

# Designing for Safe Speeds



Global Designing Cities Initiative

# Designing for Safe Speeds




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**Skye Duncan**  
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The Global Designing Cities Initiative (GDCI) focuses on the critical role of streets within urban environments around the world. The organization is committed to sharing industry best practices, facilitating peer-to-peer mentoring, and fostering regular communication. The GDCI facilitates the exchange of ideas to help a variety of stakeholders shape streets to promote public health and safety, quality of life, multimodal mobility, economic development, environmental sustainability, and equity. GDCI believes that by working together, cities can save time and money, share lessons learned, scale up best practice implementation, and more effectively achieve their policy goals and objectives.

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# Foreword



*This guide details the designs and innovative strategies cities can use to build safe-speed principles into every street.*

## *Designing Streets for the Speed of Life*

For most of the last century, city streets around the world have been designed not to support the many ways that people get around but to move as many cars and trucks around as quickly as possible. Building wider lanes and increasing speed limits led only to more traffic congestion and more dangerous streets. Nearly 1.2 million people die in traffic crashes each year, and a small difference in speed can mean the difference between life and death: A person struck by a vehicle at 30 km/h (20 mph) likely to survive, while a person struck at 50 km/h (30 mph) is likely to die.

A strong movement of city planners, traffic engineers and local communities are now organizing around the principle that predicting and preventing traffic deaths is an urgent, actionable public health strategy. And it starts with speed.

Designing for Safe Speeds is the next chapter in this story. This guide details the designs and innovative strategies cities can use to build safe-speed principles into every street. Building on the impact of the globally regarded Global Street Design Guide and upon real-world achievements in 86 pioneering cities from every continent, this guide offers the proven, adaptable solutions that cities need to build streets to operate at the speed of life.

Janette Sadik-Khan  
Principal, Bloomberg Associates  
Permanent Chair, Global Designing Cities Initiative  
Former Commissioner of the New York City  
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## About the Guide

*Designing for Safe Speeds* supplements GDCI's *Global Street Design Guide* (GSDG), which sets a new global standard for designing urban streets that prioritize people. This guide builds on the existing GDCI publications on holistic street design and emphasizes speed management, one of the most critical factors in reducing traffic violence and saving lives. In line with GDCI work it maintains a comprehensive approach to help cities create safer, more livable streets for everyone. Though it can be used as a stand-alone document, *Designing for Safe Speeds* is best applied in combination with the GSDG, as it references key principles from the original guide, alongside other GDCI resources. Funded by Bloomberg Philanthropies, this document will inspire leaders, inform practitioners, and empower communities to advocate for and implement changes in streets and networks towards safe speeds, while helping achieve cleaner air, increased mobility, more physical activity, and other sustainability and livability goals.

This guide aims to:

- Highlight the life-saving and social impact of designing streets for safe speeds.
- Promote safer, more people-centered streets by addressing speed and car dominance through practical strategies.
- Share tools, strategies, examples of street designs, and case studies from around the world that can be adapted to local contexts.
- Provide clear speed management recommendations through effective street design and operational solutions for urban contexts.

Increasing the speed limit or expanding road capacity for private vehicles does not lead to efficient or quick transportation for people in cities. In fact, wider lanes and excessive space allocated for cars often create induced demand, which can result in congestion during peak hours and provide more opportunities for speeding during off-peak times.

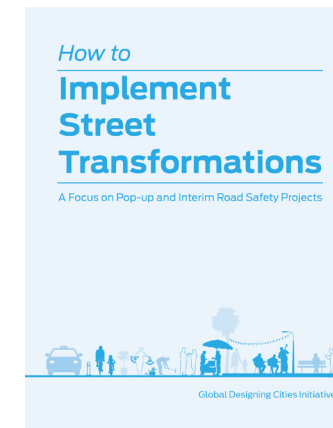
This publication shares aspirational examples of street transformations, acknowledging that cities may not always have the budget or resources to implement everything at once. Many strategies can be phased or staged over time, allowing gradual improvements while still working toward broader safety and urban design goals.

Implementing safer speed limits and promoting an equitable distribution of space among different modes of transport can enhance overall livability in cities, open up a range of design possibilities, and save lives.

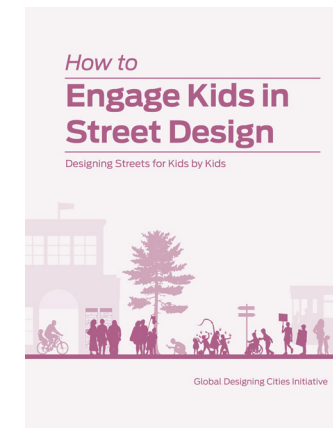
## GDCI publications referenced



Global Street Design Guide



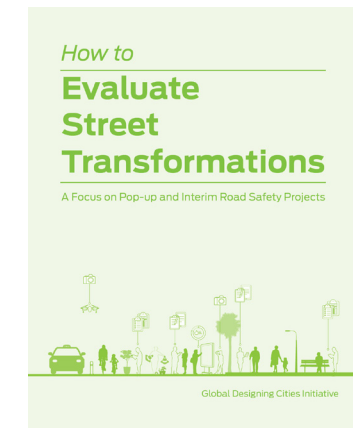
How to Implement Street Transformations



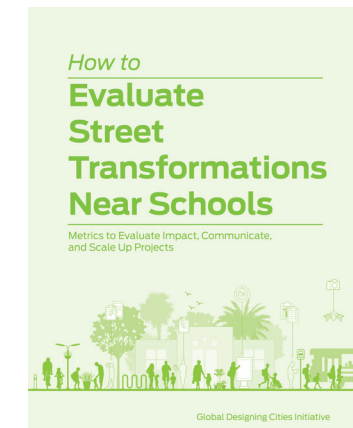
How to Engage Kids in Street Design



Designing Streets for Kids

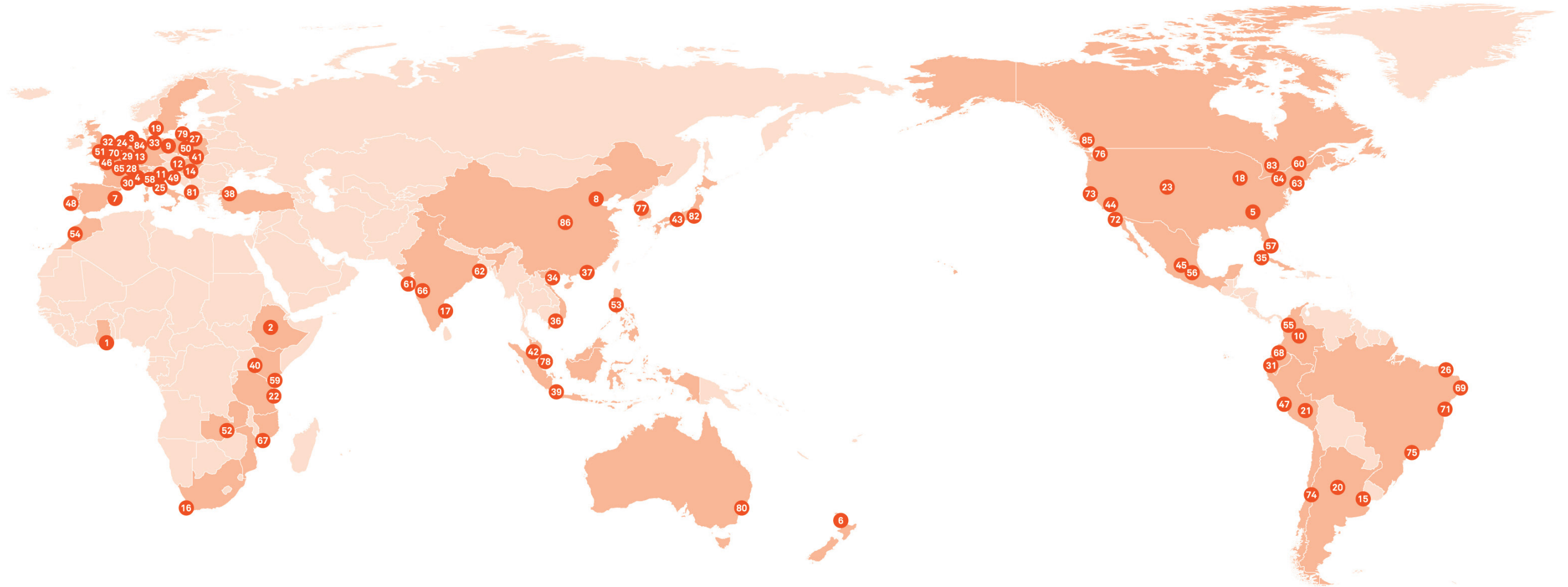


How to Evaluate Street Transformations



How to Evaluate Street Transformations Near Schools

## Global Influences



### Case studies and snapshots in the guide

- |                             |                             |                            |                         |                             |                          |
|-----------------------------|-----------------------------|----------------------------|-------------------------|-----------------------------|--------------------------|
| 1. Accra, Ghana             | 16. Cape Town, South Africa | 31. Guayaquil, Ecuador     | 46. Lille, France       | 61. Mumbai, India           | 76. Seattle, USA         |
| 2. Addis Ababa, Ethiopia    | 17. Chennai, India          | 32. Hackney, UK            | 47. Lima, Peru          | 62. New Town Kolkata, India | 77. Seoul, South Korea   |
| 3. Amsterdam, Netherlands   | 18. Chicago, USA            | 33. Hamburg, Germany       | 48. Lisbon, Portugal    | 63. New York City, USA      | 78. Singapore            |
| 4. Annecy, France           | 19. Copenhagen, Denmark     | 34. Hanoi, Vietnam         | 49. Ljubljana, Slovenia | 64. Niagara Falls, USA      | 79. Sopot, Poland        |
| 5. Atlanta, USA             | 20. Córdoba, Argentina      | 35. Havana, Cuba           | 50. Lodz, Poland        | 65. Paris, France           | 80. Sydney, Australia    |
| 6. Auckland, New Zealand    | 21. Cusco, Peru             | 36. Ho Chi Minh, Vietnam   | 51. London, UK          | 66. Pune, India             | 81. Tirana, Albania      |
| 7. Barcelona, Spain         | 22. Dar es Salaam, Tanzania | 37. Hong Kong, China       | 52. Lusaka, Zambia      | 67. Quelimane, Mozambique   | 82. Tokyo, Japan         |
| 8. Beijing, China           | 23. Denver, USA             | 38. Istanbul, Türkiye      | 53. Manila, Philippines | 68. Quito, Ecuador          | 83. Toronto, Canada      |
| 9. Berlin, Germany          | 24. Dordrecht, Netherlands  | 39. Jakarta, Indonesia     | 54. Marrakesh, Morocco  | 69. Recife, Brazil          | 84. Utrecht, Netherlands |
| 10. Bogotá, Colombia        | 25. Florence, Italy         | 40. Kisumu, Kenya          | 55. Medellín, Colombia  | 70. Ronchin, France         | 85. Vancouver, Canada    |
| 11. Bologna, Italy          | 26. Fortaleza, Brazil       | 41. Kraków, Poland         | 56. Mexico City, Mexico | 71. Salvador, Brazil        | 86. Xi'an, China         |
| 12. Bratislava, Slovakia    | 27. Gdansk, Poland          | 42. Kuala Lumpur, Malaysia | 57. Miami, USA          | 72. San Diego, USA          |                          |
| 13. Brussels, Belgium       | 28. Geneva, Switzerland     | 43. Kyoto, Japan           | 58. Milan, Italy        | 73. San Francisco, USA      |                          |
| 14. Budapest, Hungary       | 29. Ghent, Belgium          | 44. Lancaster, USA         | 59. Mombasa, Kenya      | 74. Santiago, Chile         |                          |
| 15. Buenos Aires, Argentina | 30. Grenoble, France        | 45. León, Mexico           | 60. Montreal, Canada    | 75. São Paulo, Brazil       |                          |



## Safe Speeds as a Component of Healthier Streets

Street transformations provide an opportunity to address multiple issues and contribute to different aspects that create healthier and more livable cities. Even if the original motivation of an intervention or project is to improve road safety and reduce unsafe speeds, strive to incorporate broader sustainability and livability goals, and integrate multifaceted design solutions.

*Designing for safe speeds must factor in other sustainability and livability aspects, and must also be embedded as a goal across different street design projects.*

### From a Car-Centric Approach...



→ Santiago, Chile



→ Addis Ababa, Ethiopia

Stemming from the state-of-practice for road safety in highways, a car-centric approach to speed management relies heavily on speed reduction devices that serve only that purpose—such as speed humps and cushions, and automated enforcement.

