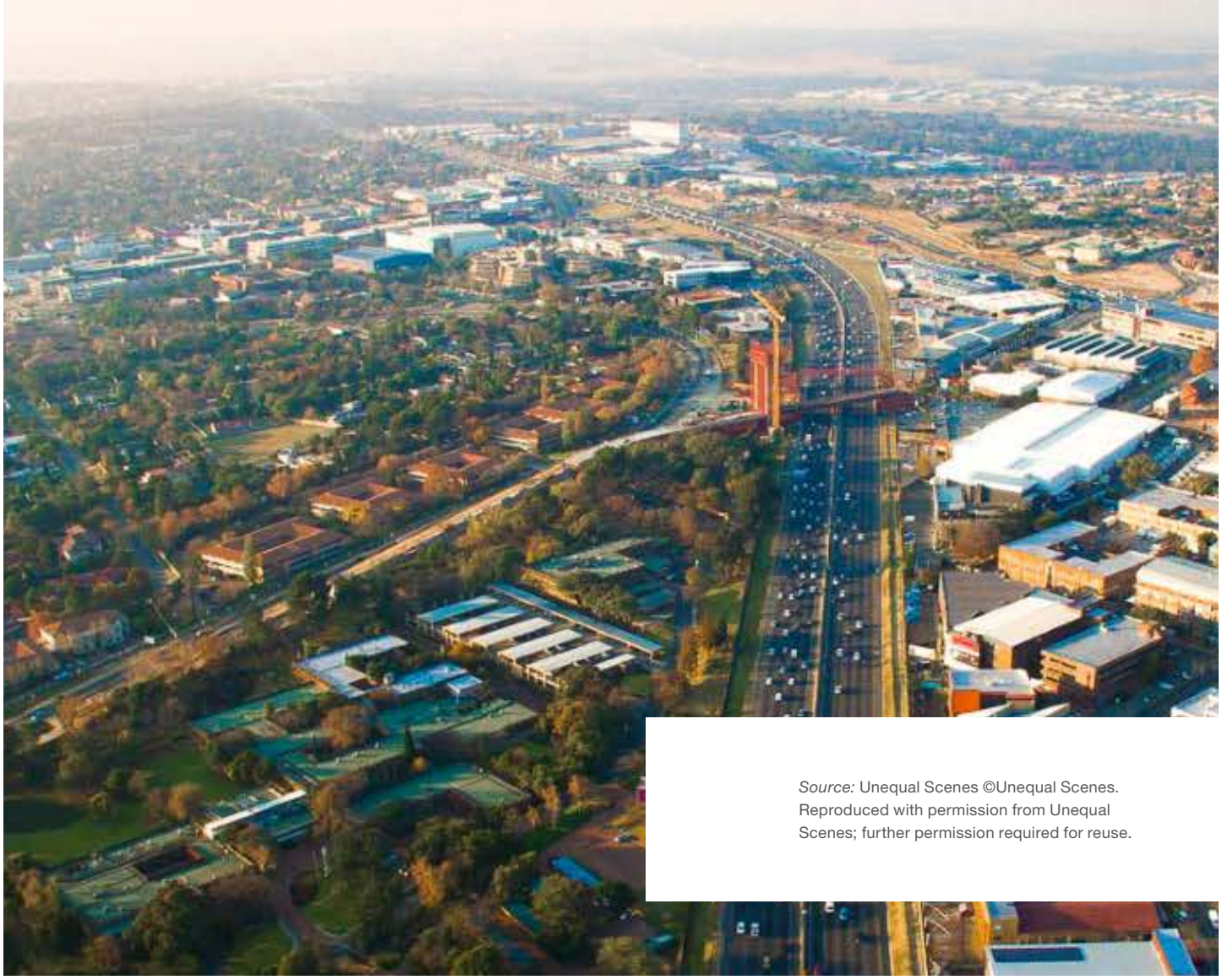
# AFRICA | CASE STUDY

## JOHANNESBURG, SOUTH AFRICA



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# JOHANNESBURG, SOUTH AFRICA

## QUICK FACTS

**Geographic Context**
Africa (South Africa)

**Scale**
City, Neighbourhood, and Corridor

**Context**
Urban and Suburban

**Mode of Higher Order Transit**
BRT and Metro

**Size of City (Population)**
10 million (Tier 1)

**Case Study Covered in WB Publication**
Yes

## URBAN CONTEXT

The political capital of the Republic of South Africa, Johannesburg is situated in Gauteng province, the most densely urbanized area of the Republic. It is home to an estimated 10 million people and has a population density of 2,900 people per square kilometer.[5] By 2030 Johannesburg is projected to grow to about 11.5 Million.[5] Despite a growing population and economy, there is extreme income disparity and around 63 percent of households do not own a car. [2]

