Principle 4
Build Transit-Oriented Developments (TODs)


Adobe Stock

Principle 4
Build Transit-Oriented Developments (TODs)

Match land-use density and mix to transit capacity in a walkable environment

GOALS

4A Create higher density mixed-use nodes around transit called transit-oriented developments (TOD)

ACTION 1: Increase walkability, mix, and a sense of place with civic uses, parks, and plazas at stations and along transit corridors

ACTION 2: Match density to transit capacity using a hierarchy of TOD types through both redevelopment and new construction

ACTION 3: Concentrate major commercial and retail development in high-capacity TOD areas

4B Design transit stations with convenient walking and bike routes to homes, jobs, and services

ACTION 4: Ensure convenient and safe entrances to transit stations free of major auto traffic

ACTION 5: Emphasize bike and pedestrian access to stations by integrating bike parking and shops

METRICS

4.1 Density Standards

For each TOD type, meet the population and employment density guidelines as per table of TOD types

4.2 Limit Parking

Set maximum commercial parking ratios; parking ratio for TOD areas should be at most 80 percent of the city standard

4.3 Parks in TOD

Provide for a minimum of 10 percent of developable land area for parks and 5 percent for civic uses in each TOD

RATIONALE AND CHALLENGES

Transit-oriented developments are the areas directly surrounding transit stations and transit corridors that should be dense, mixed-use, and walkable. They should form the structure of a city and regional master plan to focus density and commercial destinations around transit. Public transit and walking must be the preferred travel mode for a majority of household trips in TODs, thereby reducing congestion, improving air quality, and reducing carbon emissions. Increasing the density of people working and living close to transit is one of the best ways to make all the forms of shared mobility more convenient and successful. Most global cities are suffering from dramatic traffic congestion problems that cause environmental, economic, and social costs—especially for low-income and working class populations. TODs reduce auto trips by increasing the availability of goods and services within easy walking or biking range of a station. TODs across the globe are proving to be more desirable places to live and work by creating complete communities with practical transportation options.

In fact, transit-oriented development is becoming a global standard for healthy city growth. It is a simple concept: focus development around transit with mixed-use and walkable neighborhoods. The goal is to bring more people within easy access to transit in an environment that allows them to take care of most daily needs on foot to or from the station.

The challenges to realizing this simple concept are complex. In many cities, the automobile has come to dominate the primary mode of circulation, rendering transit a second-class alternate. In fact, the road and parking demands of auto-based districts contradict the fundamental needs of TOD. Too often, streets widen to become pedestrian barriers, parking requirements eat up space and drive density down, and low-transit ridership reduces the frequency and convenience of transit. Too many cities focus jobs, shopping, and housing around the convenience of the car, allowing highways, freeways and arterials to become the armature of a city's growth.

The good news is that transit ridership is relatively high in low-income or high-density cities in developing countries and Asia. The challenge is the quality of transit these cities depend on and the growing distances to economic opportunities. In most developing cities, transit is much needed but underfunded and inefficient. In areas of high-income sprawl, transit has become a safety net and is equally underfunded and inefficient, especially in comparison to auto infrastructure. In all global cities, the need for more transit, and the land-use that supports it, is critical.

Where transit is present and growing, the challenge is to shape land use around stations into walkable neighborhoods and commercial districts that make auto-free living a convenient and good choice. This means distributing density and mixed-use in appropriate proportion to the level of transit service. Today, residential densities in new developments tend to be at a uniform density regardless of location. In a landscape defined by TODs, denser residential development and more job-focused commercial areas would cluster at the station, placing more people close to transit while allowing multi-purpose trips to and from the primary transit ride. This would also provide a needed and rational variation in skyline, as too often new developments feel monotonous, placeless, and without focus.

This variation in density is particularly important for non-residential development as commercial buildings are often spread out along arterials. While this forms a logical buffer to the residential areas, it makes residents' access to transit less advantageous and walking less pleasant. As a nation's economy shifts away from heavy industry toward white collar jobs and services, clusters of high-rise offices and low-rise R&D can be directed to station areas. This shift then creates a distributed set of employment zones that decentralizes the commute, even creating reverse commuting patterns. In addition, regional and district retail centers should be located within TODs, allowing shopping trips to be transit-served and accomplished on the way to or from work.

Finally, the key to TOD is mixed-use development that includes services, cultural uses, shopping and parks, as well as housing and jobs. TODs should become complete communities for living, therefore the placement of public space, parks, plazas, and services is key. Mid-day pedestrian destinations are important to workers and local shopping and parks are important for residents. The mix provides for a safer community with 24/7 activity, rather than office districts that are dead at night or weekends, or residential areas emptying out during working hours. The whole development must act as an urban district that is lively, walkable, and creates a clear sense of community.

Not every TOD is the same. They vary by primary use (residential or commercial) and by intensity. There are five types of TOD that vary in use, intensity and size. Each type is tied to the level of service that the transit system affords and to its regional context. All TODs combine local services, shops and parks. Surrounding the TODs, but beyond the close walking radius, should be mixed-use districts that extend the pedestrian and bike range into residential or light industrial areas. The challenge is to use this new zoning language of TOD and mixed-use districts as the primary zoning language of city master plans and more local regulatory plans.

TOD offers a fundamental opportunity for cities: to create mixed-use districts that distribute jobs, housing, and services in a way that enhances the convenience of transit and makes for an area with great walkable city life. TODs should become the building blocks of the urban fabric at the neighborhood, district, and regional level.