This framework is also often deployed reactively as a response to crashes after they happen.

As a result, while this approach can effectively reduce traffic crashes and improve road safety, it often misses the opportunity to also create streets that help cities attain broader sustainability and livability goals like increasing physical activity, reducing the emission of climate and air pollutants, supporting local businesses, and many others.

### ...Towards a People-Oriented, Multifaceted Approach



→ Amsterdam, Netherlands



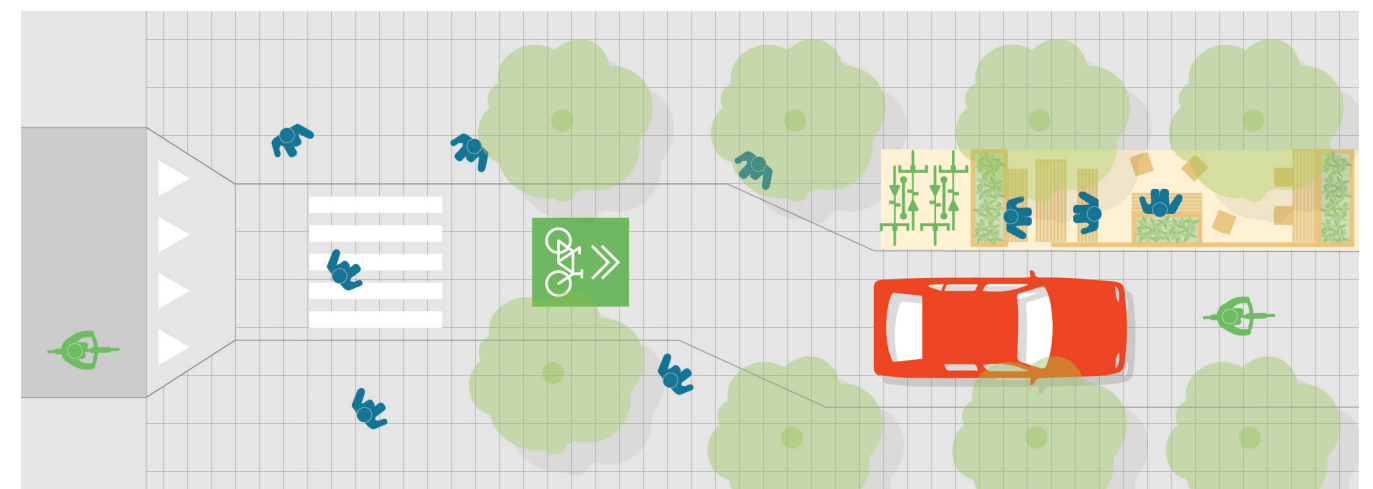
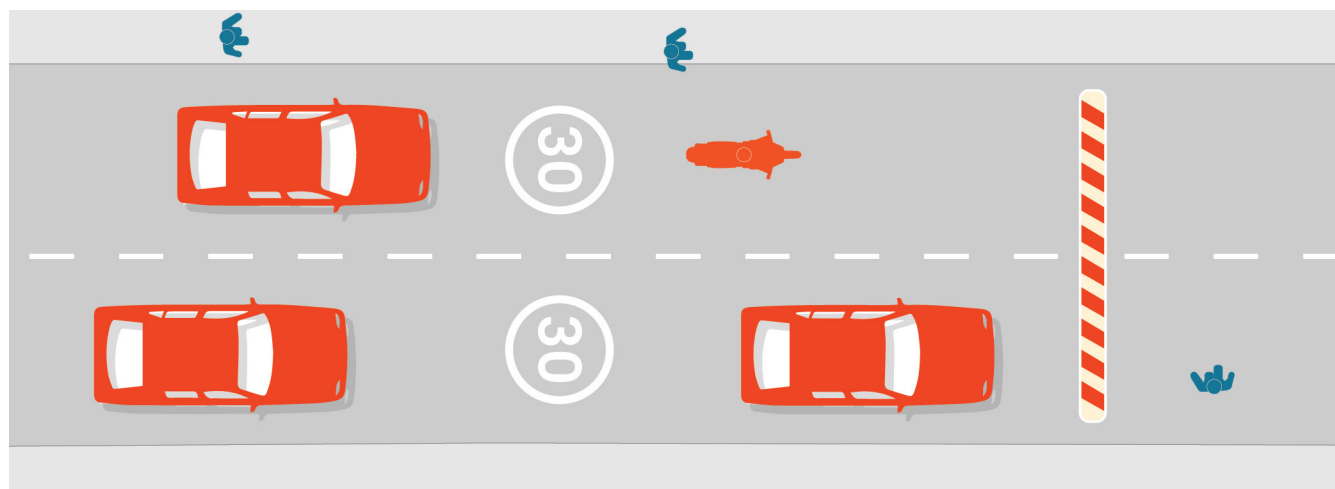
→ Tokyo, Japan

A multifaceted, comprehensive design approach seeks to address road safety as an issue among various other aspects at local and regional scale.

It relies on design measures that reduce unsafe speeds and improve road safety, while also providing opportunities to address other issues—such as reducing noise, improving air quality and increasing vegetation coverage and thermal comfort.

Designing for safe speeds must factor in other sustainability and livability aspects, and must also be embedded as a goal across different street design projects.

This helps encourage a more proactive design approach, where street design changes are made to prevent traffic crashes and injuries before they happen, rather than just reacting to their occurrence.



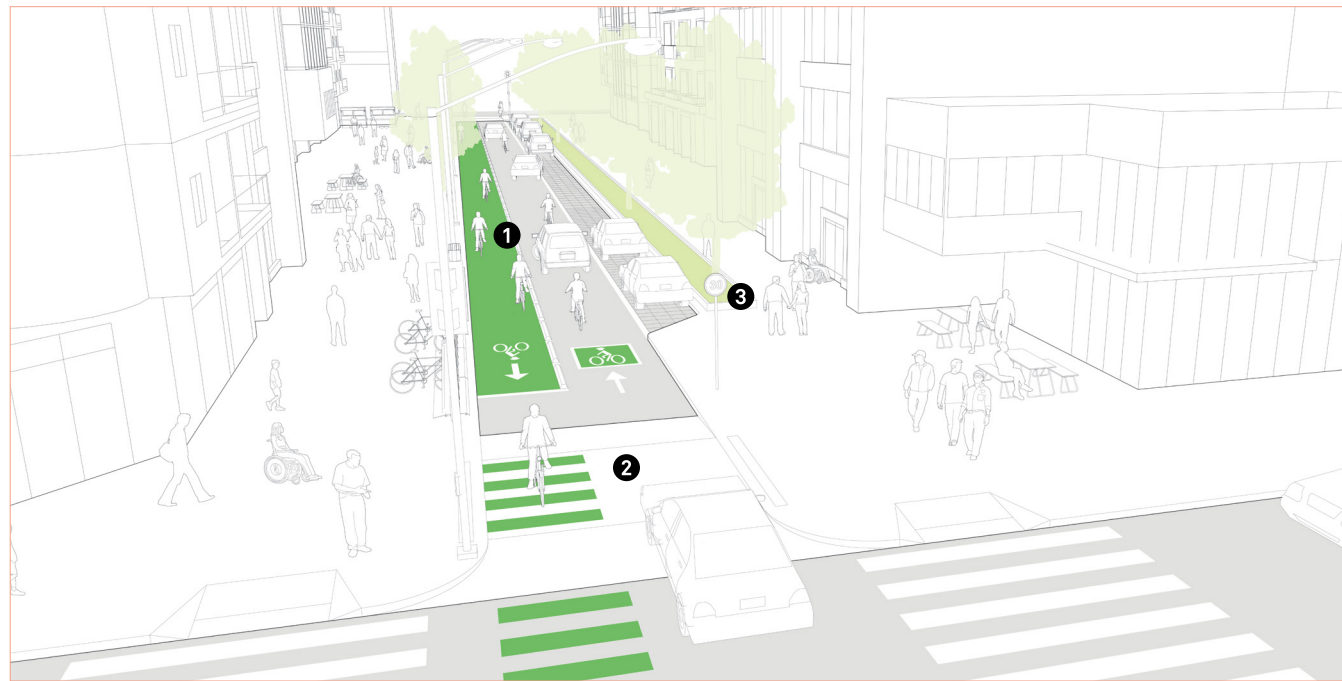
# Key Terms and Definitions

*Designing for Safe Speeds* builds on the terminology established in the *Global Street Design Guide* and other GDCI publications, referencing them for more information whenever applicable.

While a complete list of key terms and definitions is at the end of this document, this section explains a few fundamental concepts used throughout all sections.

More specifically on speeds and related issues, this document explores new concepts and terminology consistent with the world's leading organizations and professionals.

## Target, Design, and Posted Speed



### 1 Target Speed

The highest speed that designers intend motorists to reach. Safe target speeds are based on the human body's vulnerability, the context, and the street's intended configuration.

### 2 Design Speed

The design parameters adopted for the street's design based on the intended speed. Redesign streets to match the target speed and self-enforce the updated posted speed limit.

### 3 Posted Speed

The maximum lawful speed as displayed on a regulatory sign. Should match the target speed and be based on safety goals rather than motorists' comfort and the prevalent driving behavior.

## Speeding, Excessive, and Inappropriate Speeds

In recent publications, the World Health Organization established two key concepts: excessive and inappropriate speeds<sup>1</sup>

**Excessive speeds** refers to when a motorist exceeds the posted speed limit for a particular street. It can be used as a synonym of the term "speeding" and is often applied in enforcement contexts.

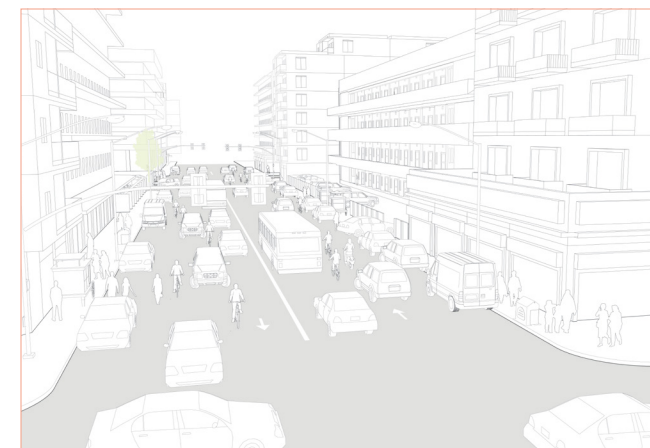
**Inappropriate speeds** refers to when motorists are driving too fast for the context, regardless of the speed limit. By being independent of it, this concept helps us navigate situations where the posted speed limit is too high (or even not clearly established) for a certain street or area. In this publication, it is used interchangeably with "unsafe speeds."



### SCENARIO 1: Excessive Speeds

In this example, the speed limit is set at 40 km/h, but motorists often exceed it.

This occurs because the design speed is higher than the posted limit, which may or may not be appropriate for the context.



### SCENARIO 2: Inappropriate Speeds

In this example, the posted speed limit is 60 km/h, but the appropriate maximum speed for the street should be 30 km/h or lower due to high crossing demand and significant volumes of motorcyclists and cyclists sharing the roadway with cars. Motorists routinely drive above 30 km/h, which is inappropriate for the context—even if it complies with the (unsafe) posted speed limit.

This mismatch occurs because both the posted speed and the design speed exceed the safe target speed for the environment.

# How to Use the Guide

*Designing for Safe Speeds* is intended to support a diverse audience with different interests and roles related to street design. This page aims to help the reader navigate the different sections and chapters, and prioritize the portions that matter the most to them. The document is divided into four sections (Focusing on Speed, Street Design Guidance, Transformations, and Toolbox), each containing a set of chapters, as illustrated below.



## Navigation

### A FOCUSING ON SPEED

#### Chapter 1 Why Design for Safe Speeds

This chapter explains why unsafe speeds are a major risk factor for road safety and how they undermine livability in cities. It explores the role of comprehensive street design in addressing these challenges.

#### Chapter 2 Addressing Speeds in the City

This chapter presents tools to change speed limits to be carried out as individual projects, scaled up into citywide programs, and become new standards by updating local design codes and regulations. The chapter also emphasizes the importance of stakeholder engagement, long-term vision, and clear communication of the broad benefits of speed reduction.

