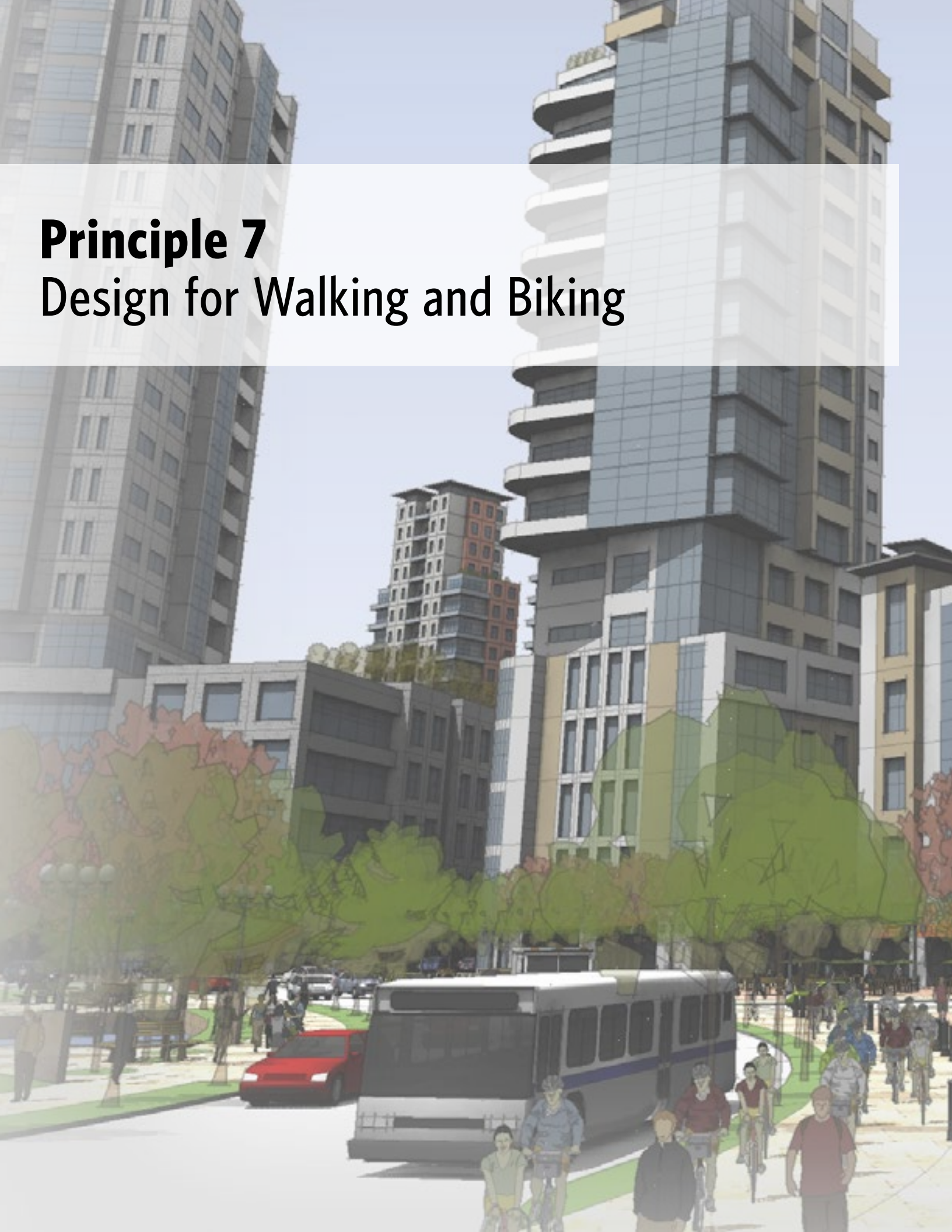

Principle 7
Design for Walking and Biking


M

Principle 7
Design for Walking and Biking

Prioritize walking and biking with ubiquitous safe, direct, and comfortable routes

GOALS

7A Emphasize pedestrian safety, comfort, and convenience

ACTION 1: Plan sidewalk dimensions in proportion to surrounding density and uses

ACTION 2: Plan for consistent street trees and pedestrian amenities

ACTION 3: Create 'bulb outs' at street corners, replacing parking lanes to reduce crossing distance

7B Encourage ground-level activity and create places to relax

ACTION 4: Line streets with visually active frontage and eliminate parking in front setbacks

ACTION 5: When block security is required, provide semi-transparent fencing design with setbacks for landscaping

7C Design streets that emphasize bike safety and convenience

ACTION 6: Protect bike lanes with physical barriers from cars and clear pedestrian separation

ACTION 7: Consider the use of auto-free streets

METRICS

7.1 Sidewalk Size

Sidewalks should provide a minimum of 3.5-meter-wide walkway on streets with four or more lanes, and a minimum of 2.5-meter-wide walkway for two-lane streets

7.2 Street Crossings

Street crossings should be 16 meters maximum curb-to-curb in the absence of a refuge

7.3 Active Street Frontage

Provide a minimum of 20 percent of residential block perimeter dedicated to publicly accessible uses, and 60 percent in commercial blocks and along shopping streets

7.4 Bike Lanes

Streets with four or more lanes must have protected bike lanes of at least two meters each direction

RATIONALE AND CHALLENGES

Walkable and bikeable streets and neighborhoods are the foundation of every great city. Walking reduces auto-dependence, supports public transit, improves health, enhances local shops, and promotes community. Unsafe environments discourage walking and biking, which in turn make the shift to a high share of non-motorized transit difficult. At once ancient and modern, walking is at the core of high-quality and humane neighborhoods all over the world. The most attractive cities in the world emphasize the pedestrian environment and human-scale in public spaces, activities, and buildings.

Biking requires far less land and energy use than any other form of transportation—it produces no pollution while providing benefits for human health. In addition, shared electric bikes are making biking more accessible and convenient—especially for trips to and from transit stations. Dense networks of walking and biking paths allow commutes to be safer, shorter, and more efficient, encouraging less car use and increasing healthy forms of commuting. Walkable and bikeable neighborhoods are shown to be healthy and, in some cases, inspirational. Of the theory of relativity, Albert Einstein said, "I thought of that while riding my bicycle."

The challenges of enhancing active transport vary dramatically throughout the globe, but on average, non-motorized transport represents a significant portion along with transit. Generally, walking dominates this category of nonmotorized transport representing, on average, twice the mode split as biking. In fact, non-walking modes are undergoing a renaissance of new technologies such as electric-assisted bikes, e-scooters, e-tricycles, and Segways to name a few. These configurations are proliferating rapidly and are sure to enhance local trips and first/last mile connections to transit. They all move too slowly to mix with larger vehicles and too fast to mix with pedestrians and so will need to share protected lanes with traditional bikes. This growth reinforces the need for expanding dedicated rights-of-way for this category of sustainable mobility.

The propensity to walk and bike depends heavily on infrastructure, urban design, and culture—not wealth. Wealthy countries such as Denmark and Holland rank very high with relative non-motorized mode splits because of a historic walkable urban forms and significant investments in bikeways and auto-free streets. In Amsterdam, a remarkable 60 percent of journeys are non-motorized while Copenhagen touts an impressive 47 percent non-motorized mode split.[1] [2] In contrast, other wealthy countries evolved into auto-oriented environments and invested heavily in roads and highways. The United States and Australia show a mere 12 percent and 6 percent mode split, respectively, for walking and biking. In less wealthy regions, walking and other non-motorized forms of transport are essential to populations with low incomes and auto ownership rates. In low-income neighborhoods and informal settlements, walking is the predominant mode even without adequate and safe walkways or protected bikeways.

Each of the three forms of global sprawl represents different opportunities and challenges for walk/bike trips. In areas of high-income sprawl, auto ownership is so high that roadways and land use have been largely configured for their use. Land uses are isolated and streets are inhospitable to pedestrians. In these areas, adding density, transit, and local destinations must go hand in hand with investments in safe sidewalks and bikeways. In areas of high-density sprawl, reforming the block structure to allow pedestrian permeability and safe bikeways should be foremost. For these areas, additional local destinations along with auto-free streets are viable and desirable. In low-income sprawl areas, the fundamental need is to develop right-of-way space as many informal areas lack a basic street network sufficient to supplement roadways with sidewalks and bikeways. Finding funds to support roadway improvements for walk/bike lanes are major challenges as are securing funds for other basic services such as water, power, and sewers. Nonetheless, enhancements and upgraded streets can efficiently combine needs for infrastructure with walk/bike space and even street trees.