Figure P4-1: Focusing density around transit by creating a walkable mixed-use development is visually represented by the skyline of the Toronto Metropolitan Area. (Source: Adobe Stock)

BENEFITS

ECONOMIC

Ensures successful mobility: The ability for people and goods to move efficiently is a fundamental requirement for economic growth. TOD is an essential strategy for managing growth in terms of land, energy, and public funds. [1]

Spurs private investment due to transit access: 67 percent of major transit investments in North America were followed by investments in new buildings that exceeded the cost of the transit upgrade.[2]

Increases returns on transit investment: Allocating density around transit stops will increase ridership, thus leading to better returns on transit investment.[3]

ENVIRONMENTAL

Decreases carbon emissions: Residents of transit-oriented developments are two to five times more likely to use public transit than others who live in the same region.[4] Transit-oriented development also produces fewer emissions than traditional suburban development.[5]

Conserves land and natural resources: Transit-oriented development can re-direct population growth at a higher density to economically vibrant areas with good transit connections, which conserves land and natural resources.[6]

SOCIAL

Increases mobility for disadvantaged groups: Increasing building density and allowing for more population and job density at TOD increases the effectiveness of public transport as well as equitable transit access for the entire community.

Builds social ties: Compared to auto-oriented urban environments, TODs can mix activities while diverse groups help to build social ties and a sense of community.

CASE STUDY

Copenhagen, Denmark

Copenhagen's achievements in creating TODs are the result of a regional plan that dates back to the 1947 Five Finger Plan. The plan clusters development along fingers of regional rail lines and includes green space buffers between them. Copenhagen has also seamlessly linked transit, biking, and walking facilities to transit. In fact, one-third of Copenhagen's suburban rail-users access stations by bicycle.

Danish architect and urban designer Jan Gehl's pioneering leadership in prioritizing pedestrian space started in 1962 with the clearing of cars from the Strøget, one of the longest pedestrian streets in Europe. In the 1990s, a series of bold steps were taken to refocus new development in transit-oriented ways. Rail growth was built in advance of demand to steer growth along desired transit corridors. In this way, Copenhagen was able to help developers identify which areas to prioritize in development. Copenhagen's transit-oriented development strategy has paid off. While sprawling Houston spends about 14 percent of its GDP on transport, Copenhagen only spends four percent of GDP on transport.[7]

Figure P4-5 illustrates Copenhagen's successful creation of transit-oriented development. The height of the red bars shows the combined resident and job density and are superimposed on top of the transit network. The greatest density is at transit hubs and secondarily along transit lines.

Figure P4-2: Copenhagen, Denmark has a successful history of seamlessly developing around transit lines. (Source: Jake Petersen)

Figure P4-3: Bus rapid transit along Nørrebrogade in the Nørrebro district of Copenhagen, Denmark (Source: Lief Jorgensen, CC BY-SA 4.0,)

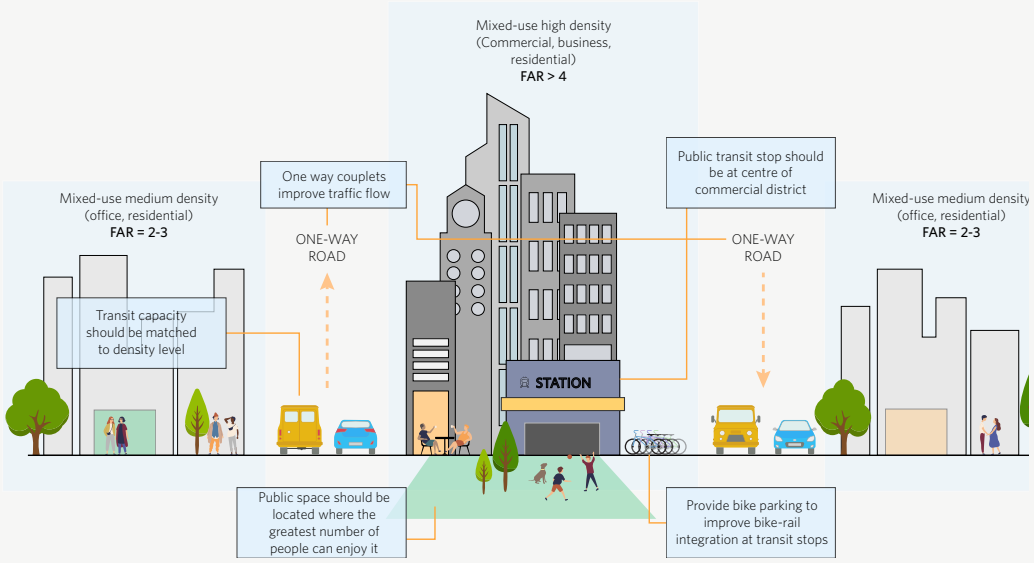


Figure P4-4: Graphic shows the logic behind transit-oriented density. Density should be matched with transit capacity and public transit stops must be placed in the most convenient locations so that the greatest number of people can access them. The floor area ratio (FAR) should be highest close to the highest capacity transit stops. (Source: Energy Innovation)

Figure P4-5: Copenhagen's successful TOD is illustrated here: the height of the red bars shows the combined residential and job density superimposed on the transit network. (Source: Rode, P., Floater, G., "Going Green. How cities are leading the next economy." Final Report, 2013. London: LSE Cities, ICLEI and GGGI; https://www.lse.ac.uk/Cities/publications/research-reports/Going-Green-How-cities-are-leading-the-next-economy)

GOAL 4A:
Create higher density mixed-use nodes around transit

High density is crucial to low-carbon cities, but density alone is not enough. In order to avoid congestion, housing and jobs must be located close to public transit. Higher overall density of housing and jobs has long been correlated with reduced auto use and increased walking, biking, and transit use. Building mixed-use areas around transit stations that are walkable, safe to bike in, and provide local services promotes transit use. Easy access to the station along with destinations close to stations makes transit trips shorter and more convenient.