### B STREET DESIGN GUIDANCE

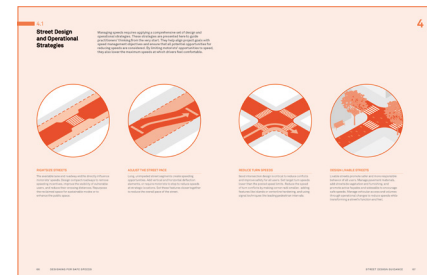
#### Chapter 3 Key Design Parameters

This chapter provides the definition of key design parameters to design for safe speeds that are used throughout the publication. It also includes contextual criteria for selecting the appropriate speed for a given street and how to apply it in design parameters accordingly. It also presents how network planning decisions and design detailing are intertwined.



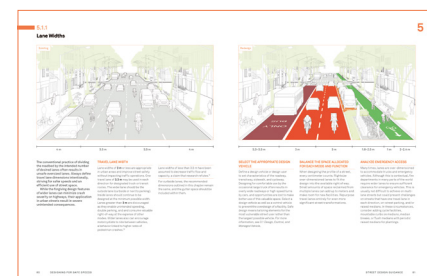
#### Chapter 4 Strategies

This chapter presents four strategies to articulate physical and operational changes to self-enforce a street's target speed, while also achieving an array of other co-benefits that help create healthier and more livable cities.



#### Chapter 5 Safe Speed Geometry

This chapter explores safe lane geometry design parameters (e.g. the lane width), and turn geometry design parameters, (e.g. corner and effective turning radii for near- and far-side turns).



### C STREET TRANSFORMATIONS

#### Chapter 6 Street Transformations

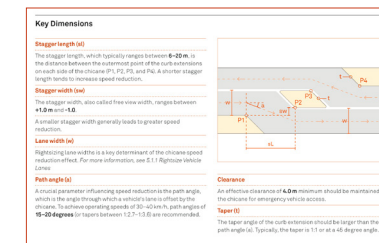
This chapter showcases examples of how existing streets can be transformed to reduce vehicle speeds while also achieving broader urban design goals, using both perspectives and real-world case studies.



### D TOOLBOX

#### Chapter 7 Safe Speeds Toolbox

This chapter presents speed management tools and offers implementation guidance, including examples such as raised crossings and chicanes. Rather than providing prescriptive specifications for dimensions and materials, this chapter aims to give practitioners a solid foundation that can be adapted to their local contexts and conditions.



## CASE STUDIES AND SNAPSHOTS

Throughout this publication, real-world examples appear on blue backgrounds in two formats. Case studies provide extensive documentation of context, design process, and measured impacts.

Snapshots offer brief project overviews or demonstrate how specific speed management tools—such as raised intersections or refuge islands—can be applied across different contexts and settings.



# How It All Fits Together

Achieving safe speeds in urban environments requires a combination of approaches that address policy, design, communication, and enforcement. The Designing for Safe Speeds guide provides practitioners with different entry points to target their actions and the opportunity to work at multiple scales.

This guide takes a comprehensive approach to designing streets as safe speed environments, starting with arguments to support this goal and moving through design parameters, strategies, examples, case studies, and tools to support safe speed transformations.

*The guidance in this publication will help cities transform their streets into safe speed environments, creating more safer, livable, sustainable, and healthier places for all.*

## A FOCUSING ON SPEED

### 1. Why Design for Safe Speeds

### 2. Addressing Speeds in the City

The context of the global road safety crisis and the key role of speeds in it.

Setting safe speeds suitable for:

- Local context and norms
- Who's using the street
- Existing network, etc.

## B STREET DESIGN GUIDANCE

### 3. Key Design Parameters

Design concepts to guide changes and to understand different vehicle types, people capacity, and network planning.

### 4. Strategies



Four strategies to help practitioners use physical and operational changes to self-enforce a street's target speed.

- Rightsize Streets
- Adjust the Street Pace
- Reduce Turn Speeds
- Design Livable Streets

### 5. Safe Speed Geometry

Key geometry parameters for designing for safe speeds, divided into two parts:

- Through movements
- Turning movements

## C STREET TRANSFORMATIONS

Ideas for how and where to reimagine and transform to make speeds safer.

### 6.2. Network level considerations

Planning networks, selecting and measuring speeds, applying to different contexts.

### 6.3. Safe Speed Corridors

Applying the design tools to different corridor typologies to achieve the strategies' goals and exemplify possible transformations.

### 6.4. Safe Speed Streets

The design tools now applied to different streets typologies to achieve the strategies' goals and transform the streets.

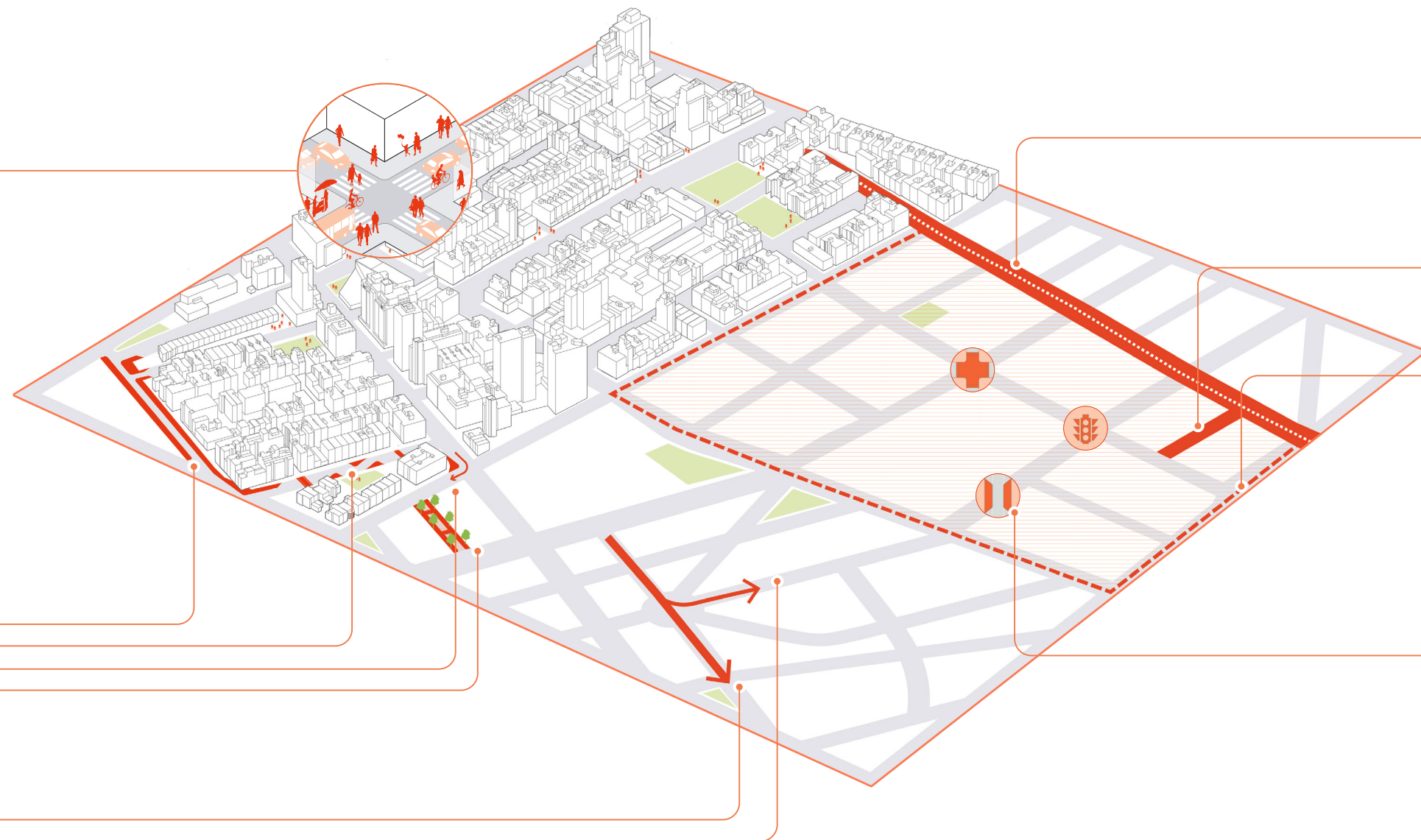
### 6.5. Safe Speed Zones

Applying the design tools in a comprehensive area-wide approach, managing volume and access.

## D TOOLBOX

Elements to apply at different scales depending on context, divided in three types:

- Vertical deflection tools
- Horizontal geometry tools
- Operational tools





# Focusing on Speed

- 1 Why Design for Safe Speeds
- 2 Addressing Speeds in the City



# 1

## Why Design for Safe Speeds

Road safety is a global public health crisis. Around the world, approximately 1.19 million people were killed in traffic crashes in 2021, and millions more were seriously injured. Speed is a key factor in traffic safety, influencing both the likelihood of a crash as well as its severity. Speed is listed as the primary cause in more than half of the crashes globally.<sup>1</sup> Further, it increases the risk of severe injury or fatality in crashes.<sup>2</sup> Managing speeds is critical for making streets safe, healthy, sustainable, and livable for everyone.

Street design is a powerful tool to manage speeds on city streets. Streets worldwide have been designed to accommodate increasing volumes of motor vehicles above all else, resulting in excessively wide roadways and intersections that incentivize unsafe speeds. These streets, which also often lack safe infrastructure, can put the most vulnerable road users (pedestrians, cyclists, and micromobility users) into unpleasant, undignified, and ultimately dangerous conditions. Streets designed for people rather than cars reduce speeds and significantly improve everyone's safety, comfort, and mobility. By making it easier for more people to walk and cycle, street design changes can reduce carbon emissions, pollutants, and noise, increase physical activity and neighborhood interaction, and support local economies.

This chapter discusses the impacts of speed on urban streets and the value of a people-centric, design-based approach to complement safe speed limits and to help motorists self-enforce safe speeds.

## Road Safety: A Global Health Crisis

Traffic deaths and injuries are a major global public health concern. An estimated 1.19 million people were killed in traffic crashes in 2021, making it the leading cause of death among people aged 5-29 years. People walking, cycling, and riding motorcycles represent more than half of the fatal victims. 92% of deaths occur in low- and middle-income countries.<sup>3</sup>

Speed is the primary determinant for severity in every crash. Designing streets for safe speeds is an effective and sustainable approach to prevent road traffic injuries and fatalities. Better street design also addresses an array of public health crises by promoting physical activity, social interaction, contact with nature, while reducing noise, air pollution, and carbon emissions.

An estimated **1.19 million people** die in traffic crashes in the world every year.<sup>4</sup>



That's nearly 3,300 people dying on the world's streets every day. Though there was a 5% decrease in the total death toll estimated for the year of 2011, these figures are unacceptably high relative to other public health issues.

Globally, road traffic crashes are a **leading cause of death among children and young adults.**



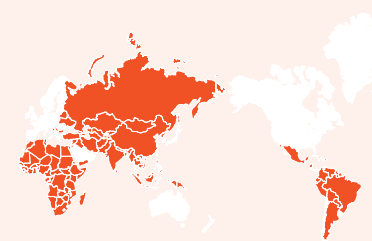
Road traffic crashes are the primary cause of death among those aged 5-29 years and the 12th leading cause of death for all age groups.<sup>5</sup>

**Pedestrians, cyclists, and motorcyclists** represent more than half of traffic-related fatalities every year.<sup>6</sup>



Street design and vehicle design historically have prioritized the safety of those inside motor vehicles while creating dangerous conditions for pedestrian, cyclists, and motorcyclists. Serious and fatal traffic crashes disproportionately burden the street's most vulnerable users.

Of the world's road fatalities, 92% occur in **low- and middle-income countries.**



Road traffic injuries and deaths are unequally distributed across the world. Compared to high-income countries, middle- and low-income countries have nearly two and three times higher traffic fatality rates, respectively.<sup>7</sup>

Road traffic injuries are estimated to cost **\$1.8 trillion** between 2015 and 2030.



This estimate includes healthcare expenditures and losses in employment.<sup>8</sup> The burden of rehabilitating those injured, combined with loss of lives, significantly reduces economic productivity. On average, a 10% reduction in traffic deaths raises the real GDP per capita by 3.6% over a 24-year period.