In 2006, following municipal elections, the new Mayor created a transportation department with the aim of better organizing urban mobility. This entity became responsible for transport planning and regulation within the city boundary. [3]

Upon awarding of the 2010 (19th) FIFA World Cup event, Johannesburg took a keen interest in improving the transport system in order to live up to the projected image of being a 'World Class City'. In particular, Johannesburg would need to accommodate the fans and tourists that would visit during the events and Rea Vaya was planned and implemented as a result. [1]

Rea Vaya was the first full bus rapid transit (BRT) system to be implemented on the African continent and provides many learning experiences that can be replicated in other cities.

Its key objectives are:

- Economic growth
- Poverty alleviation
- Restructuring the apartheid city
- Sustainable development
- Good governance

TOD KP

## OVERALL TOD STRATEGY & CITY STRUCTURE

The lack of investment in public transport, as well as the long distances (beyond a reasonable walk or bike trip) which separated home and the workplace in Johannesburg led directly to the growth of the informal 'taxi minibus' industry. Initially, this development was viewed as a positive 'entrepreneurial' trend as it required little to no state control.

The ability of the private sector to make money with low levels of investment quickly led to an oversupply and intense competition between service providers. By the 1990s, as in many cities across the developing world, the situation had degenerated into a system that served the operators, while simultaneously marginalizing the user with poor travel times, high fares and unsafe vehicles driven by drivers with poor skills.[3]

Johannesburg's bus rapid transit system Rea Vaya has saved South Africa as much as $890 million so far in reduced travel time, improved road safety and reduced carbon emissions, according to a recent report by the New Climate Economy, a project affiliated with the World Resources Institute.[4]

### LAND TENURE & LAND VALUE CAPTURE

The Rea Vaya provided enhancements to the surrounding areas creating an increase in land values for neighboring property owners. Some of these enhancements include:

- Increases in regional productivity
- Enhanced employment accessibility;
- Environmental Benefits

## KEY STAKEHOLDERS & GOVERNMENT RELATIONSHIPS

One of the most challenging aspects of implementing any transport reform is the resistance to change by those benefiting most from the present system. In much of the developing world this usually means the informal minibus owners and drivers.[1]

In Johannesburg, much of the resistance to changes in transport organization came from the powerful taxi unions. These strong groups made a solid defense of their right to operate unhindered and un-regulated. This was identified early on as a major challenge to successful public transportation implementation.

Today, there are four levels of institutions responsible in some way for transport in South Africa. There are national, regional (provincial), city or metropolitan area and local or district bodies.[1] The national Ministry of Transport is responsible for policy and legislation for transport. It is also responsible for:

- Implementing national policy and legislation;
- Coordinating the functions of the Department of Transport
- Preparing and initiating legislation
- Performing any other executive function provided for in the Constitution or in national legislation.

The Gauteng Provincial Government's role is to ensure the implementation of national policy across the province by providing oversight.[3] A creation of a new body called the Gauteng Transport Management Authority became responsible for improving transport at the regional-level and in setting quality standards and norms. The Gauteng Intermodal Strategic Public Transport Network (GISPTN) forms the basis for reform and requires linkage between the road and rail networks. It also prioritized public transport services and investments in developing infrastructure.[3]

In 2003, the City of Johannesburg formulated an Integrated Transport Plan (ITP) signed by the political head of province, as well as the Minister of Transport. It consisted of the priority for public transport, improvements to curbside lanes, infrastructure for commuters, better signage and improved passenger information.[3] These improvements really gave minibuses a better traffic environment to function.

Typically in transport, there is a split in responsibility between national and city governments that can be challenging to resolve. There was also the additional challenge of engaging existing operators and establishing a forum under which they can productively participate in the eventual delivery of mass transit. The technical skills required for planning are complex and often do not exist at the local-level. Thus, it was not until city officials and the Mayor became aware of the system in Bogotá, Columbia that the idea of BRT for Johannesburg was born.