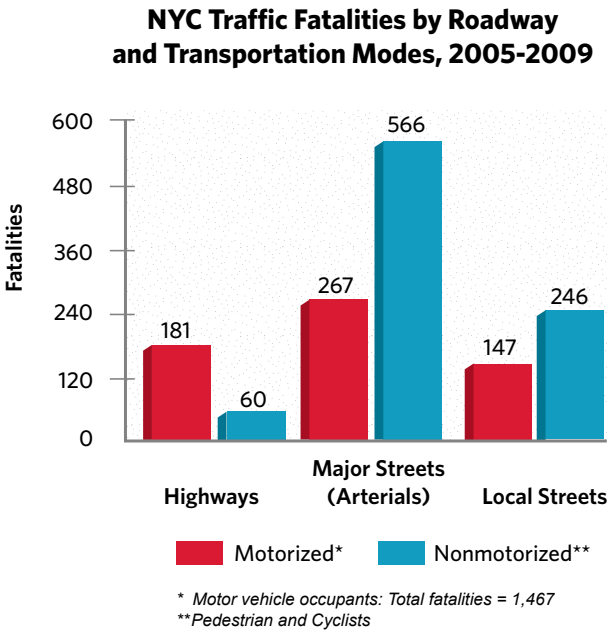

Figure P7-1: New York City fatalities by roadway and transportation modes, 2005–2009 (Source: http://www1.nyc.gov/assets/doh/downloads/pdf/survey/survey-2010-traffic-safety.pdf)

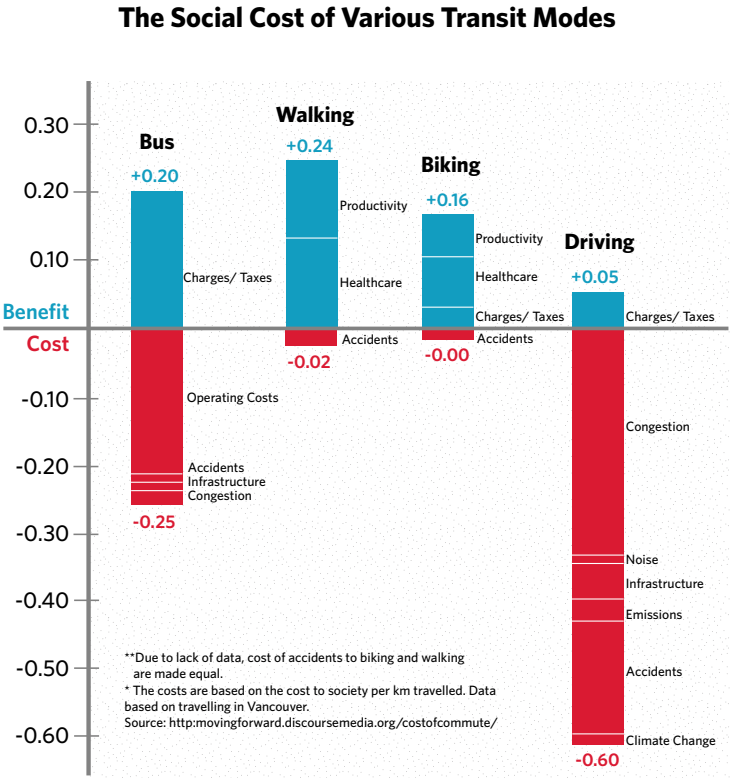

Figure P7-2: The social cost of various transit modes in Vancouver, British Columbia, Canada (Source: 12 Green Guidelines, 2015)

BENEFITS

ECONOMIC

Increases property values: As has been shown in cities all over the world, there is a price premium in walkable neighborhoods.[3]

Increases returns on investment: Bike-share systems can produce many benefits; in New Zealand, the benefits were 10 to 25 times the cost.[4]

Decreases government costs: Governments avoid cost externalities from health, congestion, and pollution when there is less driving and more biking and walking.[5]

Relieves congestion: Improving the walking and biking experience is the best way to reduce car use. For example, Guangzhou's bike-share program prevents 14,000 car trips daily.[6]

Decreases transport costs: Substantial savings on fuel, maintenance, and parking costs are achieved with more walking and biking.

ENVIRONMENTAL

Reduces carbon emissions: Biking and walking produce no tailpipe emissions. In contrast, car traffic is an increasing source of carbon emissions and other toxic emissions.[7]

Improves air quality: Motor vehicle emissions contribute significantly to particulate matter levels and other damaging air pollutants. The transportation industry is responsible for one-fifth of global carbon dioxide emissions; a majority of those emissions originate from passenger vehicles.[8]

SOCIAL

Improves physical health: Walking contributes to heart health and reduces the incidence of cancer. By contrast, vehicle emissions contribute to many documented illnesses such as asthma.[9]

Improves equality: As biking and walking are inherently less expensive transit modes, more citizens can afford the costs of biking or walking than driving.

Decreases risk of injury: Adding more bike lanes can decrease accidents and injuries for everyone on the road, not just bicyclists.[10]

Promotes age equity: Walk/bike is a universally accessible mode of travel and allows all age groups to access critical destinations and services easily and at a low cost.

CASE STUDY

Liuyun Xiaoqu, Guangzhou, China

Initially a single-use, gated residential block, Liuyun Xiaoqu is now a revitalized TOD community in Guangzhou. In 2000, when the government changed zoning to allow ground-floor apartments to transition to commercial uses, the neighborhood transformed while enhancing its unique pedestrian-friendly design. Liuyun Xiaoqu ranks fifth on a list of 50 top transit-oriented projects compiled by the Institute for Transportation and Development Policy (ITDP). The community was awarded the highest rating of gold and ranked above similar districts in Hamburg, San Francisco, and Amsterdam. Liuyun Xiaoqu was built before car use was mainstream in China and it has maintained high standards for car control. It also offers many car-free walking and biking paths. As a transit-oriented, car-limited, mixed-use neighborhood, Liuyun Xiaoqu is walkable and people-friendly. Figure P7-5 shows the area's extensive pedestrian and bike paths and, for comparison, the less extensive road network for motor vehicles.

Served by two major Metro stations and close to a BRT Corridor, Liuyun Xiaoqu's integrated transit and human-scaled form makes active transportation a convenient and safe choice. Most streets are scaled to suit pedestrians and cycling with a robust network of car-free and low-speed shared streets, safe crossings, sharp street corners and split roads lined with trees that calm traffic. Ground-floor retail and thoughtfully designed public spaces like small parks make the streets of Liuyun Xiaoqu an interesting environment for walkers, creating a lively public realm. Permeability within blocks is a key part of Liyun Xiaoqu's pedestrian-friendly urban fabric. Once gated blocks have been converted to open access with interiors that feature garden space and trees as well as pedestrian paths that connect to other public spaces.

Figure P7-3: Liuyun Xiaoqu is filled with auto-free and walkable streets. It is a neighborhood free from car use due to a well-crafted network of non-motorized transit paths. (Source: ITDP)

By limiting car use and providing quality cycling and walking infrastructure, the community's design has nurtured commerce and improved public health, supporting more active lifestyles and better air quality. Liuyun Xiaquo stands as a good model for transforming formerly isolated blocks into dynamic, human-scaled communities that invite people back onto the streets.