Unsafe streets aggravate multiple **public health crises.**

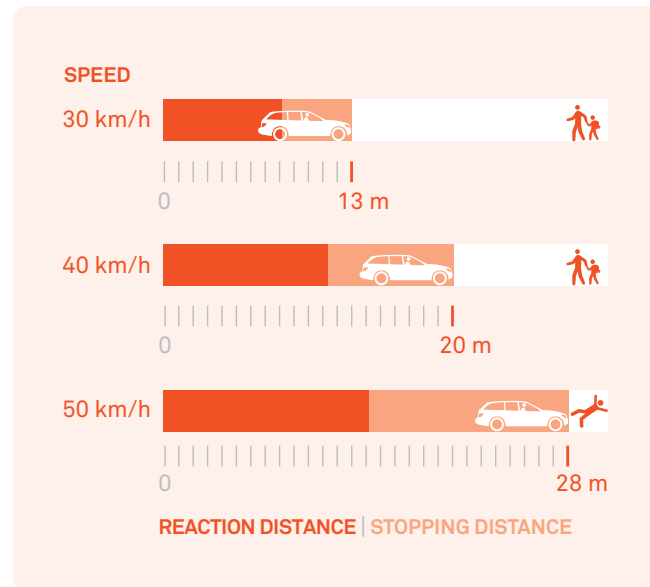


People are less likely to walk and cycle when streets are unsafe, uncomfortable, and stressful.<sup>9</sup> These environments contribute to low physical activity and higher traffic emission levels, both of which have been linked to a variety of poor health outcomes, including increased rates of heart disease, diabetes, and some types of cancer.

## The Risk of Speed

Higher speeds increase both the likelihood of a traffic crash as well as its probability of resulting in death or serious injuries. Speeding exponentially increases the energy transferred in a collision: doubling a vehicle's speed will make the crash four times more impactful. Conversely, this also means that even small reductions in speed can amount to great safety benefits.<sup>10</sup>

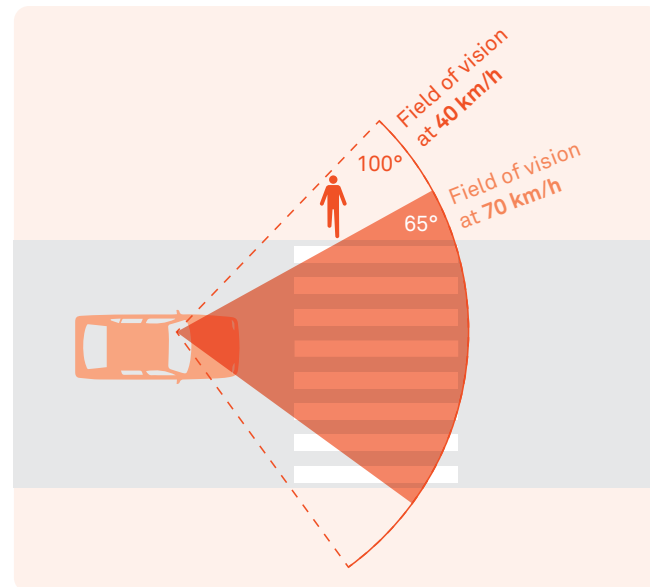
### Crash Likelihood



#### LONGER BRAKING DISTANCE

The higher the speed, the greater the reaction time and the braking distance needed to reduce the ability to avoid a collision. A car driver at 50 km/h travels more than twice as far as a driver at 30 km/h before coming to a complete stop. Braking distances are much longer for larger and heavier vehicles, as well as in wet or icy conditions.

*Adapted from Speed Management: A Road Safety Manual (WHO, 2008).*



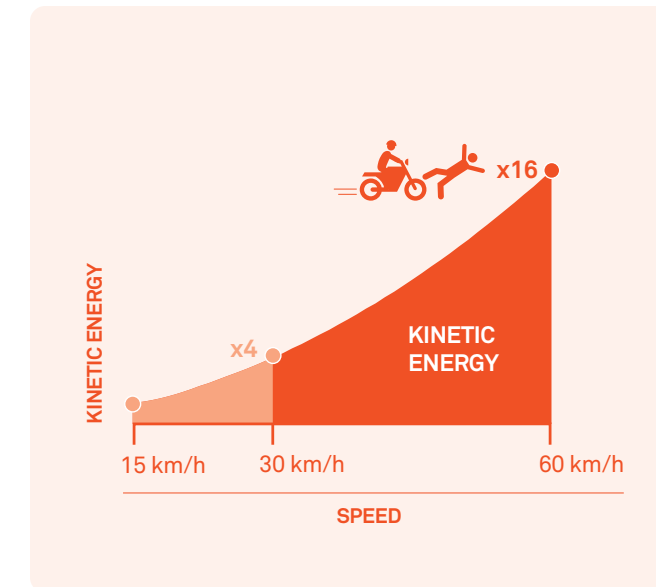
#### NARROWER FIELD OF VISION

Higher driving speeds reduce predictability and a driver's ability to control the vehicle, safely interact with other road users, and maneuver around obstacles on the street. Research shows that drivers have less peripheral awareness at higher speeds and are less likely to see or predict potential conflicts, such as people crossing the street or children playing.

*Adapted from City Limits (NACTO, 2020).*

### Crash Severity

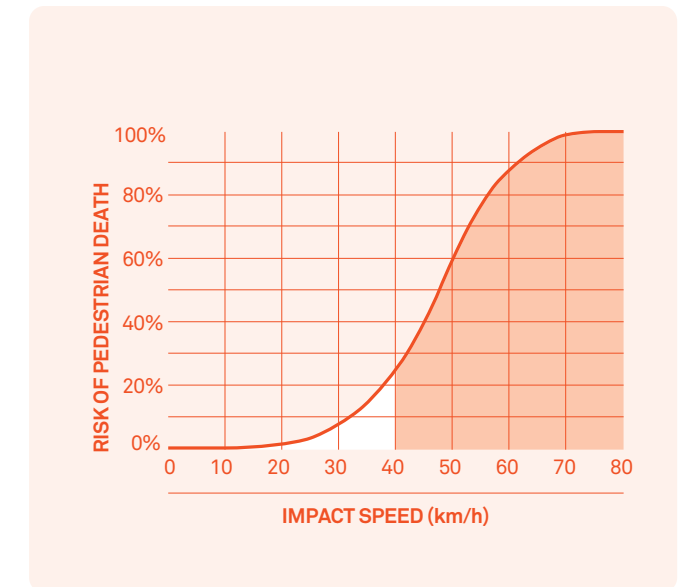
*Above 40 km/h, an increase in average speed of 1 km/h results in a 3% higher risk of a crash and 4-5% increase in fatalities.<sup>11</sup>*



#### EXPONENTIAL ENERGY TRANSFER

A vehicle at 60 km/h will transfer four times more energy in the event of a crash than the same vehicle at 30 km/h since kinetic energy increases exponentially with speed, whereas a vehicle's impact in a crash will only double if we double its mass.

This means that all motorized vehicles, even smaller ones like motorcycles, can cause high-impact crashes if they move at high speeds. Ensuring all vehicles are at safe speeds is fundamental to reducing the severity of traffic injuries, particularly for the most vulnerable road users.



#### INCREASED RISK OF FATALITIES

There is a clear relationship between impact speeds and pedestrian fatalities, providing evidence that supports local efforts to keep speeds at 30 km/h or lower on urban streets. A person hit by a car at 50 km/h is eight times more likely to die than a person hit by a car at 30 km/h.<sup>12</sup>

Researchers believe this effect might be even more extreme in low- and medium-income countries, where factors like vehicle type, emergency response time, and other characteristics disproportionately increase the likelihood of a fatality.

*Adapted from A New Approach to a Safe and Sustainable Road Structure and Street Design for Urban Areas (Wramborg, 2005).*

## Vulnerable Road Users

The majority of traffic deaths globally are of pedestrians, cyclists, or motorcyclists. This group is commonly referred to as vulnerable road users due to having lower or no physical protection from the impact of a crash compared to others protected by a vehicle shell. Their bodies absorb most of the kinetic energy from the collision with a motorized vehicle, which is often much higher than what humans can withstand without serious or fatal injuries.

The human body's limit to withstand impacts is the critical design parameter for setting safe speeds on urban streets. Some authors prefer referring to this group as "unprotected users," as they are not inherently vulnerable but rather put at risk due to motorized vehicles' mass and speed. Despite its limitations, this publication adopts "vulnerable road users," acknowledging it is currently the most common term in the road safety field.



Pedestrians		Cyclists		Motorcyclists	
User Protection	None	User Protection	None/Low	User Protection	Low
Speed	Low	Speed	Low/Medium	Speed	Very High
Mass	Low	Mass	Low/Medium	Mass	Medium

**Pedestrians** include people of all abilities and ages sitting, walking, pausing, and resting within urban streets. They also move at slower speeds—especially children, older adults, and people with temporary or permanent disabilities—making them more vulnerable when crossing streets or exposed to potential conflict with vehicles.

Poor street design and the lack of safe, inclusive, and accessible facilities can also make pedestrians more exposed to motorized vehicles at high speeds and less visible to motorists, increasing the likelihood of serious crashes. *For more information, see Global Street Design Guide Chapter 6.1 and Designing Streets for Kids Chapter 1.2.*

**Cyclists** include people on bicycles, cycle-rickshaws, tricycles, skateboards, kick scooters, and any other device, including micromobility ones, with significantly lower speed and mass than a motorcycle. Helmets and other protective gear mitigate crash risks but are ineffective in protecting cyclists from the amount of energy transferred in a collision with a motor vehicle traveling at a high speed.

When no dedicated facilities exist, cyclists share the roadway with cars, trucks, and other large motor vehicles with great speed and mass differential. Cyclists are also less visible to motorists than road users in larger vehicles, increasing their risk, especially when motor vehicles travel at higher speeds.

**Motorcyclists** include people riding different types of motorized two- and three-wheelers. These vehicles can have masses significantly higher than other vulnerable road users and can reach speeds equivalent to or even higher than four-wheeled vehicles.

Helmets and other protective gear are fundamental to decreasing a motorcyclist's risk of fatality or serious injury. Still, the motorcyclist's body is extremely vulnerable in the event of a crash with a fixed object or a heavier vehicle.

In many cities, motorcycles commonly filter through congested traffic. This increases the risk of crashes—particularly when pedestrians attempt to cross the street between stationary or slow-moving cars.

*Designing streets for safe speeds improves safety conditions for all road users, including motorcyclists.*



→ Mumbai, India

### Motorcycle crashes: a growing concern

People riding motorcycles are a unique group among vulnerable road users. Many cities observe growing fatality rates for these users, added by a high rate of pedestrian and cyclist deaths in crashes with motorcycles.<sup>13,14,15,16,17,18</sup>

The urgency of addressing this issue grows every year. From 2011 through 2020, the number of motorcycles tripled across the globe, with the highest increases coming from low- and middle-income countries.<sup>19</sup>

This trend can partly be explained by inefficient transport systems and the fact that motorcycling is seen as an affordable way to increase access and reduce travel time even in congested environments. Unfortunately, this demand is higher whenever walking, cycling, and taking transit are not attractive or viable alternatives, which comes at a high individual and societal cost. Redesigning our streets, rethinking financing, and other ways of promoting sustainable, safer, and affordable mobility options are fundamental to addressing this issue.

### Safe speeds protect motorcyclists

Speed management is fundamental to making walking, cycling, and taking transit safe, convenient, and attractive—providing more options and reducing the dependency on private motorized modes.

Designing streets for safer speeds also reduces both the likelihood and the severity of a traffic crash, improving safety conditions for all road users, including motorcyclists.<sup>20</sup> On the other hand, design strategies that disregard speed as a risk factor, such as advanced stop bars for motorcycles or dedicated motorcycle lanes, can be less effective and even increase injuries and deaths.

Speed interventions should also be comprehensive and continuous, rather than targeting specific locations.

## Speed Affects Livability

### High speeds have multiple negative impacts

For decades, cities have designed streets to prioritize greater traffic volumes, which has consequently enabled and encouraged higher vehicle speeds. Beyond increasing the risk and severity of traffic crashes, these decisions have led to higher levels of noise pollution, increased emissions that aggravate the greenhouse effect and local air pollution, higher levels of physical inactivity among children and young adults, and social isolation.

#### NOISE POLLUTION

Vehicles produce more noise at higher speeds, accelerating, braking, and from general tire noise.<sup>21</sup> Noise can affect people's health and well-being, inducing stress, sleep disturbance, heart disease, and cognitive impairment in children.

#### AIR POLLUTION & CLIMATE CRISIS

Streets designed for higher speeds and traffic volumes lead to higher air pollutant emissions from exhaust, brake and tire wear, road dust resuspension, and surface abrasion.<sup>22</sup>

Inducing higher traffic volumes also increases greenhouse gas emissions, even when shifting towards electric private vehicles—as they are less energy efficient than transit and active mobility.

#### MOBILITY DISRUPTIONS

Streets where vehicles can travel at high speeds have higher crash risks, creating traffic disruptions and leading to congestion even from minor collisions. This is especially relevant in urban areas, where the density of uses and activities and the confluence of different traffic flows create more interactions and opportunities for collisions.