In addition, the density and mix of employment and commercial destinations need to be related to the capacity of transit—the greater the transit capacity, the higher the density and where the more regional uses should be located. Within the TOD area, roads should be designed with bike- and pedestrian-friendly corridors, along with transit priority lanes; and walking, cycling, and mass transit should be more convenient than driving. TODs can shorten trip distances, save travel time, and preserve millions of square kilometers of arable land.

Figure P4-6: The design for Jinan East Station District is based on simple principles and practices focused on making China's development patterns more sustainable, resilient, and energy efficient. It reframes critical elements of city development into mixed-use, walkable and transit-oriented districts and neighborhoods. It proposes to overlay a different development pattern in residential and key commercial areas in order to support a larger range of travel modes, and create areas with more social and economic vitality. (Source: HDR)

ACTION 1: Increase walkability, mix and a sense of place with civic uses, parks, and plazas at stations and along transit corridors

A tried-and-tested way of making walking safe and enjoyable around transit stations is through mixed-use buildings lining key pedestrian routes and providing shops, restaurants and other conveniences to transit users. The high footfall around transit stations enables retail to succeed. Amenities around stations, such as plazas and public squares, create a sense of place encouraging pedestrian activity. Creating identity around stations, through either preserving historic buildings, building public places, or developing a unique commercial area also adds to a welcoming environment for walkers.

Figure P4-7: London's Trafalgar Square is a prime example of a transit-oriented development with a vibrant plaza that enhances the pedestrian experience and provides a sense of place. (Source: Herman Pijpers, CC BY 2.0)

ACTION 2:
Match density to transit capacity using a hierarchy of TOD types through both redevelopment and new construction

Areas closest to major transit stations should have higher density and, in the case of multiple regional lines converging, should be planned as sub-regional employment hubs in order to reinforce the investment in transit infrastructure. These areas within 600 to 1,000 meters of a significant station should be zoned in relation to the capacity of the transit system; the higher the capacity, the higher the density and mix of services. These TOD areas should vary in mix and density of population and jobs, depending on the capacity of all modes of transportation.

For example, TODs can be categorized using the hierarchy below based on transit type and capacity. Each of these area categories will have a minimum population and jobs density, discussed later in the chapter.

Primary Metro: located at a Metro-Metro transfer station; 1,000-meter walk radius

Secondary Metro: located at a Metro-BRT transfer station; 800-meter walk radius

Tertiary Metro: located at a single Metro station; 600-meter walk radius

BRT Center: located at a BRT-BRT transfer station; 600-meter walk radius

BRT Corridor: located along a BRT route, 800-meter total width (400 meters on either side of BRT route)

The hierarchy of TOD types must be used in infill and redevelopment areas as well as new construction areas. These areas are usually prime targets for development since they are typically located closer to the city center or close to existing residential areas. Unlike new development, redevelopment areas will have additional constraints of elements that must be preserved because of historic significance, social importance, or simply that replacement is not cost effective. Given such constraints, redevelopment areas are challenging in their complexity, phasing, and economics; however, the results can be very successful—rich in identity and unique in design quantity.

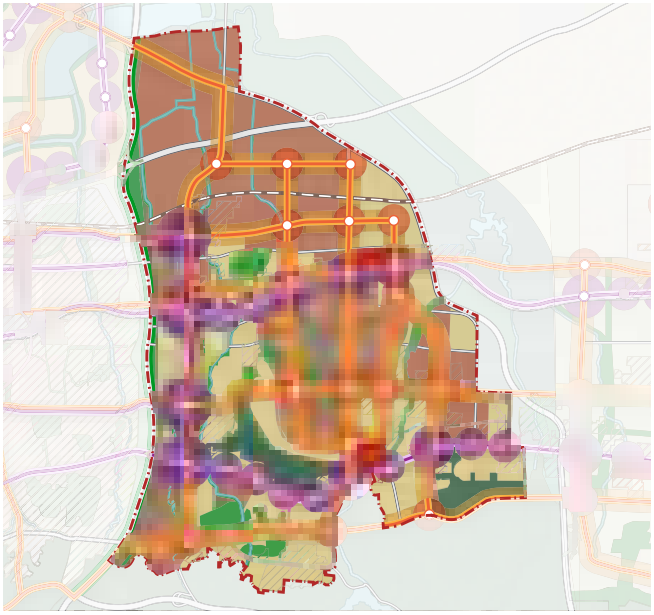


Figure P4-8: Proposed TODs are located based on transit capacity, which serves as the guiding factor for determining the development density of each TOD in the regional plan for Jinan, China. (Source: HDR | Calthorpe)

ACTION 3:
Concentrate major commercial and major retail development in TOD areas

Major commercial job centers and retail destinations should only be located where high-capacity transit services are available. Commercial density should be designed to match the area's peak-hour transit, walk, and bike capacity. A mix of recreation, services, and retail should be located in employment areas to provide daily worker needs on foot. Regional retail centers such as malls are important to locate at major transit stations in order to avoid auto traffic and large parking structures. Likewise, major office and employment areas such as the central business district (CBD) or government centers should be located within walking distance of transit. In residential areas, district level retail areas should combine with stations to add shopping convenience.

Figure P4-9: Peña Station NEXT is a conceptual wellness-focused transit-oriented community in Denver, Colorado. It includes a central park that sits at its heart, edged by key anchors including retail and residential mixed-use, a grocery store, and a wellness center that integrates recreation and a health clinic. A running path winds its way through the site and connects to regional trails, connecting the community both within and beyond its boundaries. (Source: HDR)

GOAL 4B:
Design transit stations with convenient walking and bike routes to homes, jobs, and services

It is essential that people safely and enjoyably walk or bike to transit. Too often, access to stations are blocked by major arterials or large parking lots. Basic urban design standards of small blocks, wide sidewalks, protected bikeways, and narrow streets should be employed in TOD areas. When possible, major arterials should be split into one-way couplets to reduce crossing distances and maintain human-scale. A mix of uses within the walking radius will keep the area active and safe day and night and throughout the weekends.