The new city administration decided to more aggressively explore BRT systems in other cities, specifically Bogotá, Columbia and Guayaquil, Ecuador. Through a step-by-step approach, Johannesburg established a planning and development department for the delivery of the BRT.[3] The BRT system had to be planned within a fairly constrained urban environment, both financially and in land provision. It would be planned as the backbone of a future transport system interconnected with rail to provide high levels of accessibility and capacity.[3]

## DESIGN STRATEGIES TO ENCOURAGE TRANSIT USE

Attention was given to making the system and stations functional and attractive.[3] This included pre-paid boarding; level boarding for full accessibility; multiple stopping bays; and secure, weather-protected stations. Stations have been designed with the local urban environment in mind and aesthetics were prioritized, commissioning local artists to add character and culture to bus stops.[3]

### BUS MANAGEMENT SYSTEM USING INTELLIGENT TRANSPORT SYSTEMS (ITS)

A robust but affordable bus management system was required in the context of Johannesburg. The Automatic Public Transport Management System (APTMS) was developed by a private consortium to deliver an ambitious range of information and services, including dynamic passenger information.[4]

Passenger information provision was a new concept to both those providing public transport and those using it.[4] Traditionally, minibuses were merely numbered or known by the drivers' names and routes varied and stop locations were unpredictable. The concept of having a set timetable and frequency was, therefore, a learning curve for drivers and passengers.[4]

## INCLUSIVE & AFFORDABLE TOD SYSTEMS

It was also agreed that the development of Rea Vaya would be employment neutral, providing an equal number of jobs to citizens as those that were lost. It was also decided that it should have a strong identity and brand image – and the concept Rea Vaya 'we are going' was adopted.[3]

Since its inception, 700 permanent jobs have been created in Phase 1A and some 3300 temporary jobs during the construction period.[4] Efforts have been made to design a system that is accessible to those with mobility impairments, such as level boarding at the BRT stations. This system has been a considerable benefit to all levels of society, but especially to women as minibuses were often unsafe, especially at night.[4] The stations are manned, the surroundings are monitored and initial overcrowding of the service has now been overcome, solving many of the grievances with former minibus service.

Executive Mayor Parks Tau stated "Left to the forces of the market alone, the poor would be cast to the edges of the city, huddled together in crowded shacks, trapped there by the cost of mobility," Mayor Tau said in his address. "This is exactly what we seek to disrupt and transform when we speak of confronting apartheid spatial patterns."[7] Rea Vaya created the ability to have mixed-use, mixed-class development, and focuses on location and affordability of housing.

## IMPLEMENTATION OF TRANSIT ORIENTED DEVELOPMENTS

### APPROXIMATE TIMELINE [6]

- **2003-** The City of Johannesburg formulated an Integrated Transport Plan (ITP)
- **November 2006-** A transportation department was created within the city of Johannesburg's government
- **October 2007-** Rea Vaya BRT construction begins
- **April 2009-** Beginning of Phase 1A
- **August 2009-** First bus began operating
- **June 2010-** FIFA World Cup 2010 awarded 12 cities infrastructure funding.
- **February 2011-** Taxi industry shareholders hand over their operating licensed and equity in return for share in Rea Vaya.
- **October 2013-** Phase 1 completed

### ACTIONABLE STEPS

1. Identify needs/ Take Inventory
2. Create Strategy Plan (Phases)
3. Establish Transportation Department
4. Identify Key Stakeholders
5. Find Funding
6. Mitigate Competition
7. Create Brand
8. Market Plan
9. Optimize/ Utilize Land Value
10. Create Design Strategies to Encourage Transit Use

## KEY LESSONS LEARNED AND BEST PRACTICES

### SUMMARY

The successful implementation of Rea Vaya is a real milestone in Africa, a place which has suffered, particularly low-income populations, lacking formal public transport for the past 25 years. An affordable but high-quality bus system has been put in place, while also overcoming significant political challenges that have hampered initiators before them. In addition, it has saved South Africa $890 Million so far by reducing travel time improving road safety, and cutting down on carbon emissions.[4]

### ROADBLOCKS AND WAYS TO IMPROVE

One of the most challenging aspects of implementing any transport reform is the resistance to change by those benefiting most from the present system. In much of the developing world this usually means the informal minibus owners and drivers, which fought to remain unregulated in the case of Johannesburg.[1]

To improve this relationship, Johannesburg created a plan that integrated all forms of transportation with political support. The plan consisted of modest priority for public transport, both minibus taxis and buses, improvements to curbside lanes, modest infrastructure for commuters, better signage and improved passenger information. 3These improvements really gave minibuses a better traffic environment to function rather than creating a proper public transport network across the city.

### KEY LESSONS

The following key takeaways should be derived from the Johannesburg example:

- Rea Vaya was designed to address historical inequalities, increase civic pride and to provide safe, affordable transport
- Inclusion of a strong and powerful informal sector into formal and professional transport planning
- Marketing plan was highly inspired by the Transmilenio in Bogota
- Project was employment neutral- creating at least as many jobs as it removed.

## ENDNOTES


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