### Safe Speeds Enhance Livability

Streets with safe speeds can promote a virtuous cycle. By making walking, cycling, and taking transit safer, more convenient, and more comfortable, cities can generate a shift toward sustainable modes. This helps reduce emissions, incentivize physical activity, and address other issues. Additionally, it maximizes street space use, creating more opportunities for social interaction and play, as well as supporting local businesses.

#### QUIETER ENVIRONMENTS

In urban areas with speeds between 30 and 60 km/h, reducing speeds by 10 km/h would cut noise levels by up to 40%.<sup>23</sup> Living in a quiet area improves overall health and well-being, especially for children and older adults.

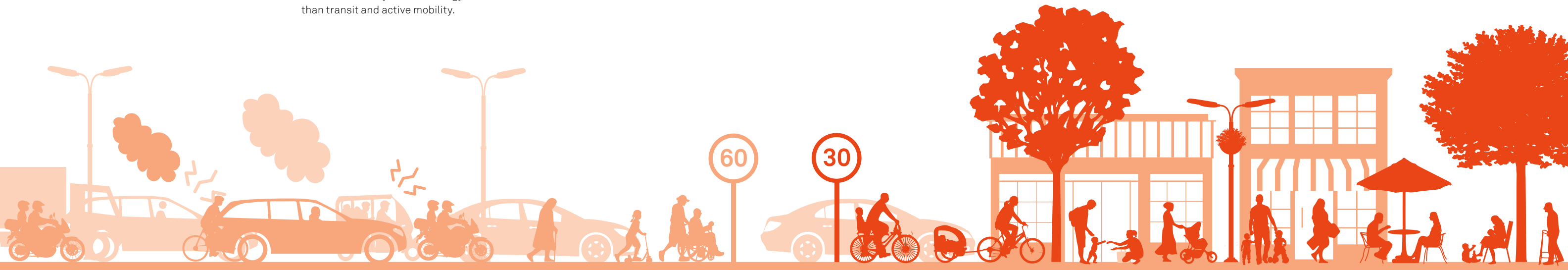
#### CLEANER AIR AND CLIMATE MITIGATION

Street networks with access control, lower traffic volumes, and safe speeds help separate emissions from sensitive areas and support a shift towards walking, cycling, and transit. These result in improved air quality in urban areas<sup>24</sup> and reduced greenhouse gas emissions.

#### INCREASED MOBILITY

Safe speeds can reduce travel times for all users, when considering all modes. Even if they slightly increase travel time for drivers, these are nominal in the face of safety benefits.

Additionally, streets with safer speeds have a smaller risk of crashes, thus reducing road traffic disruptions.<sup>25,26,27</sup>



#### LACK OF ACCESS AND SOCIAL ISOLATION

High speeds on or near residential streets can create significant access hurdles for people going to shops, schools, and medical services, especially for people in wheelchairs, older adults, children, and people carrying groceries or pushing strollers. Fast traffic also contributes to community severance, which can increase inequalities by making it more difficult to form support networks.

#### PHYSICAL INACTIVITY

Streets with high motor vehicle speeds and limited protected places for people to walk and cycle create unsafe, inconvenient, and unpleasant conditions for people traveling outside of a car or motorcycle, discouraging the kind of transportation options that can improve cardiovascular and pulmonary health and fitness.

#### CHILD VULNERABILITY

Children are particularly disadvantaged by high traffic speeds. Streets lacking safe, multimodal transportation options often encourage caregivers to drive children to school, which removes opportunities for physical activity as part of children's daily commutes. Children who are active are physically healthier and have better spatial and cognitive skills. These challenges affect all children but are particularly stark for children from lower-income areas.

#### SOCIAL INTERACTION

Streets with low traffic speeds and volumes have been found to have more street activity, which creates opportunities for social interaction, a significant factor in public health.<sup>28</sup>

#### INCREASE IN PHYSICAL ACTIVITY

Ensuring vehicles are traveling at safe speeds is fundamental to encouraging people to walk, cycle, and ride transit. Combined with cycle lanes, sidewalks, and safe crossings, this encourages physical activity, with important health benefits at the societal level.<sup>29</sup>

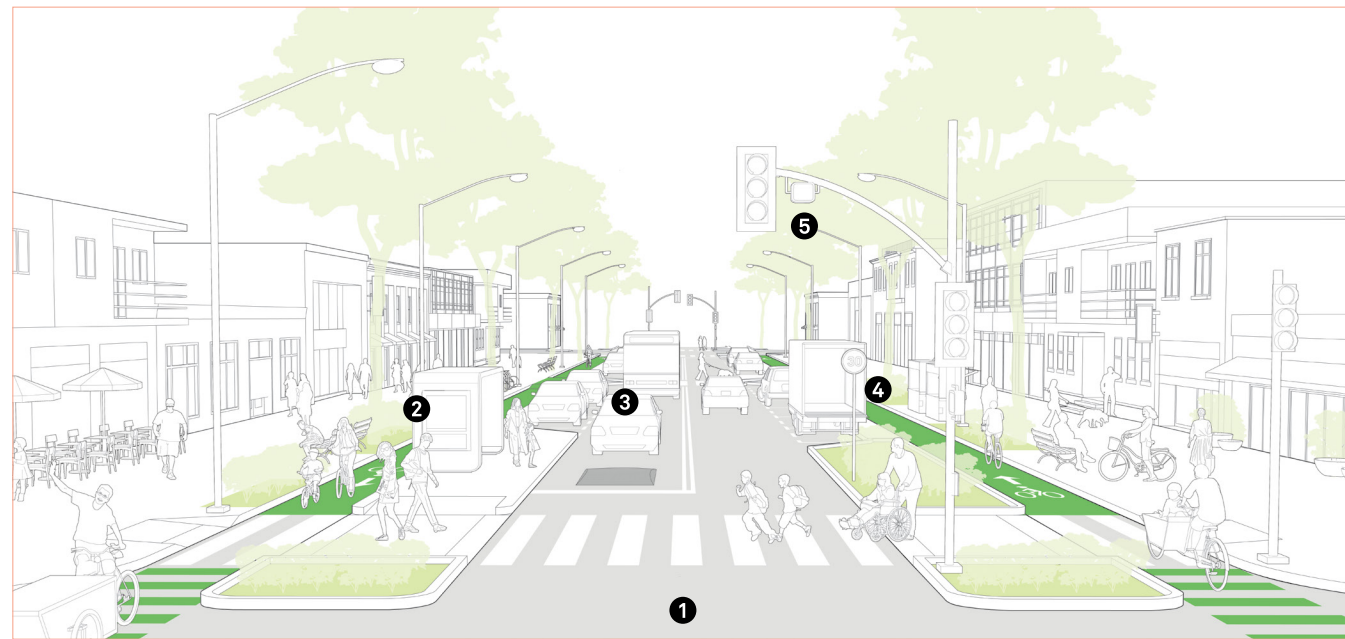
#### PLAYING AND LEARNING

Slow streets make it easier for children to play and walk to school, contributing to their social and cognitive development. *For more information, see [Designing Streets for Kids](#).*

# A Comprehensive Approach to Speed Management

Road traffic fatalities and injuries result from decades of car-oriented planning and insufficient consideration for safety consequences to all users. Yet, cities worldwide demonstrate that reducing traffic-related deaths and making streets safer is possible by shifting towards a systemic understanding of road safety. Rather than focusing exclusively on individual behavior, these cities focus on changing the policies and systems that create unsafe conditions.

Road safety experts advocate for a Safe System Approach, emphasizing speed management measures to protect vulnerable road users. Addressing unsafe speeds requires action at various levels, from national legislation to city policies and project-specific interventions. While this publication concentrates on street design and operations, it acknowledges the need for a comprehensive approach involving complementary strategies.



- 1** Street design and operations
- 2** Communications
- 3** Vehicle safety technologies
- 4** Lowering speed limits
- 5** Enforcement

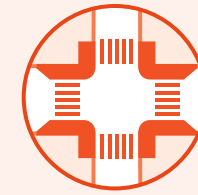
Effective speed management strategies require a multifaceted approach that addresses political, technical, and social dimensions. That requires coordinated efforts of multiple government agencies, the private sector, nonprofits, advocacy groups, and communities.

Actions in the five components introduced in this section allow a more comprehensive approach to speed management. Those include street design and operational changes—the main focus of this publication—lowering speed limits, targeted communications, strategic speed enforcement, and improved vehicle safety technologies.

Speed management plans allow cities to articulate actions with broader policy frameworks, set ambitious yet achievable goals, define specific targets for different components, and assess progress over time. Implementation should occur at the project level (e.g., targeting street improvements at a project site); at the program level (e.g., addressing high-speed corridors or school zones as focus areas); and at the city level (e.g., updating city-wide speed limits).

Coordinated efforts improve overall efficacy and garner stronger support and understanding from communities. All of the components illustrated above influence street design. Given that their implementation unfolds partially or fully on city streets, they can potentially establish synergies for increased effectiveness.

Speed management implementation must be grounded in data and evidence. Proposed actions should be evaluated for efficacy, and prioritization should follow effectiveness and equity criteria. Moreover, constantly engaging with communities about the risks of road traffic and the importance of reducing speeds enhances civil society's understanding and support for these measures.



## STREET DESIGN AND OPERATIONS

Street design and operational changes can limit motorists' opportunities to speed and self-enforce conditions for safe and responsible behavior.

These changes effectively improve road safety for all road users and are sustained over time.

**Street design and operational changes are the focus of this publication.**

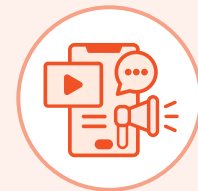


## SAFE SPEED LIMITS

Setting appropriate speed limits based on the desired use, function, and context of each street, instead of on the prevalent speeds, is a critical step in managing speeds.

The human body's limit to withstand impacts is the critical parameter for setting safe speeds on urban streets. *For more information, see 6.2.2 Speed Selection.*

Advocacy work is instrumental in advancing national and local laws and regulations mandating safe speed limits.



## COMMUNICATIONS

Mass media campaigns help raise awareness and public support about the risks of speeding and can change behavior, especially when aligned with education and enforcement efforts.<sup>30</sup>

When communities understand that speeding is unacceptable, they will be more willing to support speed reduction measures and other related road safety interventions.



## ENFORCEMENT

Speed enforcement has been proven effective in increasing compliance, and the presence of speed cameras significantly decreases fatalities and injuries.

Manual enforcement, for instance on frequent and randomly located speed related on-site operations, helps reduce predictability and increase compliance on a large scale.

Automated enforcement can help mitigate crash hotspots and provide consistent data collection for speeds and volumes.

Integrating enforcement with street design can promote safer behaviors before more profound infrastructure changes occur.



## VEHICLE SAFETY TECHNOLOGIES

Technologies such as Intelligent Speed Assistance (ISA) can improve road safety by using behavioural nudges, like alerts, or physical impediments, such as limiting acceleration, to prevent motorists from driving above the speed limit.

Cities like New York City<sup>31</sup> and London<sup>32</sup> will expand the usage of ISA devices in their bus and other vehicle fleets, following successful pilots.

## The Importance of Street Design

Carefully planned and implemented street design and operational changes are an effective tool for improving road safety in cities. Well-designed streets help self-enforce motorists' speeds and make safe behavior self-explanatory to all users. This reduces the need for traffic enforcement and leads to long-lasting safety benefits.

Moreover, safer speeds unlock a wide range of design possibilities to transform deadly roads into urban places that can truly benefit the community, like public spaces and play areas. Over time, such transformations lead to profound benefits in areas like public health, social equity, environmental and economic sustainability, and overall quality of life of urban residents.

### Street design restricts speeding opportunities and invites safer behavior from motorists



→ Chicago, USA

The design of a street physically affects the motorists' ability to accelerate and reach unsafe speeds and will also directly influence their behavior. Design can make driving above the chosen target speed impossible, or make it feel uncomfortable and inappropriate.

In an environment that provides little or no physical restrictions to speeding and resembles a highway, motorists often feel incentivized to drive at higher, unsafe speeds that are incompatible with the target speed of a street.

In situations like these, speed signs (when present) can feel inadequate to motorists, and automated enforcement, arbitrary, as the environment communicates that it is possible to drive much faster.



→ Tirana, Albania

Street design should then rely on speed management tools that physically restrict speeding—such as raised crossings, chicanes, and mini roundabouts—while also seek to communicate the appropriate driving speed both explicitly through signage, and subconsciously via characteristics such as the choice of materials, mix of users at different times of the day, land use, building and landscape design.