Figure P4-10: Richmond Transit Village is a transit-oriented development that includes mixed-ownership and mixed-income housing situated around BART's multimodal transit station in Richmond, California. A wide pedestrian promenade running between the station's grand entrance and the village provides direct access to transit. (Source: HDR | Calthorpe)

ACTION 4:
Ensure convenient and safe entrances to transit stations free of major auto traffic

To encourage the greatest use of transit, attention must be given to walkability. Access to stops and the walkability of nearby areas are important elements for making public transit a first-class option. Making entrances convenient through good wayfinding, easy accessibility, and visibility will enhance commuter safety. Transfer routes to local buses or other modes should be mapped to be direct, easy to find, and short.

ACTION 5:
Emphasize bike and pedestrian access to stations by integrating bike parking and shops

Too often bike parking is undersized leading to inconvenient bike-to-transit options. Large secure bike storage areas must be planned close to the entrances of major stations. Bike, pedestrian, and transit systems can work beautifully together, so transit station design should include bike parking around major transit stops, and bike lanes and walkways that go directly to the transit stop.

Figure P4-11: Dual-level bicycle parking system is a cutting-edge design at Den Haag HS Central Station, Holland. (Source: Dreamstime)

METRIC 4.1:
Density Standards

For each TOD type, meet the population and employment density guidelines as per table of TOD types

Five types of TODs are listed in the following pages, along with mixed-use residential neighborhoods that surround them and special citywide centers such as the central business district or civic centers. Each land-use and TOD category will have a minimum population and jobs densities with the aim of maintaining a jobs-to-housing balance at both the city and regional scale.

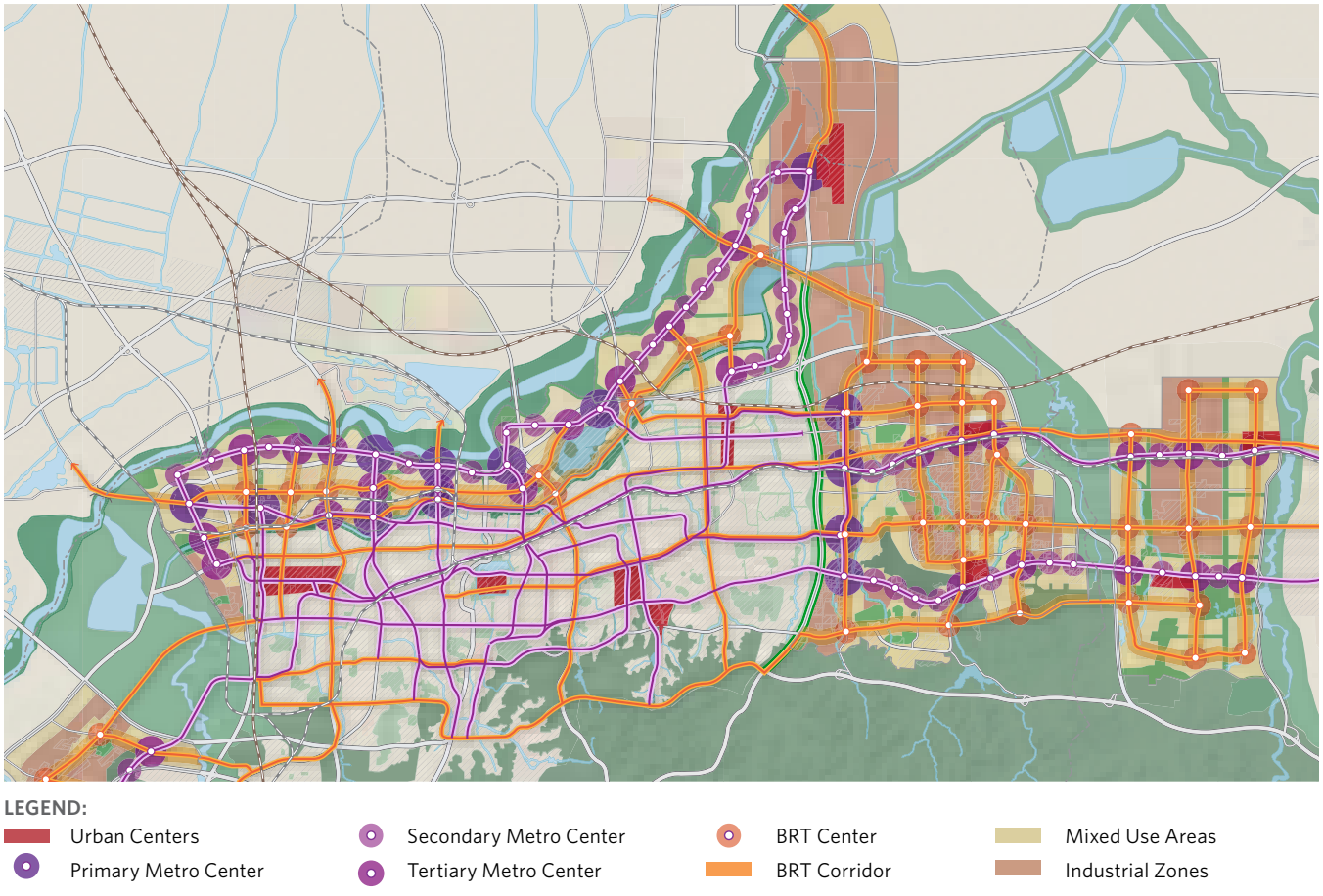


Figure P4-12: Proposed TODs are located based on transit capacity, which serves as the guiding factor for determining the development density of each TOD type in the regional plan for Jinan, China. (Source: HDR | Calthorpe)