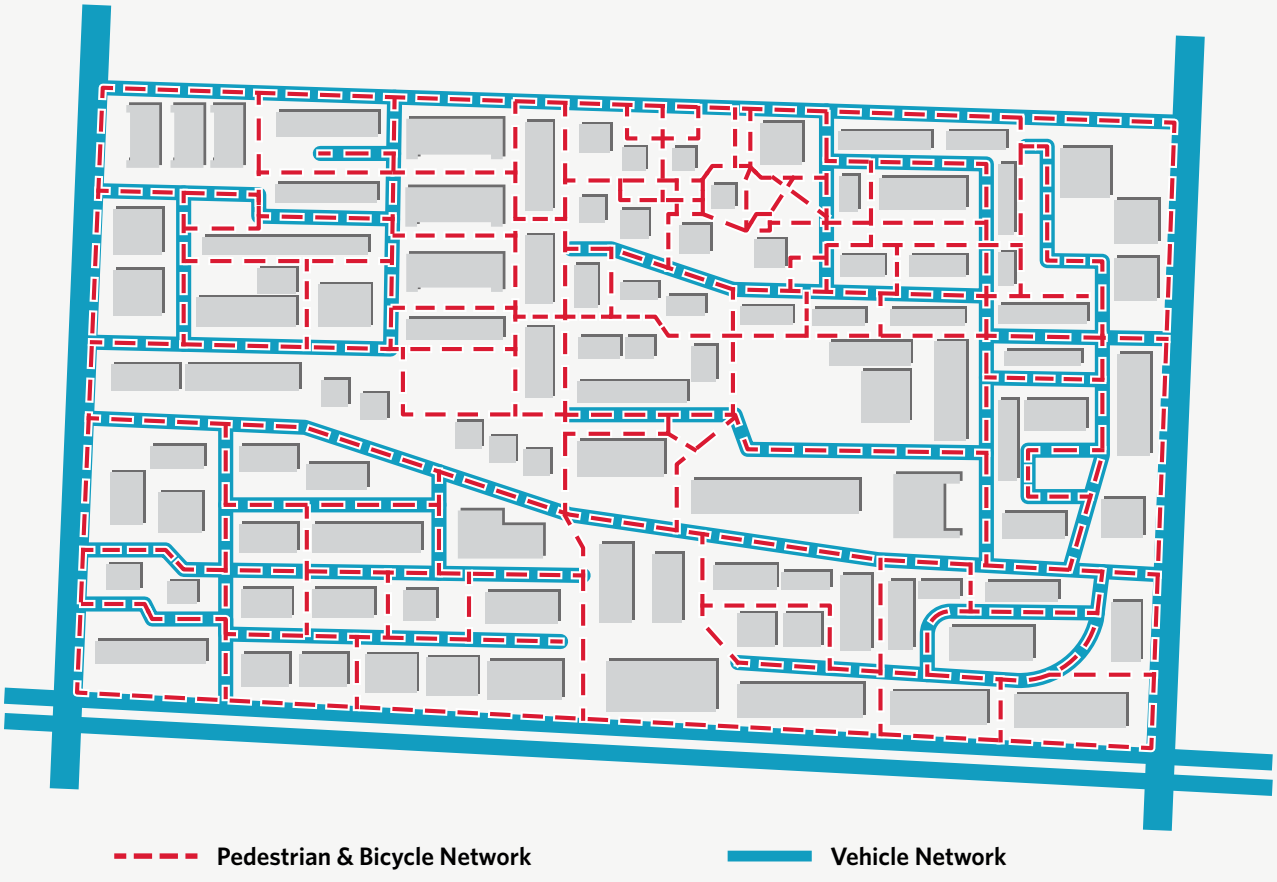

Figure P7-4: The street network of Liuyun Xiaoqu is designed for pedestrians and bicyclists. The above graphics show a comparison between non-motorized and vehicular paths. (Source: ITDP)

GOAL 7A:
Emphasize pedestrian safety, comfort, and convenience

Designing streets that are safe to cross while providing comfortable, interesting places to walk should be the first priorities in establishing livable, low-carbon cities. Pedestrian-friendly streets not only foster a sense of community but support and improve business value. By adopting simple design measures, we can create environments conducive to pedestrian safety and convenience.

Limiting road width, block lengths, and setbacks between buildings and sidewalks will encourage walking. As an example, street widths should be no more than 16 meters curb to curb without a refuge and street crossings must be marked and secure for pedestrians. The key to prioritizing pedestrian safety is good intersection design. Other design features such as bulb-outs, medians, and bollards slow traffic and keep pedestrian safe.

Creating direct routes and permeable blocks by limiting average block length to 150 meters in new development and creating public paths through existing superblocks will help pedestrian connectivity and security. These routes will help form complete pedestrian networks connecting people to community amenities, parks, and local destinations seamlessly. Providing safe, well-defined, and uninterrupted pedestrian zones on each side of every street will enhance pedestrian safety and comfort.

STANDARD INTERSECTION

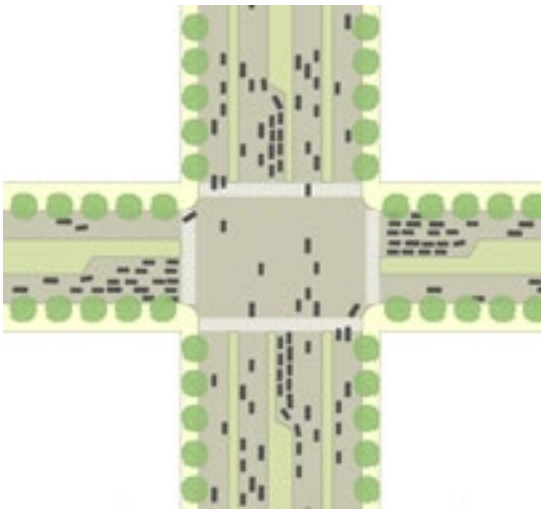

Figure P7-5: Standard intersections between wide arterial roads with multiple lanes create crossing areas that are unsafe for non-motor and pedestrian traffic to navigate. (Source: HDR | Calthorpe)

LOCAL, ONE-WAY STREET INTERSECTION

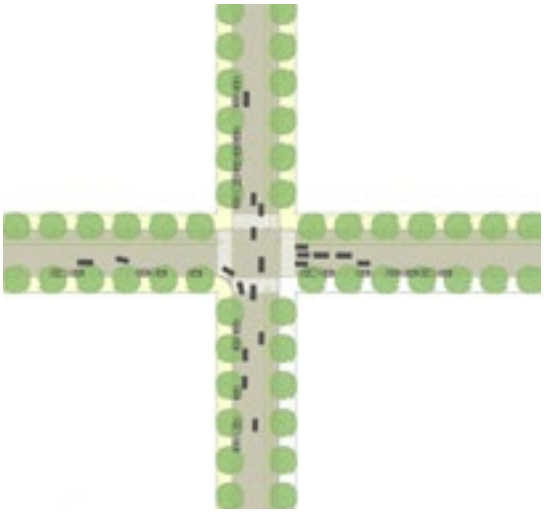

Figure P7-6: Advantages of local, one-way street intersections are shortened pedestrian crossing distances and fewer signal phases. (Source: HDR | Calthorpe)

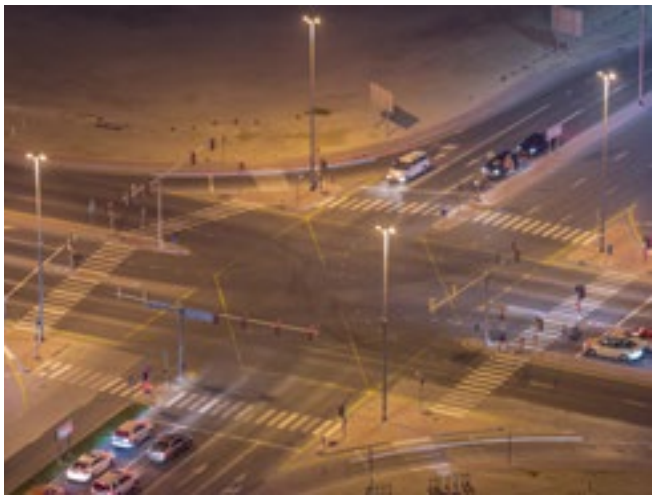

Figure P7-7: Traditional intersections create longer crossing times due to wider roads and unsafe environments, making navigation for pedestrians and bikers difficult. (Source: Adobe Stock)

Figure P7-8: Curb extensions: (also called bulb-outs) extend the sidewalk into the parking lane or driving lane to provide additional pedestrian space at key locations, usually at corners or mid-block. Curb extensions enhance pedestrian safety by increasing pedestrian visibility, shortening crossing distances, and visually narrowing the roadway. (Source: NACTO)