*The best practice in street design seeks to eliminate or reduce speeding opportunities, while creating livable, human-scaled spaces that entice more responsible, predictable, and intuitive behavior from all users.*

### Designing for safe speeds can unlock opportunities for broader sustainability goals



Cities all over the world have designed and transformed their urban streets following a car-centric, highway-oriented approach. Among many other issues, this inadequacy resulted in streets that are oversized for motorized vehicles—with cities dedicating much of their street space towards accommodating traffic volume at higher speeds.

A comprehensive approach to safe speeds not only reduces road danger, but help establish a more efficient use of space by rightsizing lanes and changing the focus of moving cars to moving more people through more sustainable modes.

This efficient use of space unlocks opportunities for streets to serve many purposes, connecting to the local and immediate contexts—for instance, improving stormwater management through green and blue infrastructure, and creating areas for play and local businesses. It also connects to broader sustainability and livability goals such as increasing vegetation coverage.



## Speeds Set to Human Limits

The combination of speed and potential points of conflict produces deadly results. For safe walking, cycling, and motorcycling, motor vehicle speeds must be set at survivable levels.

Cities should strive to reduce high-speed interactions to systematically eliminate fatalities and serious injuries. That includes reducing top operating speeds, eliminating potentially fatal conflict points, and reducing speeds at interaction areas to very low levels.

The maximum speed on urban streets should be set based on the level of physical separation vulnerable street users have from motorized traffic along the street and at conflict points.

### Lower separation means lower speed limits



#### CONTEXT 1: UP TO 15 KM/H

When pedestrians and cyclists share the roadway with motorized traffic.

Up to 15 km/h, preferably lower than 10 km/h, when motor vehicles are turning at pedestrian or cyclist crossings.



#### CONTEXT 2: UP TO 30 KM/H

Where cyclists share the roadway with motor vehicles, but pedestrians have dedicated, physically separated facilities.



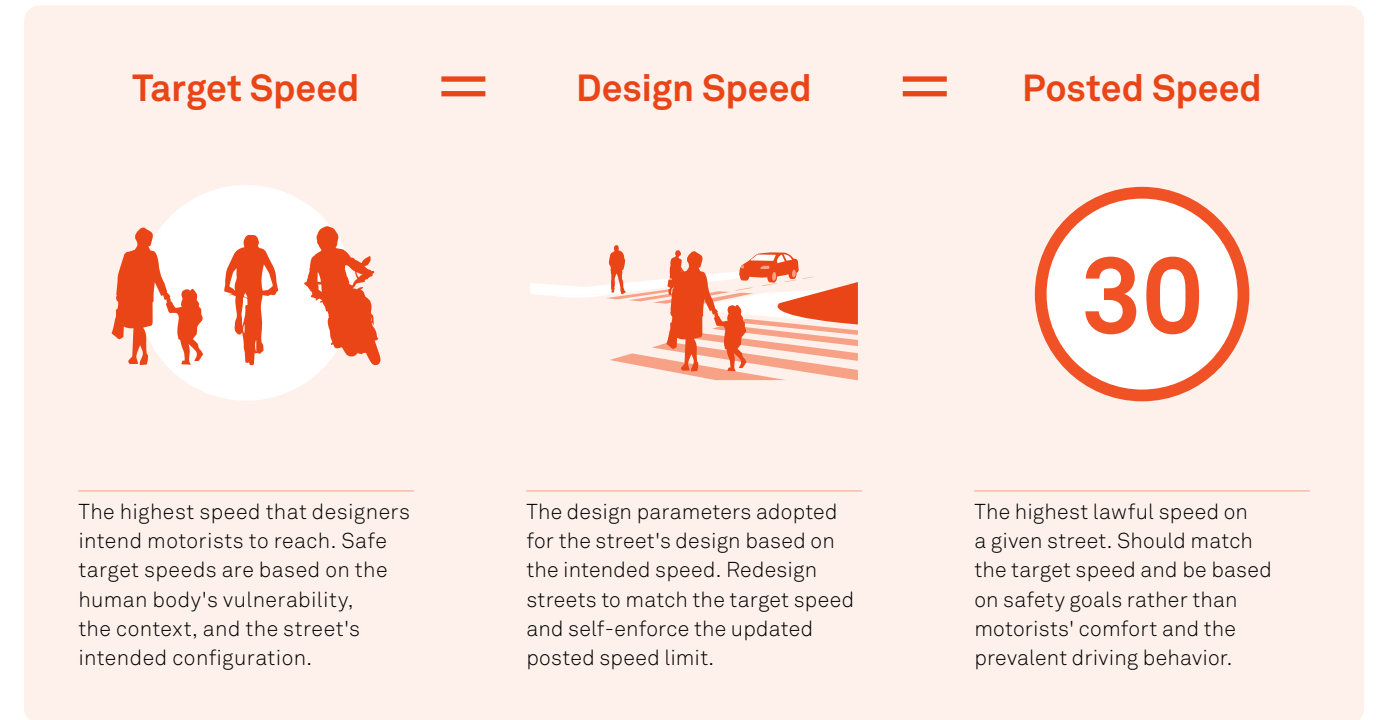
#### CONTEXT 3: 30 KM/H AND ABOVE

Where the interactions between motor vehicles, pedestrians, and cyclists are limited to signal-controlled crossings.

## Design Speed

Design speed is the target speed at which drivers are intended to travel on a street, and not, as often misunderstood, the maximum operating speed. It defines critical design parameters that help self-enforce a safe target speed through design.

*Design speeds must reflect a street's target speed and match the posted speed. If the posted speed cannot be changed, a safer design speed can still be adopted.*



### PROACTIVE SPEED MANAGEMENT

Conventional practice sets design speeds higher than posted limits to accommodate driver error, but this encourages speeding.

A proactive approach selects a target speed and uses design to achieve that speed, guiding driver behavior through physical and perceptual cues.

Apply the design speed across different scales to ensure motorists meet the appropriate target speed for each street. This must be done proactively, without the need for crash occurrences to justify changes.

If posted speeds cannot be changed, a lower target and design speed can still be set to ensure motorists' speeds are adequate to the context.

### DESIGN SPEEDS ACROSS SCALES

For a broader and more effective speed management approach, the design speed must be embedded across different scales.

#### Network scale

Examples include street hierarchy, directionality, and permeability for different users. *For more information, see 6.2 Network-Level Considerations.*

#### Street scale

Examples include lane widths, corner radii, spacing between speed reduction measures, etc. *For more information, see 4 Strategies.*

#### Tool scale

The choice of speed management tools and design detailing, such as ramp gradient for raised crossings, or the stagger angle for chicanes. *For more information, see 7 Safe Speeds Toolbox.*

# Safe Target and Design Speeds

Set safe target speeds to reduce the risk of road traffic crashes, injuries, and fatalities in city streets. The target speed should be set based on the existing context, but also on the envisioned transformation of the street. Consider all the street users and the local context's characteristics. See *Global Street Design Guide's A New Approach to Street Design*.

## 10-15 km/h

A shared street or similar environment mixes users at very low speeds, at most 15 km/h, with both activity and geometry keeping speeds low.

In this type of street, pedestrians and cyclists share the roadway space with motorized traffic, so low speeds are key to protecting vulnerable users' lives.

This target speed can be paired with measures to restrict access or reduce the volume of motor vehicles and ensure proper space-sharing conditions.

### Target Turn Speeds: 5-15 km/h

At intersections, where various street users cross paths at different speeds, there is an increased risk of crashes and severe injuries.

Target turning speeds must be lower than the intersecting streets' speed limits, and, in urban settings, **should be seldom above 10 km/h and never higher than 15 km/h**. Use geometric design, signal operations, and other perceptual cues to self-enforce this target speed.

High-speed turn configurations such as slip lanes and access ramps are critically dangerous in urban areas and must not be implemented.



Fully Shared

## 20 km/h

Near key destinations—such as schools, hospitals, nurseries, daycares, markets, and parks—speeds should be reduced to accommodate pedestrians and cyclists and support the street's role as an extension of these spaces for sitting, gathering, waiting for transit, and other street activity.

Reduced speeds on residential streets allow play and social activity in the street. Use a target speed of 20 km/h also to support such activities and implement speed management strategies if higher speeds exist.



Shared by Cyclists and Motorists

## 30 km/h

**30 km/h should be the citywide default speed limit,** applicable to the majority of streets and communicated as the legal limit when signs are not available. In some cities, the citywide speed limit might be even lower than 30 if the context requires, for instance in protected heritage sites.

Use speed management techniques to limit speeds to 30 km/h or lower on streets with a high degree of activity in all modes and high demand for pedestrian crossings. This is a safe speed for cycles to ride in mixed traffic and presents low risks to people walking along and crossing the street. It is also a safer speed for motorcycles to ride in mixed traffic and interact with cyclists and pedestrians. This condition is often applicable on neighborhood main streets and large central city streets.

On streets with this target speed, always provide protected and accessible facilities for pedestrians, as well as frequent crossing opportunities.

While 30 km/h is a safe speed for cyclists to share the lane with motor vehicles, low traffic volumes are critical to increasing comfort and attractiveness for people of all ages, genders, and abilities. With moderate or high volumes, cycle tracks or lanes are recommended.

## 40 km/h

**The target speed for urban areas should not exceed 40 km/h, with exceptions for specific corridors. To determine appropriate target speeds other than 40 km/h, consider the multiple safety, health, mobility, economic, and environmental goals.**

At this speed, designate frequent signalized pedestrian crossing points, and include cycle tracks based on the overall network. Use street geometry and speed management tools to physically and visually signal to drivers that speeds should not exceed 40 km/h.

40 km/h is the maximum recommended target and design speed in city streets, usually applicable to a small selection of arterial corridors.

## 50 km/h

On some large streets with cycle tracks, large sidewalks, medians, and frequent signalized intersections and pedestrian crossings, it is possible to accommodate traffic speeds of 50 km/h, using signal progressions, trees and furnishings, and 3-meter wide lanes to discourage speeding.

## +60 km/h

Speeds of 60 km/h or higher are not safe on urban streets. Extreme care must be used to protect vulnerable users without destroying the social and economic functions of the street or disrupting the walking network.



Fully Separated



# 2

## Addressing Speeds in the City

Cities can take a systematic approach to addressing unsafe speeds and their road safety impact. Updating citywide speed limits is a critical step in reducing people's exposure to severe traffic crashes. Globally, cities that have changed their standard posted speed to 30 km/h are seeing immediate results in lives saved.

Redesigning streets to self-enforce those new limits, once set, will maximize safety gains. Street transformations can be carried out as individual projects, be scaled up into citywide programs, and become new standards by updating local design codes and regulations.

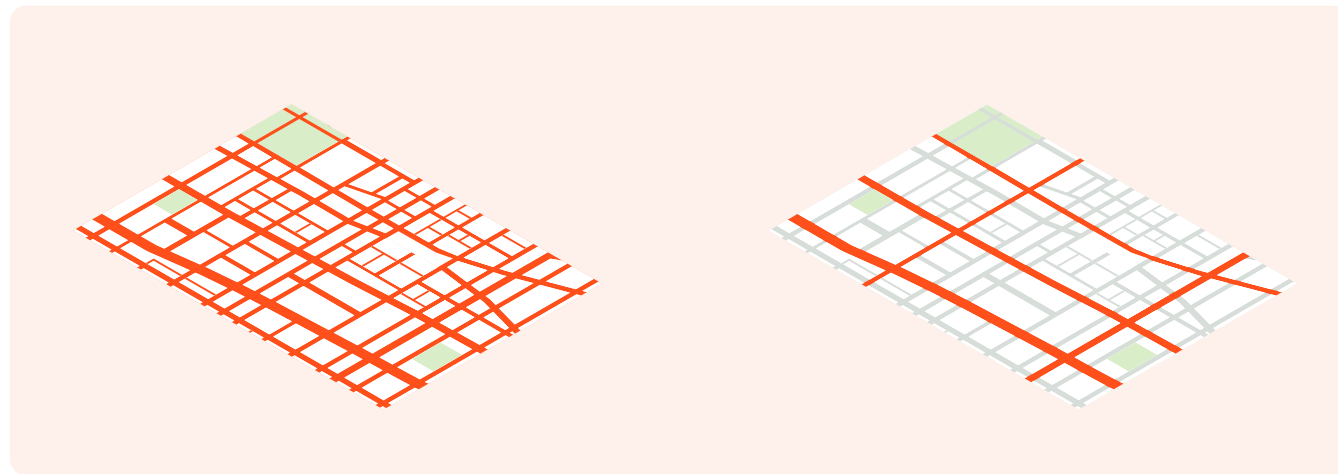
Taking comprehensive action requires engaging with different stakeholders, setting a long-term vision, and communicating the wide array of benefits.