PRIMARY METRO

Location: Metro-Metro transfer station

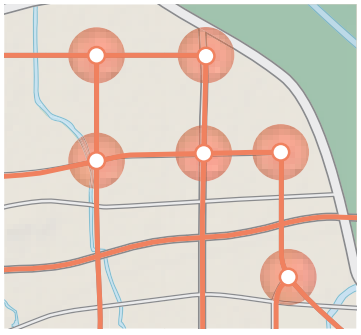
Size: 1,000 m radius | 314 hectares

Walk Distance: 12–15 minutes from station

Min. Population Density: 300 persons/hectare

Min. Employment Density: 150 jobs/hectare

BUS RAPID TRANSIT CENTER



Location: BRT-BRT transfer station

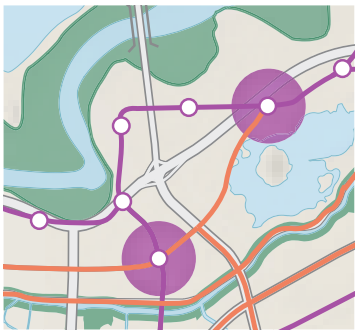
Size: 600 m radius | 113 hectares

Walk Distance: 7–9 minutes from station

Min. Population Density: 250 persons/hectare

Min. Employment Density: 75 jobs/ hectare

SECONDARY METRO



Location: Metro-BRT transfer station

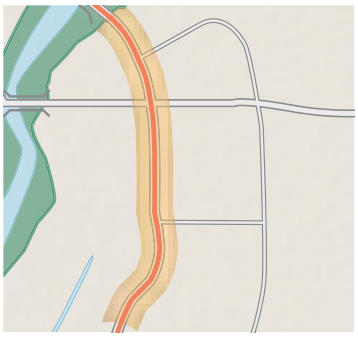
Size: 800 m radius | 201 hectares

Walk Distance: 10–12 minutes from station

Min. Population Density: 300 persons/hectare

Min. Employment Density: 150 jobs/hectare

BUS RAPID TRANSIT CORRIDOR



Location: Along BRT route

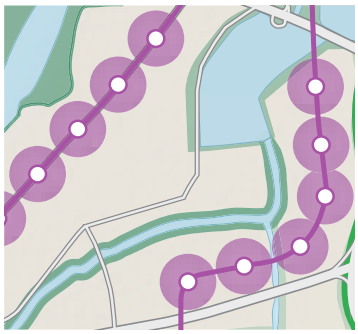
Size: 800 m total width

Walk Distance: 5–6 minutes from BRT line

Min. Population Density: 200 persons/hectare

Min. Employment Density: 50 jobs/ hectare

TERTIARY METRO



Location: Metro (single) station

Size: 600 m radius | 113 hectares

Walk Distance: 7–9 minutes from station

Min. Population Density: 250 persons/hectare

Min. Employment Density: 75 jobs/ hectare

REGIONAL SUB-CENTERS

Locations: Special areas spanning several TODs that serve as city and regional-level destinations such as CBDs and citywide civic centers.

Min. Population Density: Varies

Min. Employment Density: Varies

MIXED-USE NEIGHBORHOODS

Areas beyond the TOD radius that are largely residential or mixed-use in character, including residential, retail and commercial uses along with civic amenities, but remain within the mixed-use district.

Min. Population Density: 150 persons/ hectare

Min. Employment Density: 30 jobs/ hectare

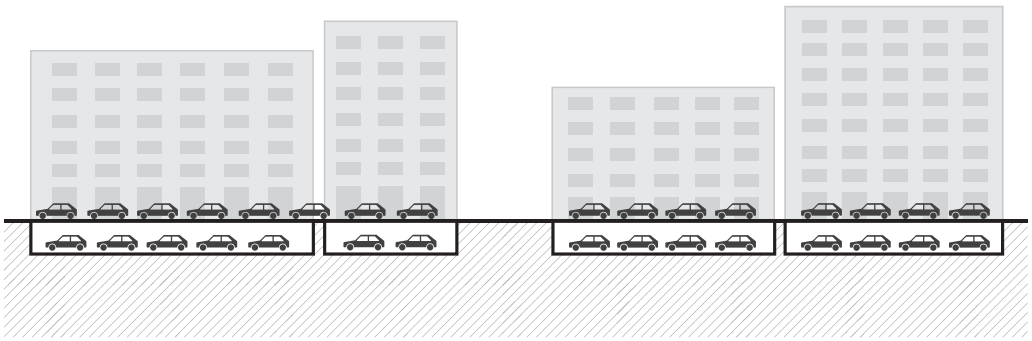
METRIC 4.2:
Limit Parking

Set maximum commercial parking ratios; parking ratios for TOD areas should be at most 80 percent of the city standard

Avoiding gridlock requires limiting the use of vehicles to levels that the road network can support. Peak commute-hour car trips are often unnecessary and should be discouraged especially to TODs. There are many ways to discourage driving. London, Hamburg, and Zurich restrict parking in destinations served by public transit. Where high-quality transit exists, limits on commercial parking are necessary.

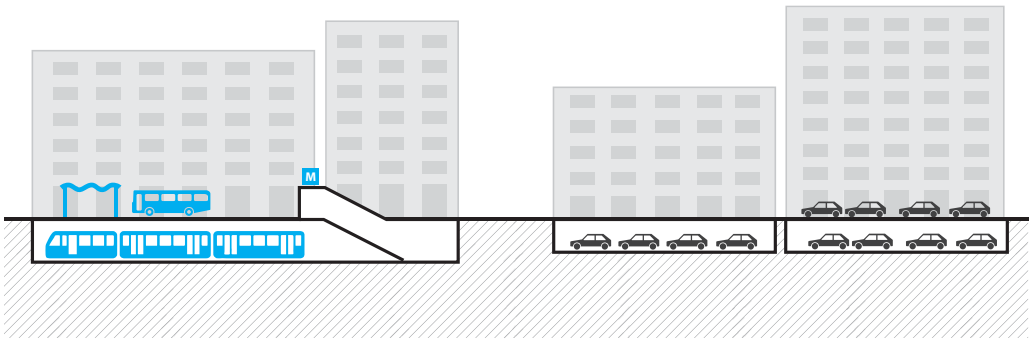
To ensure a true transit-oriented development with less auto use, commercial parking should be limited. On-site parking maximums should be 80 percent or lower than the city standard. Most of this parking should be located in below-grade structures or, when above-grade, the structure must be lined at the sidewalk edge with shops and commercial development.