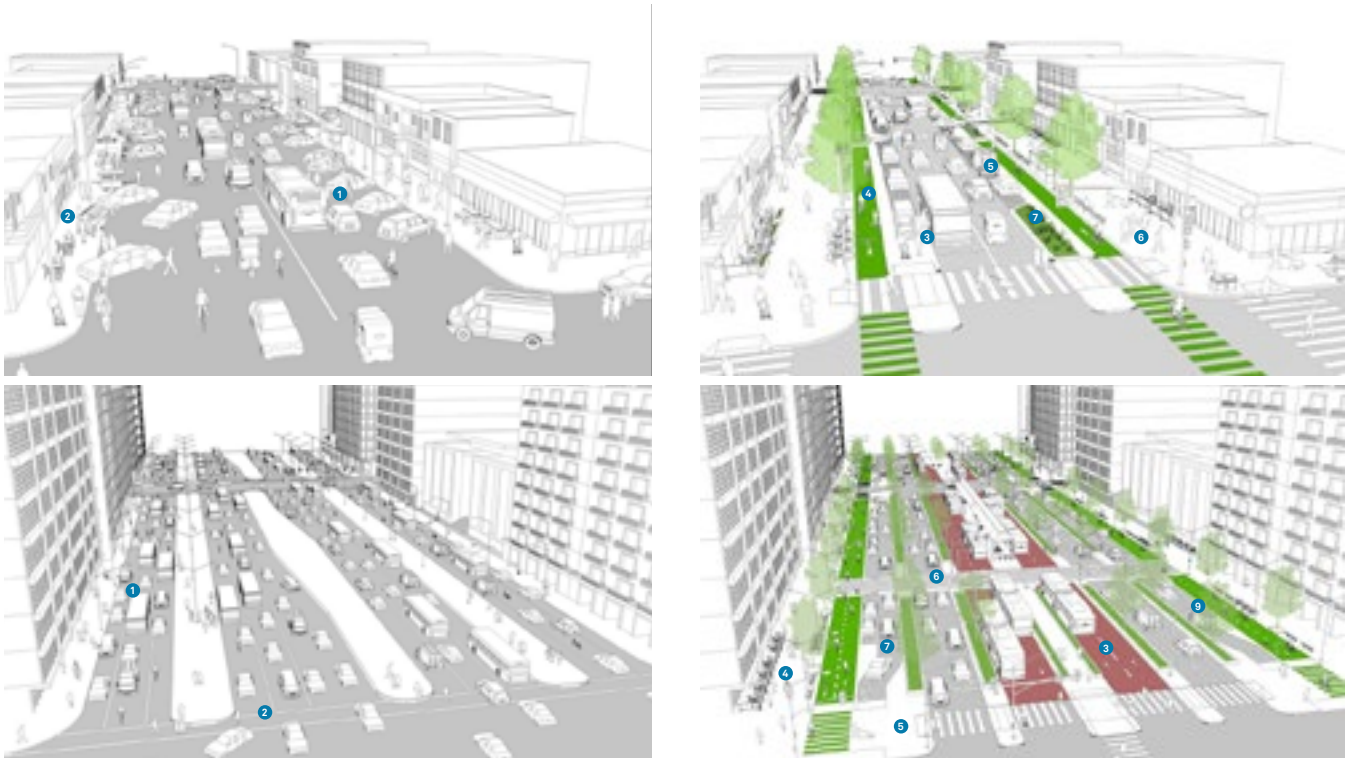

Figure P7-9: The National Association of City Transporation Official's (NACTO) Global Street Design Guide's approach puts pedestrians, bicyclists, and transit users on equal footing with motor-vehicle drivers. The aim is to improve the quality of life by creating streets that are both great public spaces and sustainable transportation networks. It embraces innovation to address climate change and promote healthy living. (Source: NACTO)

ACTION 1:
Plan sidewalk dimensions in proportion to surrounding density and uses

The key to designing uninterrupted pedestrian routes is providing adequate walking areas that will enhance the pedestrian experience. Sidewalk widths should complement the surrounding development density and uses. For example, in high-density mixed-use zones and commercial areas, sidewalks should be wide enough to accommodate high foot traffic. Providing unimpeded pedestrian flow in these areas will encourage walking while enabling ground-floor retail to thrive. In residential areas, sidewalks can be narrower than in mixed-use commercial areas, as the expected foot traffic will be lower. Sidewalk widths also directly correspond to the road width and traffic lanes. Typically, high-density mixed-use commercial zones will have streets with more vehicular traffic lanes than in predominantly residential zones, where the majority of roads will be two-lane 'local' streets.

Figure P7-10: Sidewalks are an integral part of cities and should be prioritized as a central component of people-oriented urban design. (Source: La Citta Vita, CC BY-SA 2.0, www.flickr.com/photos/la-citta-vita/5853024104)

Figure P7-11: Wide sidewalks in Curitiba, Brazil not only provide unobstructed paths to walkers, but also have sufficient space to accommodate outdoor seating for sidewalk cafés and restaurants. (Source: iStock)

ACTION 2:
Plan for consistent street trees and pedestrian amenities

Investing in pedestrian environment upgrades greatly contributes to fostering walkability. The streetscape design must allow for street trees, benches, lighting, and other amenities that provide pedestrian comfort and safety.

Properly spaced street trees provide great environmental value and aesthetic benefit while ensuring pedestrian safety by functioning as a visual and physical barrier between travel lanes and the sidewalk. Street trees provide more than shade and increased walkability. Studies have shown that retail areas with trees demonstrate a 12 percent higher willingness to pay for goods and services in consumers.[11]

Providing amenities such as benches, water fountains, trash receptacles, streetlights, and other street furniture help pedestrian zones and businesses thrive. Street furniture should be placed so as not to hinder the path or become tripping hazards but to enhance the walking environment.

Figure P7-12: Street concept near the New East Station in Jinan, China shows a comfortable pedestrian environment and desirable streetscape design. Street trees, landscaping, benches and other amenities are shown along the street and designated bike lane. (Source: HDR | Calthorpe)

ACTION 3: Create 'bulb-outs' at street corners, replacing parking lanes to reduce crossing distance

Eliminating parking lanes at intersections provides an opportunity to expand the sidewalk at corners and shorten the pedestrian crossing distance by creating 'bulb-outs.' For low-volume streets, the curb radius at these bulb-outs should be minimized so that cars making right turns must slow down. This heightened driver awareness can also increase pedestrian safety.

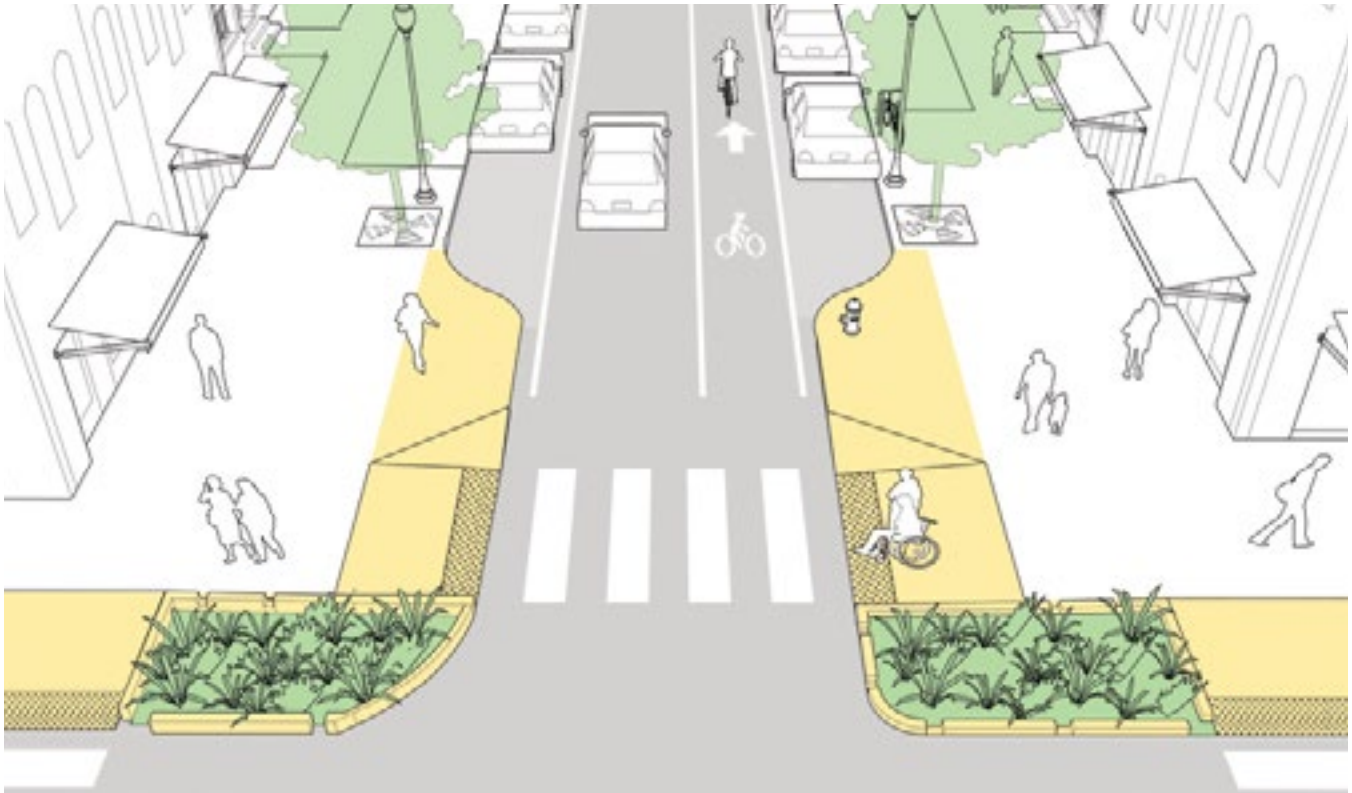

Figure P7-13: The bulb-out at street intersections can reduce crossing distance and enhance pedestrian safety. (Source: NACTO Urban Street Urban Guide)

GOAL 7B:
Encourage ground-level activity and create places to relax

To encourage street-level activity, buildings with public uses and shops should front the sidewalk and residential developments should have multiple access points. This increases the level of activity and safety, thus encouraging pedestrian movement. Ensuring that major shopping streets have building frontage close to the sidewalk will help define the pedestrian domain, improve permeability, and provide convenient uses for pedestrians. Uses that activate and provide direct entries are encouraged, such as shops, cafés, restaurants, or small businesses. Community facilities such as day cares, clubs, recreation halls, and post offices also help to reinforce the pedestrian realm. It is important that buildings respect the maximum setback requirements as discussed in Chapter 11 to maintain a consistent and active street edge.