This chapter provides recommendations for setting safe posted speed limits on urban streets, along with tools to support this process. The selection of tools and the focus areas will vary depending on each city's context.

## Tools to Change Speed Limits

A city's ability to change speed limits varies depending on the government structure and the legal requirements to update traffic regulation. In some jurisdictions, cities have the authority to implement their own speed limits, while in others, speed limits are set at the subnational or national level.

In many countries, cities have led the way by reducing their speed limits and influencing other cities and higher levels of government to do the same. Pairing the new speed limits with changes in street design is fundamental to effectively achieving safe speeds.

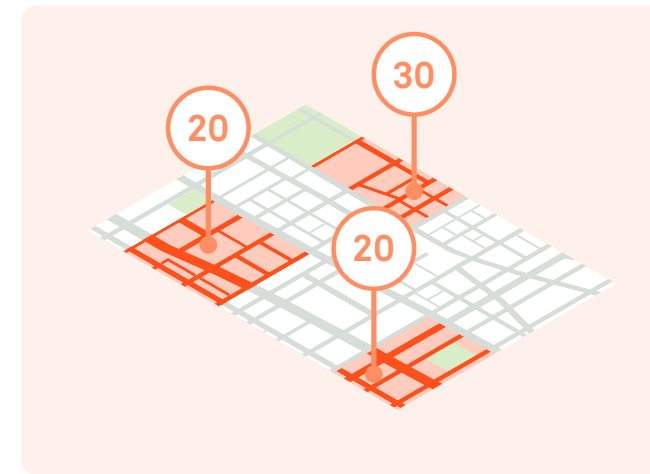


### DEFAULT SPEED LIMITS

Within their boundaries, cities can establish speed limits on many streets at once. Set default speed limits broadly across all streets of the city, unless otherwise posted.

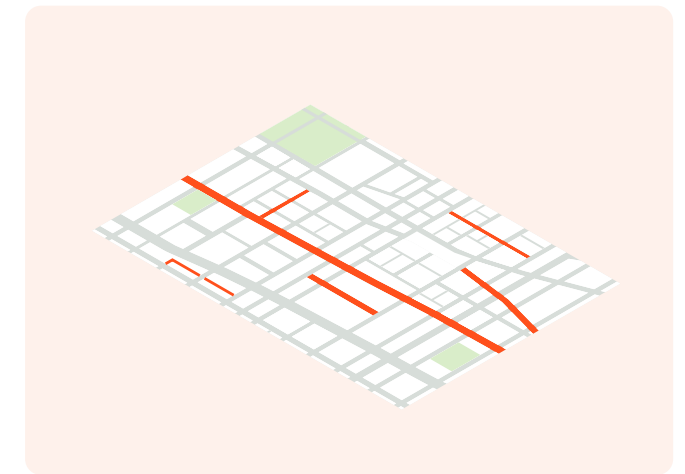
These limits can be applied generally to the whole jurisdiction or based on categories, e.g. grouping arterials, collectors, and local streets, or through other categorization systems. For more information, see 2.1.1 Default Speed Limits.

*Designing for Safe Speeds* builds on the guidance provided in *City Limits*, published in 2020 by the National Association of City Transportation Officials (NACTO), an association of North American cities and transit agencies formed to exchange transportation ideas, insights, and practices and cooperatively approach national transportation issues.



### AREA-WIDE SPEED LIMITS

Fast speeds where the most vulnerable road users are present decreases livability. Define speed limits in sensitive areas of the city, such as residential areas, central districts, school zones, hospitals, and others. For more information, see 2.1.2 Area-wide Speed Limits.

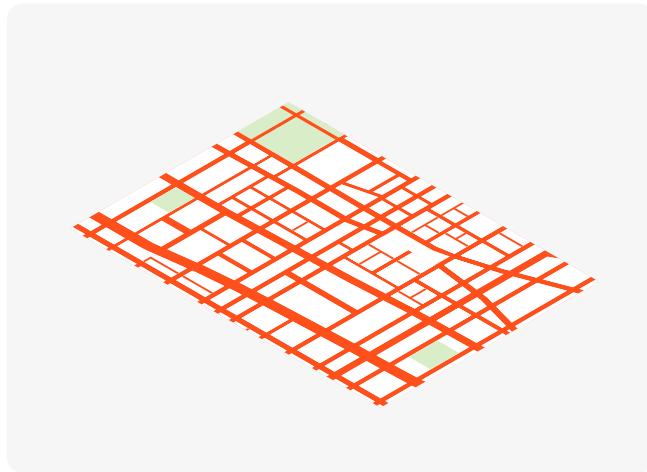


### STREET-SPECIFIC SPEED LIMITS

Implement specific speed limits based on a contextual analysis of a street's or corridor's existing conditions and its transformation prospect (when applicable). For more information, see 2.1.3 Street-specific Speed Limits.

## Default Speed Limits

Cities can choose to set default speed limits either citywide or based on street categories like major or minor roads. A citywide limit is simpler to implement and easier for drivers to follow, while category-based limits can allow for lower speeds on more streets in a network, enhancing safety outcomes. The choice should be based on feasibility and relevance to the local context.

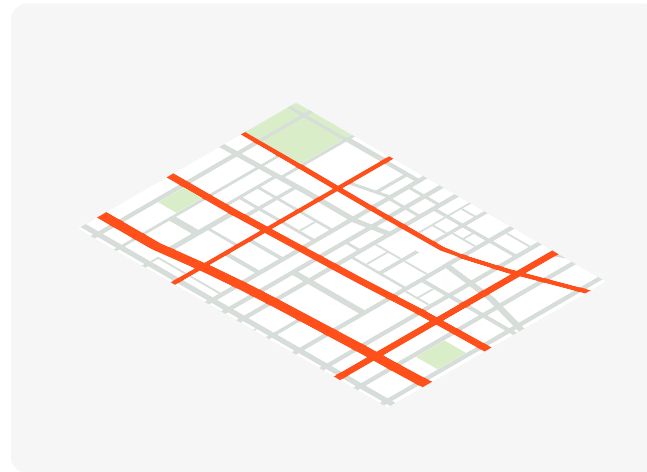


### DEFAULT CITYWIDE SPEED LIMIT

This approach simplifies and standardizes speed limits across an entire city or jurisdiction, using a single default limit unless otherwise posted. It is quick, cost-effective, and scalable, providing consistency that makes it easy for motorists to understand and follow.

Consistently placing signs throughout the city is essential to reinforce the default speed limit and increase awareness and compliance. This method also lays a strong foundation for further safety improvements.

Communication strategies—such as mass media campaigns and consistent messaging across city government platforms—combined with enforcement initiatives (e.g., offering a grace period during the transition) are fundamental to facilitating implementation.



### CATEGORY-BASED SPEED LIMITS

This approach allows cities to lower speed limits across many streets by grouping them into broad categories and setting appropriate limits for each. By using existing street typologies or simple classification rules, cities can apply lower limits to a larger portion of the network compared to a single citywide limit, which is usually higher.

Street category examples include multilane corridors, single-lane streets, pedestrian-priority zones, and streets near schools or public facilities. This method simplifies implementation, is easy to scale up, and still allows flexibility to set unique limits for critical corridors where needed.

Higher limits can be applied selectively on certain corridors based on their specific context, ensuring a balanced approach that enhances safety across the network. Setting limits of 30 km/h or lower is still recommended for most streets to prioritize the safety of pedestrians, cyclists, and other vulnerable road users.



### Julián Esteban Law, Colombia

In June 2022, the Colombian Congress passed Law 2251, also known as the *Julián Esteban Law*, aimed at reducing traffic fatalities and named after a 13 year-old child who was run over by a speeding driver while riding his bike. The law was part of the 'Conduce a 50 vive al 100' initiative ("Drive at 50, live 100%"), supported by the Global Road Safety Partnership and the University of the Andes' Group of Studies in Urban and Regional Sustainability. It sets speed limits of 50 km/h in urban areas, and 30 km/h in school and residential zones. The law also mandates safer vehicles, continuous monitoring of high-risk areas, and infrastructure improvements.<sup>1</sup>



### Grenoble, France

Between 2016 and 2018, Grenoble, France, saw a notable shift in motorized traffic patterns and road safety following the implementation of 30 km/h speed limits across 80% of its streets. Motor traffic decreased by 9% for light vehicles and 20% for heavy vehicles, reflecting a significant reduction in congestion. The severity and frequency of crashes also declined, with pedestrian fatal or injury crashes reduced by 50%.<sup>2</sup>

Beyond safety, the community embraced the new speed limits, with 61% of pedestrians and 70% of cyclists expressing approval after three years. The initiative aligns with the city's goals of reducing crashes, fatalities, and injuries, minimizing noise, encouraging walking and cycling, and reclaiming public space for active transportation.<sup>3</sup>



### Bologna, Italy

In 2024, Bologna became the first major Italian city to implement a default speed limit of 30 km/h throughout its area—or the *Città 30* policy—with the exception of a few corridors. Its main goals were to increase livability and reduce crash injuries and fatalities. In its first year, the policy achieved a 13% reduction in all crashes, with serious injuries decreasing by 30% and fatalities plummeting by 50%,<sup>4</sup> with many other co-benefits such as lower emissions, calmer streets, and increased physical activity.<sup>5</sup>

A study was conducted to assess the policy's impact on traffic flow, using TomTom data to analyze changes in vehicle speeds and travel times. Findings indicate minor increases in travel times, and traffic flow remained largely unaffected.<sup>6</sup>

→ *Bologna. 30 City, more space for people*

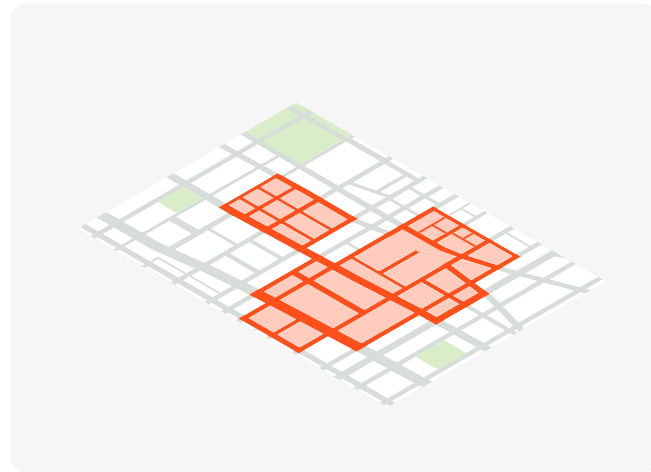
## Area-wide Speed Limits

Area-wide speed limits apply a standard limit to multiple blocks or an entire district at once. These can have different names from city to city, such as safe speed zones, low-speed zones, traffic-calmed areas, slow zones, 20 or 30 zones (depending on local speeds being set in miles or kilometers per hour), etc. Those can serve as testing grounds for incremental speed limit reductions.



### NEIGHBORHOOD SAFE SPEED ZONES

Neighborhood zones can be set to prioritize safety and overall livability in residential or mixed-use neighborhoods. Speed limits in these zones should be set even lower than the city's general default speed limits, reflecting the local context and safety needs. To be effective, the updated speed limit should match the design of the streets within the area. *For more information, see 6.4.4 Mixed-use Street.*



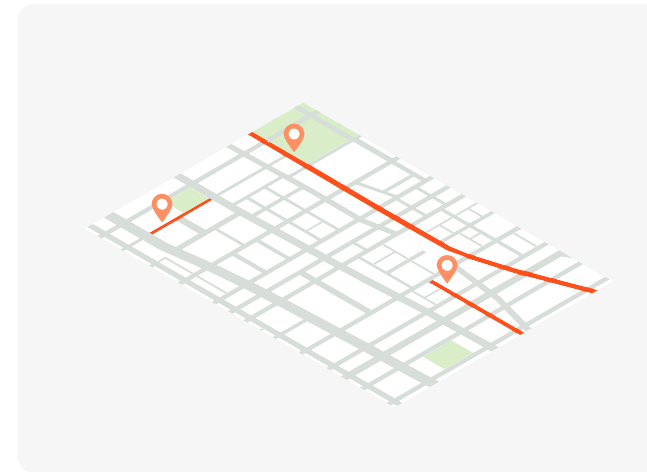
### CENTRAL DISTRICTS SAFE SPEED ZONES

These zones share similar characteristics with neighborhood safe speed zones but are specifically designed for central districts or city centers. Central districts tend to attract higher numbers of people daily, which generates specific mobility needs. That often implies treatments such as transit-only streets, shared streets, pedestrianized streets or areas, etc. These streets can have speed limits even lower than that set for the district.