CITY STANDARD



City Standard

TOD AREA



80% of City Standard (or Less)

Figure P4-13: To encourage transit use, parking controls are needed disincentivize personal auto use. Parking ratios for TOD areas must in all cases be at least 80 percent or lower than the city standard as illustrated in the graphic above. (Source: HDR | Calthorpe)

METRIC 4.3:
Parks in TOD

Provide for a minimum of 10 percent of developable land area for parks and 5 percent for civic uses in each TOD

It is not sufficient to only provide jobs and housing within walking distance of a transit station. Recreation and public amenities play a critical role in the viability of neighborhoods including TODs.

Creating places where residents and workers alike can relax, gather, and walk to add vitality and create a sense of community. Civic amenities such as schools, theaters, markets, and other community services must also be located within TOD areas for establishing livable neighborhoods. A minimum of 10 percent of the developable land area must be allocated for parks and five percent for civic uses.

Figure P4-14: A minimum 10 percent of developable land use should be devoted to parks and open space while a five percent minimum should be for civic uses. (Source: HDR | Calthorpe)

Figure P4-15: Proposed open space amenities and civic structures within the Zhangma District in Jinan, China account for 20 percent and 18 percent, respectively, of the total developable land area. (Source: HDR | Calthorpe)

CASE STUDY

Johannesburg, Guetang Province, South Africa

Population (Metro): 5,605,000 [8]
2030 Forecast: 11,573,000 [9]
Size: 1,645 km^2

HEALING APARTHEID SCARS: REA VAYA BRT AND "CORRIDORS OF FREEDOM"

Johannesburg's (Joburg) economic capital carries a legacy of apartheid in its urban form. Patterns of urban segregation located millions of black poor in distant townships, physically cut off by highways, away from opportunity. This sprawling pattern forced long commutes in low-quality, expensive transit, which can consume up to 40 percent of household budget for poor residents of remote towns.[10] A large proportion of the metro area's residents spend a staggering 20 percent of their budget on transport.[11]

In preparation for the 2010 World Cup games, Joburg inaugurated Africa's first full BRT network called Rea Vaya (which means "we are going" in Scamto), connecting distant settlements to the city center while crossing disruptive infrastructure. Upon completion of Rea Vaya Phase 1C, the system will include 75 kilometers of trunk corridors with additional complementary bus feeder routes, as well as bicycle and walking prioritization around stations to ensure adequate access.[12] However, due to uneven distribution of residential density and centralized zone for jobs, ridership on the BRT is lower than projected, except commute hours.[13]

With the goal of restructuring the apartheid city and equalizing economic vitality, while simultaneously capitalizing on BRT transit investments, the city prepared a TOD strategy branded "Corridors of Freedom." This umbrella framework is a long-term planning and policy effort to incentivize private development along the three Rea Vaya BRT corridors. As mixed-use development advances, ridership on BRT will increase, reaching the self-sustained economic model hoped for when originally planned and reducing the need for subsidies. Population density is expected to increase from 7,436 people per km^2 to 41,632 people per km^2 along the three corridors.[14] High-density residential developments within the corridors are planned to support a range of typologies, densities, and incomes. Public investments in services and housing are intended to help realize a vision of social inclusion, in a reality of rising land values along the BRT corridors.

With the construction of pedestrian and cycling bridges across highways, "Corridors of Freedom" is already bringing positive change. Louis Botha Avenue, Marlboro South, and Park Station are growing as lively, multi-use sites that attract people from all over South Africa and the continent, while reducing transportation costs, shortening travel times and enhancing complementary healthier active mobility.[15] [16]

Figure P4-16: Regional density levels in Johannesburg metro area (Source: State of Guetang)

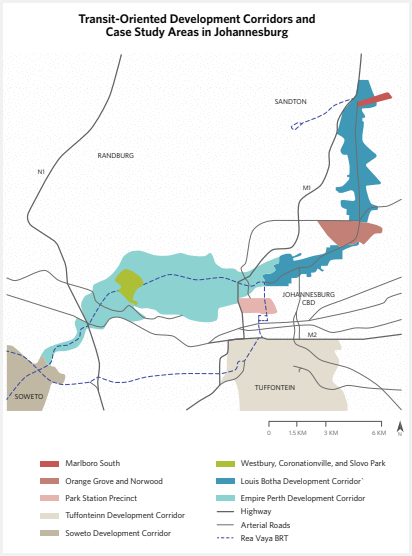


Figure P4-17: Development plans connecting Alexandra, a low-income township segregated by industrial zone, and the M1 highway from Sandton, the wealthiest neighborhood in Africa (Source: Wits University)

Figure P4-18: A BRT line, including a pedestrian and bike bridge, connects Sandton with Alexandra and its industrial zone. (Source: Google Earth)

CASE STUDY

Addis Ababa, Ethiopia

Population: 3,316,000 [17]
2030 forecast: 5,851,000 [18]
Size: 540 km^2 [19]