A comfortable walking environment is dependent on creating spaces where the pedestrian can relax. Parks, plazas, and parklets provide opportunities for rest and social interaction in addition to fostering a sense of community and enhancing walkability. Streets should have benches and other furniture that will help reinforce the pedestrian domain.

Figure P7-14: One of many pedestrian-friendly features along Denver's Santa Fe Drive, this parklet is part of the corridor's streetscape improvements aimed at reclaiming underutilized roadway space. (Source: HDR)

Figure P7-15: Water Lily Street in Jinan, China encourages ground-level activity with small shops along pedestrian-only paths. (Source: Rolfmueller, CC BY-SA 3.0, https://commons.wikimedia.org/wiki/File:Furongjie_2008_11_11.jpg)

ACTION 4:
Line streets with visually active frontage and eliminate parking in front setbacks

Walkability is enhanced when the pedestrian environment is inviting and interesting instead of walled-off. Visually active frontage occurs when there are entries, sidewalk cafés, show windows, transparent fencing, or accessible open space. In addition, parks and playgrounds shape interesting sidewalk experiences for passersby and can provide space for programs like farmers' markets, pop-ups, and fitness classes.

In too many cases, setbacks in front of the buildings are used for parking. This disrupts pedestrian flow and visibility and discourages walking. Relocating parking to the side or rear of buildings will improve the walking experience by enforcing the pedestrian realm and bringing commercial activity to the sidewalk.

Figure P7-16: In Liuyun Xiaoqu, wide sidewalks with adequate seating and other amenities provide unobstructed pedestrian flow. Eliminating parking in the setback area to accommodate a generous sidewalk allows retail activity to interact with the pedestrian experience in a seamless fashion. (Source: Karl Fjellstrom - ITDP)

ACTION 5:
When block security is required, provide semi-transparent fencing design with setbacks for landscaping

Perimeter security walls should be set back from the street to allow for landscaping or be constructed of semi- transparent fencing. A blank wall is a barrier between uses and creates an unsafe environment due to lack of surveillance. Shorter fences that enable privacy and security while allowing views to the sidewalk and street should be provided where possible. Setbacks must be landscaped to create a more attractive streetscape for pedestrians.

Figure P7-17: A solid blank wall provides no benefit other than the privacy for its interior. (Source: HDR | Calthorpe)

GOAL 7C:
Design streets that emphasize bike safety and convenience

In recent years, cities across the globe have been working to reintroduce bicycles as an integral part of city life because they are a simple, inexpensive, and low-carbon way for city residents to travel between destinations and to transit stations. To ease congestion, cities must once again encourage cyclists by providing safe conditions. The current growth of shared bike programs is a testament to the growing demand for biking in cities.

Creating dedicated and protected bike lanes in both directions on medium and high-volume streets will encourage biking and ensure safety and convenience. To further promote biking, secure bike parking in buildings, on streets, and at transit stations must be provided. In addition, auto-free streets and greenways with bike trails encourage biking. When auto-free rights-of-way are combined with transit and sidewalks, bike lanes should be protected. Another approach to increasing bike use is incorporating a bike-sharing system that will increase non-motorized transit use by providing additional convenience. A study of the Hangzhou Public Bicycle program found that 30 percent of users incorporated bike-sharing in their commute and reduced use of motorized vehicles.

Figure P7-18: Dedicated and protected bike lanes improve bike safety and convenience while increasing non-motorized transit use. (Source: NACTO)

ACTION 6: Protect bike lanes with physical barriers from cars and clear pedestrian separation

Bikes and pedestrians don't mix. In addition to adequate space for each, barriers are key to their effective use. In addition, cars will invade bike lanes if not protected. Likewise, bikes can veer into pedestrian areas to pass or avoid other bikes. In both cases, it is important that strong, continuous, and clearly visible separations be constructed. Strong bollards or low fencing is required between car and bike lanes and planter strips can provide additional protection. Light, low fencing is needed between bikeways and sidewalks. Alternatively, landscaped areas can act as separators.

Figure P7-20: Clear pedestrian separation between the sidewalk and the dedicated bike lane improves pedestrian and bike safety. (Source: Paul Krueger, CC BY 2.0, www.flickr.com/photos/30604571@N00/5862136555)

Figure P7-19: A one-way, dedicated bike lane offers protection from the street and sidewalk by using tree buffers. (Source: Paul Krueger, CC BY-SA 2.0, https://commons.wikimedia.org/wiki/File:Hornby_Street_Separated_Bike_Lane.jpg)

Figure P7-21: In the Netherlands, a comprehensive and well maintained system of cycle tracks, physically protected from fast motor traffic, have helped to make cycling widespread at all ages and reduce the risks of injury. (Source: Ted Eytan, CC BY-SA 2.0, www.flickr.com/photos/taedc/20362788051)

ACTION 7:
Consider the use of auto-free streets

For some infill or redevelopment projects, it is difficult to reconfigure the road network. However, developers can open connections in existing built environments by adding biking and walking paths. Singapore has created extensive networks of walk/bike only pathways through residential superblocks, effectively creating a small block urban fabric. The recent Chinese State Council recommendation to allow access and through traffic in existing superblocks will involve a detailed study in each case. Often internal driveways can be enhanced with sidewalks and bikeways to become full city streets. In others, pathways can offer auto-free access through the superblock to allow shortcuts for pedestrians and bikers.

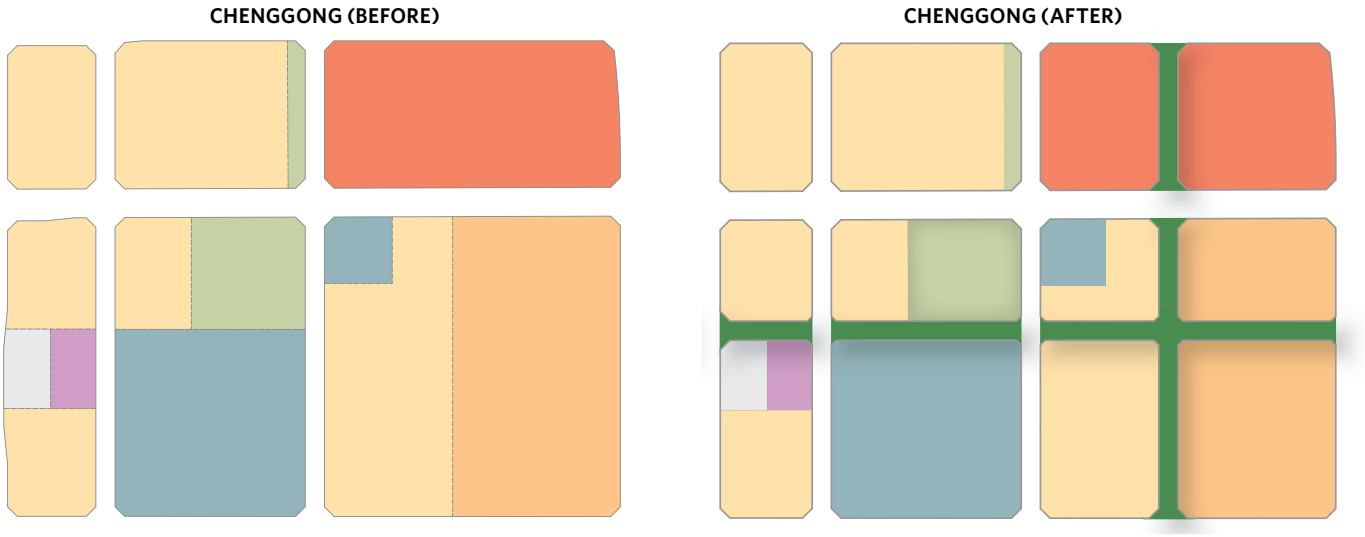

Figure P7-22: Auto-free streets (highlighted in green) are used to sub-divide an existing superblock in Chengong. These passages provide an efficient pedestrian network that connects the individual to important employment, civic and recreational amenities throughout the neighborhood. (Source: HDR | Calthorpe)

METRIC 7.1:
Sidewalk Size

Sidewalks should provide a minimum of 3.5-meter-wide walkway on streets with four or more lanes, and a minimum of 2.5-meter-wide walkway for two lane streets

Sidewalk widths are critical to creating a safe and continuous walking experience that seamlessly connects pedestrians to homes, businesses, transit, and recreation. As discussed previously, sidewalk widths should relate to surrounding uses and the scale of the street. To ensure this criterion is met, sidewalks should be a minimum of three meters wide on both sides of streets that carry a higher volume of traffic, i.e., streets with four or more vehicular traffic lanes. This space can include tree wells. Shops fronting on the sidewalk should have setbacks of no more than one meter unless a sidewalk seating area is planned. On local or two-lane streets, sidewalks should be a minimum of 1.5 meters.