MANAGING DEVELOPMENT ALONG SUB-SAHARAN AFRICA'S FIRST LIGHT RAIL

Ethiopia is seeing a rapid pace of urbanization thanks to its large population of 86.6 million people, rapid economic growth averaging 10 percent annually, and a low baseline rate of urbanization of 19 percent.[20] Since adopting its first urban strategy in 2005, the city has set the foundations for sustainable long-term development. In the past few years, the city has seen large improvements in transit infrastructure facilitated by Chinese investment. Sub-Saharan Africa's first light rail transit (LRT) system was introduced in 2015 and later expanded.[21] The total length of lines is 34.25 km (North-South line is 16.9 km and East-West line is 17.35 km), with 41 stations.[22] The system is currently working at capacity, serving 60,000 people per hour.[23]

On top of the light rail, plans for an extensive BRT system are underway. The system was supposed to open in 2019 but was delayed until 2021.[24] [25] Upon completion of the entire BRT system, it is planned to include six corridors by 2030. In parallel to mass transit trunks, road infrastructure has been upgraded too; however, car ownership is still low and buses are aimed at providing access in a city where 60 percent of the population walk as the main way to get to their destinations.

One of the goals set when embarking on these transit projects was increasing real estate development. As quoted by Dr. Solomon Zegeye, head of Addis Ababa Road and Transport Bureau, "The potential for land value increase along the BRT corridor is key for investors."[26] The new LRT line has already shaken the housing market: 23,000 informal homes were demolished and people were sent to high-rise, government-built apartments in the outskirts of the city. Research indicates that multiple problems have arisen from this disruption including residents' loss of jobs, possessions, and social networks.

To synchronize the multi-faceted challenge of injecting high-capacity transit and managing real estate and housing needs for existing residents, Arup was commissioned a year before inaugurating the LRT to prepare a transit-oriented development plan managing growth and public access in 10 major stations.[27] [28] High-rise buildings are already popping up in adjacent locations to LRT station, while some quick solutions for pedestrian access and safety were inserted to manage busy junctions.

Figure P4-19: Quick improvements for pedestrian access in major junctions along LRT lines increase safety and usability. (Source: Arup, South Africa)

Figure P4-20: TOD strategy endorsed with introduction of LRT, securing a timely sustainable development citywide (Source: Arup, South Africa)

CASE STUDY

Vancouver, British Columbia, Canada

Population (Metro): 2,463,431 [29]
2030 Forecast: 3,152,000 [30]
Size: 2,882 km^2 [31]

SKYTRAIN AND THE 50 PERCENT ACTIVE TRANSIT GOAL

SkyTrain (TransLink) is a three-line, elevated plus underground and fully automated Metro system. Lines opened in 1986, 2002 and the latest, the Canada Line, in 2009. The system boasts 79.6 km (49.5 mi) of track and 53 stations, with a daily ridership of 562,400 in 2019.[32] [33] SkyTrain was cardinal to Vancouver's aim to reach a 50 percent active-transit goal five years ahead of time.

Metro 2040, a comprehensive plan to accommodate the metropolitan region's projected growth of 500,000 jobs and nearly one million residentsover the 30-year horizon of the plan, was adopted in 2011, laying out a roadmap to a region of compact cities that enables a balanced, comfortable life without a car. Within a constrained urban growth boundary, Metro 2040 targets 40 percent of the region's residential growth to urban centers, and an additional 28 percent of residential growth along TransLink's Frequent Transit Network.

'Frequent' was defined as service that runs at least every 15 minutes in both directions throughout the day and into the evening, every day of the week.[34] (Fifteen minutes was found to be the maximum time most people are willing to wait without pre-planning the trip.) A significant share of that residential development is directed to mixed-use and livable urban centers. This strategy is enabled by incentivizing planning frameworks coordinated with planned transit investments.[35] [36] In the outskirts of the metro area, such as the Richmond municipality, suburban strips dotted with large parking lots and big box retailers are being replaced with dense, mixed-use development and active, walkable street frontages.

The region is now working to recalibrate its policies to tackle two main challenges arising from recent development waves: ensure sufficient affordable and rental units to reduce displacement and balance luxury development on highly valued land; and create complete transit-oriented neighborhoods with unique, local identities. Metro 2040 is being updated to Metro 2050 to address these new challenges and respond to the gaps discovered in the last 10 years. The drafted Metro 2050 mostly differs from its predecessor in its increased focus on affordable housing, addressing the impacts of climate change, improving equity outcomes, and collaboration with other regional agencies, the province, First Nations, and the public. Transit will be at the center of future growth strategies with stronger alignment between land-use and transit.

Figure P4-21: This map shows metropolitan growth boundary in black, urban centers in green, and Frequent Transit Network connections in white. (Source: Metro Vancouver: www.metrovancouver.org/services/regional-planning/PlanningPublications/AerialMap-UrbanCentresFTDAsUrbanContainmentBoundary.pdf)

Figure P4-22: Platform level at Richmond–Brighouse station. An inbound train to Waterfront station can be seen departing the station. May 2019. (Source: Northwest, CC BY-SA 4.0)

ENDNOTES

1 Calthorpe Associates. "Vision California: Statewide Scenarios Report," June 2011. http://www.calthorpe.com/vision-california.

2 Institute for Transportation & Development Policy. "More Development for Your Transit Dollar: Analysis of 21 North American Transit Corridors," November 13, 2013. https://www.itdp.org/more-development-for-your-transit-dollar-an-analysis-of-21-north-american-transit-corridors/.

3 Fehr and Peers. Direct Ridership Forecasting: Out of the Black Box. 2004.

4 U.S. EPA. "Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality (2nd Edition)." United States Environmental Protection Agency, 2013. http://www2.epa.gov/smart-growth/our-built-and-natural-environments-technical-review-interactions-between-land-use.

5 U.S. EPA. "Encouraging Transit Oriented Development: Case Studies That Work," n.d. http://www.epa.gov/smartgrowth/pdf/phoenix-sgia-case-studies.pdf.

6 Freemark, Yonah. "The Interdependence of Land Use and Transportation." The Transport Politic, February 5, 2011. http://www.thetransportpolitic.com/2011/02/05/the-interdependence-of-land-use-and-transportation.

7 Laconte, Pierre. "Urban and Transport Management-International Trends and Practices." International Symposium "Sustainable Urban Transport and City". Shanghai, Tongji University and Nagoya University. 2005. https://www.ffue.org/wp-content/uploads/2012/07/Laconte_Urban_and_transpMgt_Shanghai_2005.pdf.

8 United Nations. Department of Economic & Social Affairs. "The World's Cities in 2016 Data Booklet". 2016. p.10-26.

9 Ibid.

10 Allen, Heather. "Africa's First Full Rapid Bus System: the Rea Vaya Bus System in Johannesburg, Republic of South Africa". For Global Report on Human Settlements. UN-Habitat. 2013. p.5.

11 City of Johannesburg. "Corridors of Freedom, a vision of a city that works for its people". Mail & Guardian. June 26, 2014. Accessed December 5, 2014. https://mg.co.za/article/2014-06-26-corridors-of-freedom-a-vision-of-a-city-that-works-for-its-people.

12 Rea Vaya website. Fast Facts. Accessed December 5, 2018. https://www.reavaya.org.za/welcome/fast-facts.

13 Venter, Christo, and Gary Hayes. "South Africa Needs to Revamp Its New Public Transport System." The Conversation. September 19, 2018. Accessed December 05, 2018. https://theconversation.com/south-africa-needs-to-revamp-its-new-public-transport-system-84930.

14 City of Joburg website. "Corridors of freedom Interactive Story Map for Medium Term Projects". Accessed November 10, 2018.

15 City of Joburg. "Louis Botha Avenue Development Corridor, Strategic Area Framework". Iyer Studio. 2016.

16 Dr. Rubin, Margot and Appelbaum Alexandra. "Spatial Transformation Through Transit-Oriented Development in Johannesburg". University of Witwatersrand, School of Architecture & Planning. 2016.

17 United Nations. Department of Economic & Social Affairs. "The World's Cities in 2016 Data Booklet". 2016. p.10-26.

18 Ibid.

19 Ethiopian Government Official Portal. City of Addis Ababa Administration. Accessed December 3, 2018. http://www.ethiopia.gov.et/addis-ababa-city-administration.

20 UN-Habitat. United Nations Human Settlements Programme. "The State of Addis Ababa 2017".

21 Nadi, Gifti. "Addis Ababa prepares for its first Bus Rapid Transit system". C40 Cities, April 12, 2017. Accessed December 5, 2018. https://www.c40.org/blog_posts/addis-ababa-prepares-for-its-first-bus-rapid-transit-system.

22 Jemere, Yehualaeshet (MSc. CEng). Ethiopian Railways Corporation (ERC). "Addis Ababa Light Rail Transit Project" presentation slides, July 2012. Accessed December 5, 2018. http://www.lestradedellinformazione.it/contents/instance1/files/document/2858Etiopia-Progetto.pdf.

23 Nadi."Addis Ababa prepares for its first Bus Rapid Transit system".

24 Agence Française de Développement (AFD) website. "First Bus Rapid Transit Lane in Addis Ababa". Accessed December 5, 2018. http://www.afd.fr/en/first-bus-rapid-transit-lane-addis-ababa.

25 Fikade, Birhanu. "Bus Rapid Transit Corridor Project Underway." The Reporter Ethiopia. August 11, 2018. Accessed December 06, 2018. https://www.thereporterethiopia.com/article/bus-rapid-transit-corridor-project-underway.

26 Nadi."Addis Ababa prepares for its first Bus Rapid Transit system".

27 Arup via Engineering News. "Addis Ababa – 10 Rail Stations to Benefit from TOD". December 11, 2014. Accessed December 5, 2018. http://www.engineeringnews.co.za/article/addis-ababa---10-rail-stations-to-benefit-from-tod-2014-12-11/rep_id:4715/company:arup-2008-06-13.

28 Arup via World Architecture News Awards. "Addis Ababa Urban Renewal Initiative, Addis Ababa, Ethiopia". 2015. Accessed December 5, 2018. https://backstage.worldarchitecturenews.com/wanawards/project/addis-ababa-urban-renewal-initiative/?source=sector&selection=all.

29 Statistics Canada, Vancouver Metropolitan Area Census Profile, 2016 Census. Accessed December 5, 2018.

30 Metro Vancouver. Regional Growth Strategy Bylaw No.1136, 2010. "Metro Vancouver 2040 – Shaping Our Future". July 29, 2011. Updated July 28, 2017. p.68.

31 Statistics Canada, Vancouver Metropolitan Area Census Profile, 2016 Census. Accessed December 5, 2018.

32 City News Everywhere. "Evergreen Extension opening today". NEWS 1130. December 2, 2016. Accessed October 16, 2021. https://vancouver.citynews.ca/2016/12/02/evergreen-extension-opening-today.

33 American Public Transportation Association. "APTA Q3 2019 Ridership Report" (PDF). American Public Transportation Association. November 22, 2019. Accessed November 10, 2021. https://www.apta.com/wp-content/uploads/2019-Q3-Ridership-APTA.pdf.

34 Metro Vancouver, Regional Planning and Agriculture Committee. 2011 Population Density and the Metro 2040 Growth Model.

35 City of Vancouver website. Cambie Corridor Plan. Accessed December 5, 2018. https://vancouver.ca/home-property-development/cambie-corridor-plan.aspx.

36 BC Business. "Why TransLink is a Leader in Transit-Oriented Development". Canada Wide Media Limited. Accessed December 5, 2018. https://www.bcbusiness.ca/why-translink-is-a-leader-in-transit-oriented-development.