Figure P7-23: A wide, active sidewalk on Orchard Road, a wide busy vehicular road in Singapore, provides a safe environment for shoppers. (Source: Glen Bowman, CC BY-SA 2.0, www.flickr.com/photos/glenbowman/2397935521)

METRIC 7.2:
Street Crossings

Street crossings should be 16 meters maximum curb-to-curb in the absence of a refuge

Creating safe intersections and shortened crossings encourages walking while providing security. Multi-lane roads with wide intersections acts as barriers to walking and are especially difficult for children, elderly, and people with disabilities due to the time and distance required to cross the street. Features such as bulb-outs, medians, and refuges help reduce the distance and make crossing more convenient. To ensure pedestrian safety, in all cases, street crossings should be no more than 16 meters curb-to-curb when without a refuge.

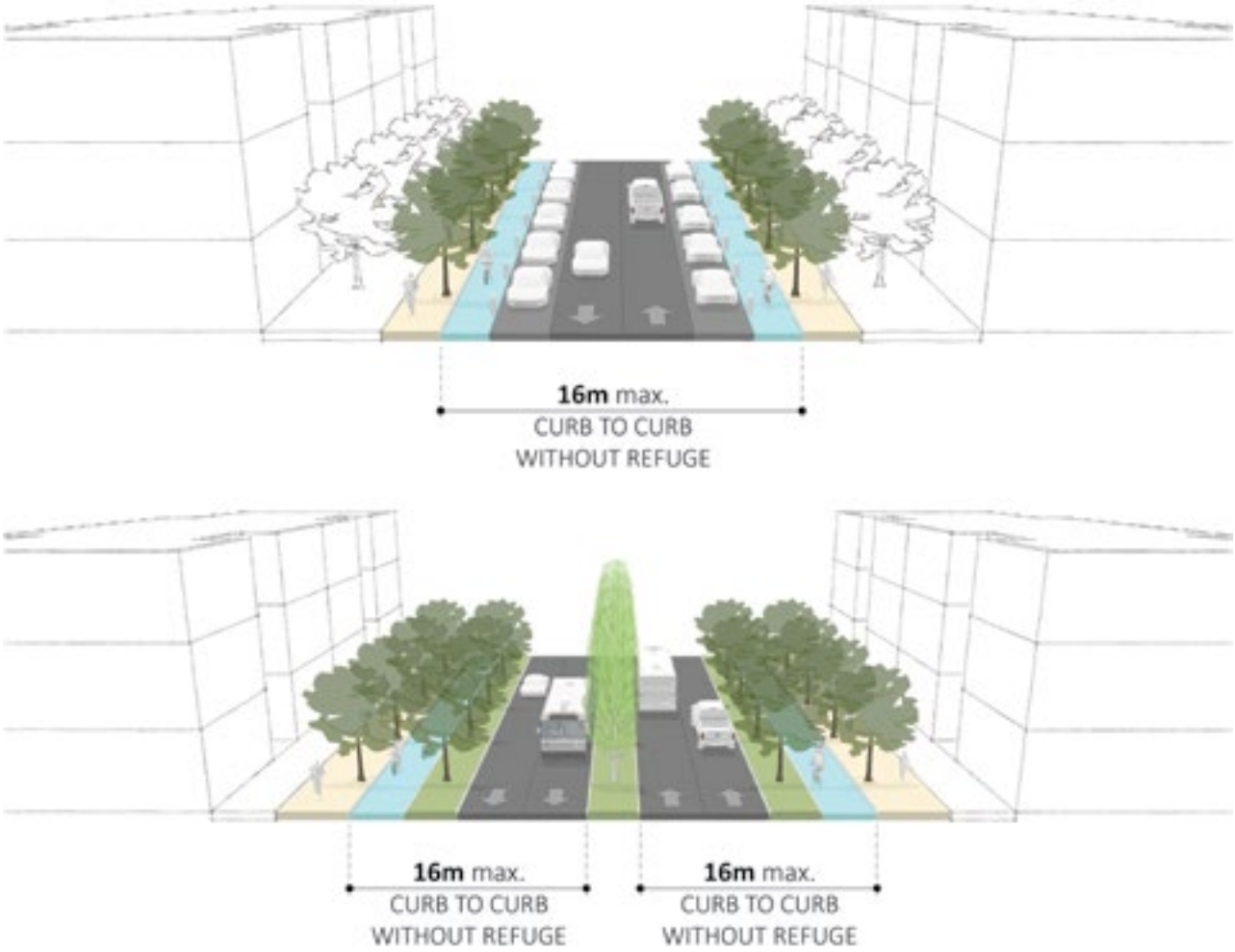

Figure P7-24: Streets should be designed so that no pedestrian crossing from curb-to-curb is greater than 16 meters (Source: HDR | Calthorpe)

METRIC 7.3:
Active Street Frontage

Provide a minimum of 20 percent of residential block perimeter dedicated to publicly accessible uses, and 60 percent in commercial blocks and along shopping streets

To ensure that streets and pedestrian areas are lined with interesting and useful street-side uses, a minimum percentage of the block perimeter must be lined with publicly accessible uses. Publicly accessible uses include shops and other retail, cafés, restaurants, small businesses, community facilities as well as residential services such as community halls, entrance lobbies, etc. This percentage will vary depending on the primary land use within the block.

For residential blocks along non-shopping streets, a minimum of 20 percent of the block perimeter shall be dedicated to such uses with the corners designated for shops and other public uses. Along designated 'shopping streets,' it should be a minimum 60 percent. The lineal meters of the property line lengths on all sides should be aggregated and the required percentage of this number can be placed along any edge.

Figure P7-25: Active street corner with ground-level shops in Qianmen Street in Beijing, China (Source: Adobe Stock)

RESIDENTIAL BLOCK: NON- SHOPPING DISTRICT
20% FRONTAGE

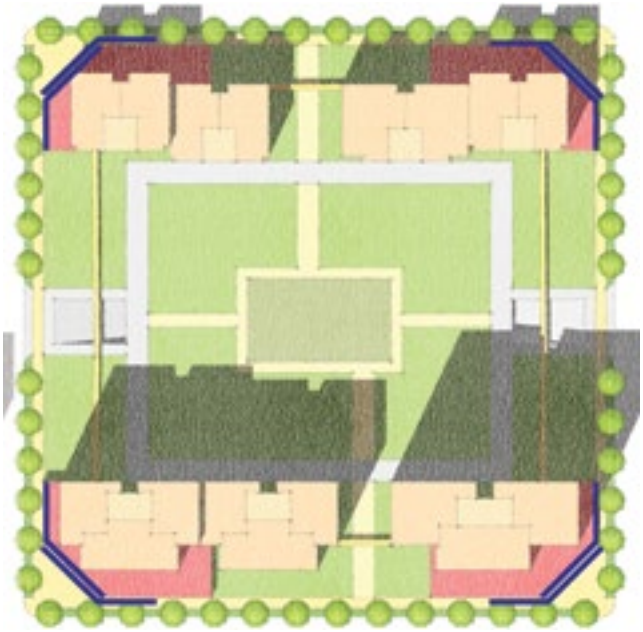

Figure P7-26: Typical 100-meter by 100-meter residential block in a non-shopping district, with a minimum 20 percent of block perimeter dedicated to publicly accessible uses (blue line represents publicly accessible shop frontages) (Source: HDR | Calthorpe)

RESIDENTIAL OR COMMERCIAL BLOCK: SHOPPING DISTRICT
60% FRONTAGE

Figure P7-27: Typical 100-meter by 100-meter residential/commercial block in a shopping district, with a minimum 60 percent of block perimeter dedicated to publicly accessible uses (blue line represents publicly accessible shop frontages) (Source: HDR | Calthorpe)

Figure P7-28: Perspective view of a residential block in a non-shopping street, with a minimum 20 percent of block perimeter dedicated to publicly accessible uses (Source: HDR | Calthorpe)

Figure P7-29: Perspective view of a residential block in a shopping street, with a minimum 60 percent of block perimeter dedicated to publicly accessible uses (Source: HDR | Calthorpe)

METRIC 7.4:
Bike Lanes

Streets with four or more lanes must have protected bike lanes of at least two meters each direction

To ensure a safe and secure environment for bikers, streets must be designed keeping the biker in mind. In high traffic volume roads or streets with four or more lanes, protected bike lanes of at least two meters in each travel direction should be provided. On one-way streets, a single 1.5-meter lane is required. On local streets with posted speeds greater than 30 km/h, 1.5-meter separated bike lanes are recommended. On all streets except local ones, physical barriers should separate bikes and vehicles.

Figure P7-30: Bike lanes should be dedicated and protected on any street wider than four automobile lanes. (Source: Flickr: Rich & Cheryl, CC BY-NC-SA 2.0)

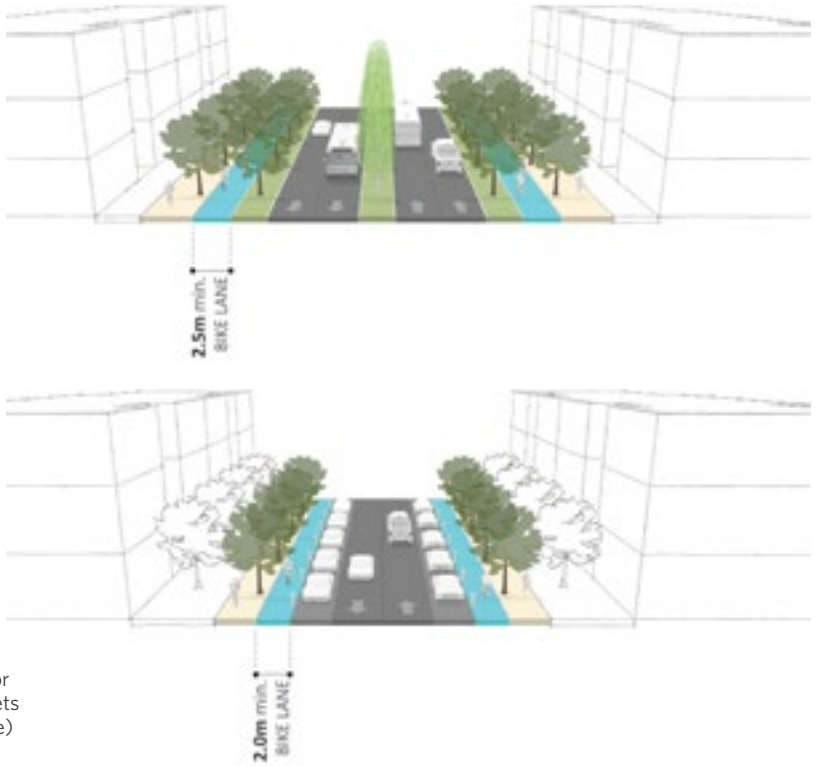

Figure P7-31: Street sections showing minimum two-meter bike lanes for streets with four lanes or more and minimum 1.5-meter bike lanes for streets with two lanes of traffic (Source: HDR | Calthorpe)

CASE STUDY

Bogotá, Colombia

Population: 8.181 million [12]
2030 forecast: 11,966,000 [13]
Size: 1775 km^2 [14]

CICLORUTAS: THE MOST COMPREHENSIVE BIKE NETWORK IN LATIN AMERICA

In 1974, a local grassroots organization called Pro-Cicla, which promoted bicycles over cars, received a one-time approval to close a main street in Bogotá to traffic on Sunday morning. The event, known as Ciclovía, became a tradition which today hosts 1.8 million people every Sunday. A quarter of Bogotá's residents ride, walk, or participate in sports activities on 119.5 kilometers of roads that are closed to traffic from 7 a.m. to 2 p.m. Ciclovía has expanded to dozens of cities around the world as "open streets" or "Sunday streets."

Ciclovía's success played a fundamental role in progressive mayoral agendas of "citizen's culture," which formed the constituent base for bold prioritization of bikes, pedestrians, and public transit. The 1990's plan for an elevated highway network, backed with international investment, was replaced with Cicloruta—a safe biking network consisting of greenways, separated bike lanes and integrated street lanes, connecting the city's periphery to its center and public transit. Funding came from a local gas surcharge that incentivized people to reduce car use. Cicloruta created a network of 214 kilometers of bike lanes within three years; by 2018, it reached its 500-kilometer mark making it Latin America's most extensive urban bike network.[15] The city now aims to reach 10 percent bike mode share and expand the network to 700 kilometers.

Cicloratu led to the transformation of 100 kilometers of greenways and pedestrian-only streets including Porvenir Promenade, connecting poor and wealthy neighborhoods.[16] The process also included investments in public plazas and the revival of Alamedas, walkable tree-lined avenues. Ultimately, the network allows Bogotá's residents to move without a car and enjoy the health benefits of active mobility.

Another important effort at the heart of this active mobility strategy was the creation of the world's most extensive BRT system. By 2015, this TransMilenio system reached 112 kilometers of trunk corridors, moving 2.4 million passengers every day.[17] The large city still suffers from congestion and transit system growing pains; however, these mobility strategies successfully provided an alternative to cars, reducing air pollution by over 40 percent, shortening travel times by 32 percent, and diminishing road fatalities by 92 percent along transit corridors.[18] Bogotá revolutionized large-scale urban mobility development by focusing on the well-being of people while targeting its limited capital investment for smart, equitable growth.

Figure P7-32: Bogotá's comprehensive network of bike lanes are well connected to transit wth pit stops for certified bike services. (Source: City of Bogotá)

CASE STUDY

Copenhagen, Denmark

Population: 1,281,000 [19]
2030 Forecast: 1,455,000 [20]
Size: 606.5 km^2 [21]

A PEDESTRIAN PARADISE IN THE BIKE CAPITAL OF THE WORLD

Copenhagen is a decade-long leader of bike culture and keeps pushing the envelope in offering residents of all ages a comfortable car-free lifestyle. On the urban design level, the city's non-vehicular culture is enabled by several types of bike lanes and a pedestrian-oriented urban core.

• Separated cycle paths on streets: With evidence of an improved sense of safety from 20 percent to 100 percent, separated bike lanes are a highly effective way to increase bike ridership with diverse genders and ages, well proven in the city's extensive network of separated bike lanes integrated in its streets.[22]

• Cycle Superhighways: 23 municipalities in the Copenhagen region worked together to build a 746-kilometer network made of 45 routes, shortening commuter trips from suburban areas into the city. By 2018, 147 kilometers were opened to the public. The average bike commute on a cycle superhighway was 14.7 kilometers, with some commutes reaching up to 30 kilometers. A survey among commuters showed 25 percent replaced car trips with bikes.[23] These astounding metrics have a significant impact on Copenhagen's congestion, carbon emissions, and resident's health indicators thanks to the increased exercise.

• Green cycle routes: Connecting neighborhoods, parks, and natural assets. The green routes aim to encourage recreational biking as a slower leisurely alternative to the Cycle Superhighways.

The city set a goal of raising the mode share for commuters from 43 percent in 2017 to 50 percent, in line with its 2025 carbon neutral city goal.[24] To push bike ridership higher, the city continues to optimize bike infrastructure with innovative design solutions. Designated parking for cargo bikes popular among families, bike count meters on busy lanes, green wave traffic lights, and repair pit stops are some of the features offering a safe and complete experience for different mobility needs. These design elements help remove boundaries to new users.

Active mobility also means creating safe spaces for pedestrians. Copenhagen's pedestrian network in the city center started in 1962 with a 1.1-kilometer experiment. Strøget, the city's main street with a 10- to 12-meter right-of-way, was converted into a pedestrian street despite merchant and driver resentment. The experiment was successful, demonstrating a 35 percent increase in pedestrian traffic within the first year.[25] It was expanded into a network of car-free streets and squares in a process that included the gradual removal of parking spaces by two to three percent per year. Today, some 80 percent of total movements in the inner city are made by foot.[26]

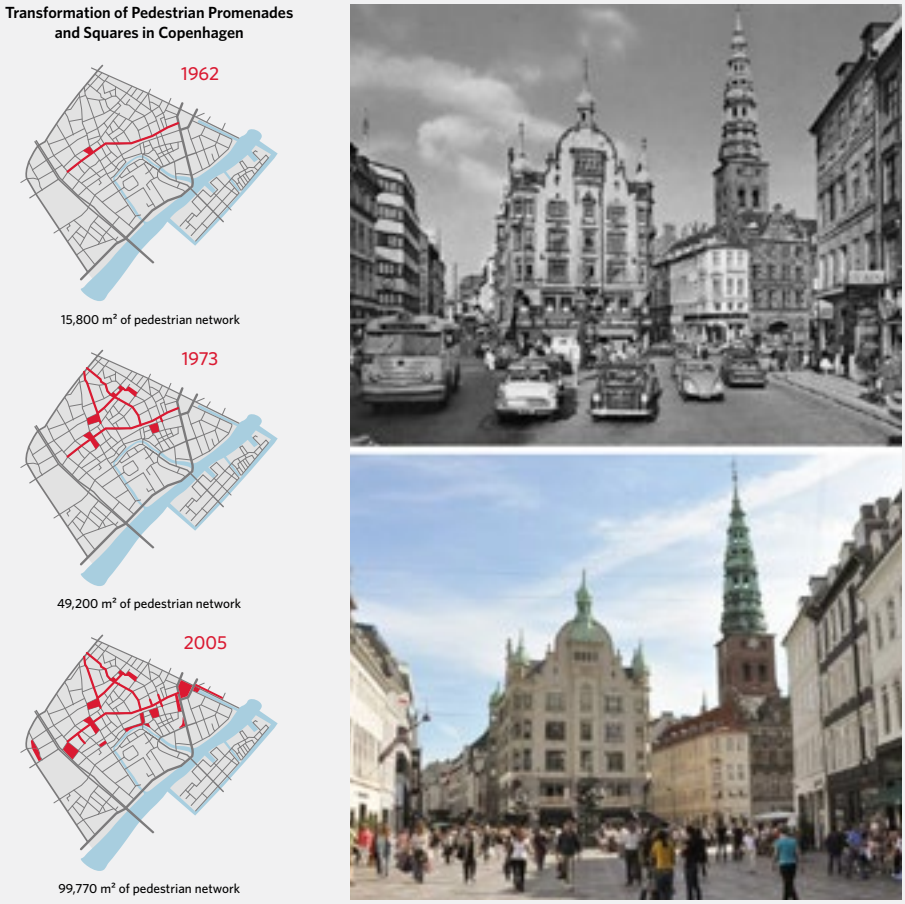

Figure P7-33: Copenhagen's Amagertorv public square in the Stroget pedestrian area, 1960 and 2010 (Source: Gehl Architects)

Figure P7-34: Copenhagen's cycle paths (left), green cycle routes (center), and cycle superhighway network (right) (Source: City of Copenhagen)

CASE STUDY

Hanoi, Vietnam

Population: 4,874,982[27]
2030 forecast: 6,361,522[28]
Size: 3,300 km^2[29]

WALKING STREETS: ENABLING PEDESTRIAN CULTURE

Vietnam's capital announced its first walking street in 2004 when a section of Hang Dao Street in the old quarter was banned for cars. The change's popularity motivated an increase in the number of car-free streets in the old quarter of town. Since 2016, an innovative pedestrianizing strategy offers a unique time-sharing method. During weekend evenings, from Friday at 7 p.m. until Sunday at midnight, streets and roads are closed to traffic, allowing pedestrian-only activity, food stalls, kiosks, and mixed-generation cultural activities.

One such area is around Hoan Kiem Lake area, outside the old quarter. The lake is surrounded with a five-lane, one-way road that becomes a "walking street" every weekend. Tens of thousands of people enjoy the lake front scenery and a quiet, emission-free space for recreation, relaxation, and spontaneous activities. The highly popular initiative expanded in 2018, reaching more streets, improving level of services, and further boosting local business activity. Using these weekly events to solidify the urban community has been successful in creating a culture shift among the residents, business owners, and tourists. Hanoi's walking streets are a countermeasure for a dangerous trend of growing car ownership and deteriorating congestion. Expediting the construction of the city's Metro lines, adding buses, and replacing polluting motorbikes with electric bikes could transform the bustling city that is working to enjoy its charm.

Figure P7-35: Hanoi's walking streets are a countermeasure for a dangerous trend of growing car ownership and congestion. (Data source: VietnamDiscovery.com)

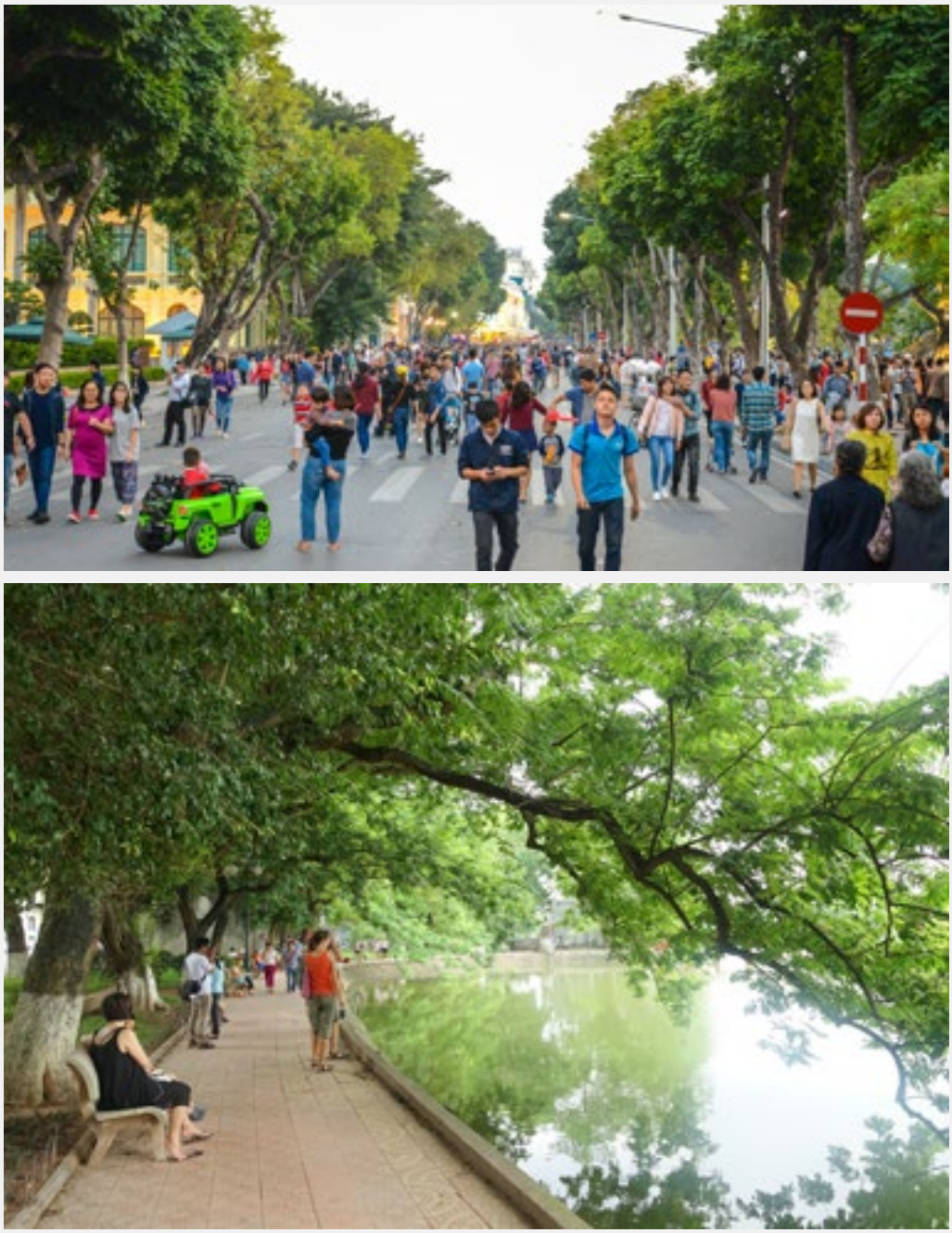

Figure P7-36: People of all ages slow down to interact with each other and the environment. (Source: Dreamstime (above); Hoan Kiem Lake–Hanoi, Vietnam. Daderot, CC0 1.0 (below))

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