These zones are tasked with balancing mobility needs while keeping the key pillar of safety as a priority. The updated speed limit should be reflected in the design of the streets within the area. *For more information, see 6.4.8 Central Streets.*

## Street-specific Speed Limits

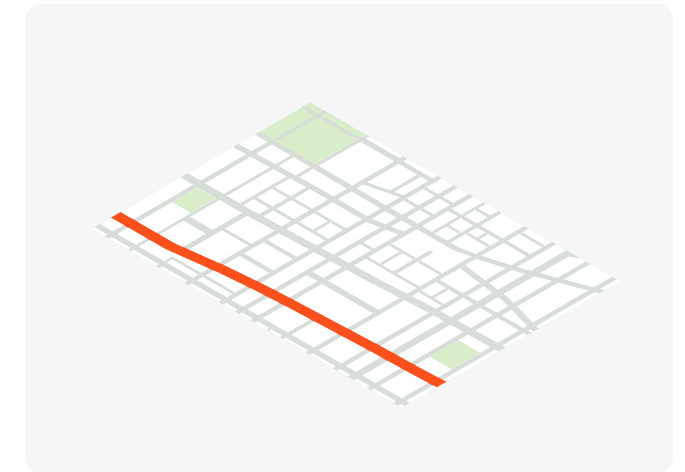
Tailoring speed limits to the specific conditions of each street or corridor allows for the consideration of factors such as land use, street design, presence of vulnerable road users, and other context-specific needs. Street-specific speed limits are compatible with all the previous approaches and add nuance and specificity to special cases. Examples of such include critical corridors, streets where the most vulnerable road users are particularly common or exposed, etc. Street-specific limits can also provide a practical approach to testing and demonstrating the benefits of lower speed limits before scaling up.



### KEY DESTINATIONS SPEED LIMITS

Lower speed limits are recommended in sensitive areas like those near schools, parks, and hospitals to address the higher risks posed by the high concentration of vulnerable users. These reductions are essential for improving safety in these environments.

The lower limits can apply to the block directly in front of these destinations or to multiple streets surrounding them. Alongside reduced speed limits, redesigning these streets to naturally slow traffic and provide safe crossing opportunities is crucial for protecting all road users. *For more information, see 6.4.3 Streets Near Schools.*



### CORRIDOR SPEED LIMITS

A specific corridor or cluster of blocks may present a different context from the surrounding area, such as the presence of street fairs or higher-density segments with more pedestrian activity. In these situations, where lower target speeds are more suitable, corridor-specific speed limits can be deployed. *For more information, see Global Street Design Guide Chapter 5.4.*

Preferably, the corridor-specific speed limit can be applied to the whole length of a street or, if not possible, to the span of where the context requires lower target speeds.

## Where to Focus

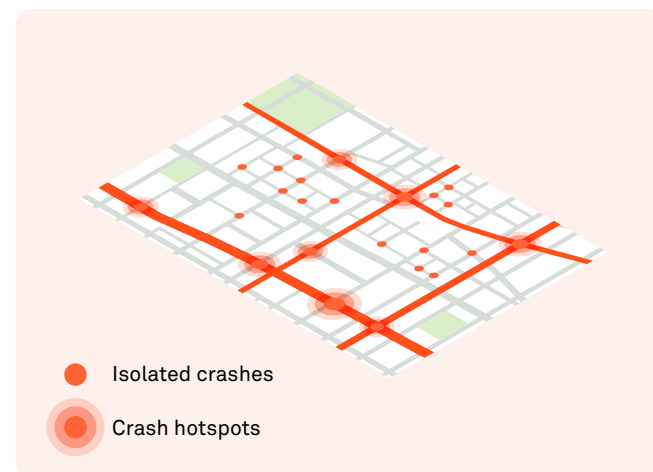
With limited resources, cities have to prioritize where to intervene for maximum impact. While the initial motivation for a project might be to improve road safety, it should also include other goals, such as adding cycling facilities, improving transit efficiency, or enhancing public spaces—and the same applies the other way around, as road safety must be a project goal.

Regardless of the primary objective, however, ensuring safe speeds should always be a non-negotiable component of any street transformation project. A structured, data-driven approach helps identify the most effective locations for intervention based on the city's goals, resources, and communities' needs. *For more information, see 6 Street Transformations.*

### Road Safety-driven Interventions

Cities can approach project site selection from a road safety perspective by prioritizing corridors with the highest crash rate and risk. Local crash data, speed monitoring, and other user behavior studies provide valuable insights into which streets or corridors require immediate attention and can serve as a starting point for interventions.

However, additional technical and political factors will also influence the feasibility and success of a project and should be considered in the planning process. Consider the potential co-benefits of a road safety-driven intervention to maximize the impact of city investments.



#### HOTSPOTS AND CRITICAL CORRIDORS

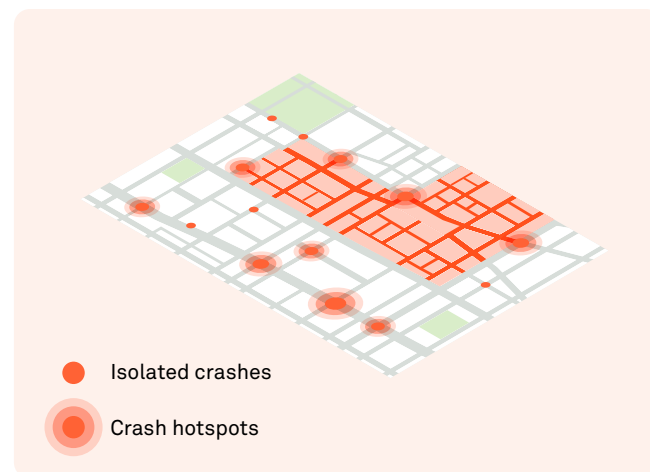
High-crash corridors and intersections are often located in streets with higher traffic volumes.

These often multilane, high-capacity corridors account for a large proportion of road traffic fatalities, despite comprising a small percentage of the network.

Intervening in these areas is a resource-efficient way to reduce overall traffic deaths in a city.

Prioritizing interventions in critical corridors, rather than in isolated intersections, allows for a more systemic and scalable approach.

A multimodal approach to corridor interventions will maximize impacts and build a strong reason to advance a project.



#### A PROACTIVE APPROACH

A significant percentage of fatalities occur outside high-crash corridors, often in streets with lower volumes within neighborhoods, but not exclusively.

These crashes are dispersed across the larger portion of the street network, and hotspots are less marked and may shift year by year.

Strive for a proactive approach to speed management, setting adequate speed limits and ensuring streets are designed to enforce safer speeds, even if they are not within the ones with higher crash rates.

Area-wide interventions allow for addressing multiple streets at once, improving safety across entire areas.

Such interventions bring the opportunity to substantially improve livability and quality of life in the impacted streets.

### Integrating Safe Speeds in Every Project

Every street transformation project, despite its primary goal, can and should embed safe speeds as a primary goal in order to achieve different co-benefits—especially reducing traffic injuries and fatalities.

Below are examples of people-oriented project goals where safe speeds are a prerequisite.

#### PROMOTING CYCLING

Traffic calming is a key component of designing cycle-friendly cities. Cycle tracks and lanes are more attractive when vehicular speeds are lower. Effective traffic-calming enables cyclists to share the roadway with motor vehicles.

#### IMPROVING ACCESS TO KEY DESTINATIONS

Schools, healthcare facilities, markets, parks, etc. are invaluable community assets and safe speeds improve access to those services for all people.

#### CELEBRATING HISTORIC AND CENTRAL AREAS

Reducing speeding in historic and city centers enables creating people-oriented places that are more inviting and compatible with preservation and livability.

#### IMPROVING COLLECTIVE TRANSIT

Most first- and last-mile trips are taken walking and cycling. Safe speeds make reaching transit stations safer and more attractive.

#### SUPPORTING LOCAL BUSINESSES

Safe speeds create more inviting environments, increasing foot traffic and supporting commercial activity. It also enables businesses to use street space creatively, such as for outside dining areas.

#### ACTIVATING STREETS NEAR PARKS AND WATERFRONTS

Parks are where cities often intervene and treat as critical public and recreational spaces. Ensuring safe speeds facilitates accessing them, creates more hospitable spaces, and maximizes the use of those areas.

#### CREATING MORE LIVABLE NEIGHBORHOODS

Safe speeds enable making residential streets into hospitable neighborhoods that prioritize residents of all ages, abilities, and genders.

#### EMPOWERING INFORMAL AREAS

Sometimes streets become shared streets informally, because they are narrow and lack planned or structured rights-of-way. To maintain those benefits, retrofitting those streets must include safe speeds.

## Taking Action

Successful speed management projects depend on understanding the context and the participation of key stakeholders to define a clear and comprehensive implementation strategy. The actions below highlight some of the key steps in the larger process of transforming streets for safer speeds and aim to ensure that limited resources are used effectively.



### ENGAGE STAKEHOLDERS

Implementing a street transformation project requires people working on multiple pieces simultaneously, from project management to on-site implementation. Identify different departments that can contribute to the process. Connecting with the people who live, work, and visit the area to be transformed is also key for a successful project.

To gather an accurate picture, a successful and equitable data-driven approach will require both collecting data as well as a robust community engagement process that prioritizes outreach in underserved communities.

An effective community engagement process is also important from a political standpoint. Practitioners may propose solutions that may not address the unrecorded problems observed by and of concern to the community. Community engagement allows practitioners to learn from residents and supports design proposals that are more aligned with the residents' expectations.



### CREATE A SHARED VISION AND PREPARE AN ACTION PLAN

A clear vision offers stakeholders direction and aligns designs with each neighborhood's social, economic, and environmental goals. Balancing technical expertise, global best practices, and input from residents and businesses fosters support and a shared sense of ownership.

A shared road safety vision should be ambitious and yet easy to communicate and capable of bringing multiple stakeholders together.

Community and stakeholder input is essential to ensure the vision reflects collective goals. Every action and project proposal should align with this vision.

Cities that develop strategic action plans are more likely to succeed in improving road safety. Action plans can begin small, with short-term, low-cost yet effective measures to tackle immediate challenges, and progress to longer-term implementation.

Using data and community insights, cities can direct resources to projects with the greatest potential to reduce severe traffic crashes.



### ALIGN WITH EXISTING EFFORTS

Alignment with other local projects, programs, or initiatives can create opportunities for creating safe streets.

A good starting point is identifying projects and programs that already have political, community, and financial support, and streets that are already scheduled for regular or upcoming maintenance and reconstruction.

It is important to coordinate with different departments in the city government to ensure that best practices, a new language, innovative approaches, and lessons learned find their way into the everyday practice of shaping streets with safe speeds.



### DEMONSTRATE POSSIBILITIES

Consider starting with short-term interim projects. These are easier to implement, considering time constraints, budgets, and, often, building codes and permits.

Interim street transformations can demonstrate the potential for success, which is a crucial way to inspire demand for safe streets and possibly secure additional funding for permanent construction or scaling up. The temporary or interim nature often reduces fear of change from local stakeholders. See *How to Implement Street Transformations*.



### EVALUATE AND COMMUNICATE THE IMPACT

Designing for safe speeds should be a data-driven approach. Gathering, analyzing, utilizing, and sharing formal data on injury crashes and community input are fundamental to the project's success.

Collecting livability data is also important to help measure the impact of interventions beyond road safety. Data collection and assessment require collaboration between public health department professionals, policymakers, and other stakeholders, such as those in NGOs, advocacy groups, and transportation and police departments. Engaging these different departments early in the process is important to working towards the same goal. For more information, see *How to Evaluate Street Transformations*.



### INSTITUTIONALIZE THE CHANGE

Individual street transformations can demonstrate results and build momentum toward broader change in speed management. Each project must work toward embedding this new approach to street design into policies and guidelines, local codes, training curricula, and political campaigns.

Policies reflecting desirable future conditions—and not documenting past trends—should drive decisions about street design. This will enable cities to achieve their vision, and not maintain the streets' current status.

Speed management's proven impact on road safety worldwide should guide local policies. The evaluation of an interim or permanent project can also help demonstrate positive outcomes locally. It should be used to update policies, remove impediments to best practices, inform new local design guidelines, and alter existing transportation or engineering models.

# Street Design Guidance

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3 Key Design Parameters

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4 Strategies

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5 Safe Speed Geometry

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# 3

## Key Design Parameters

Network planning decisions and design detailing are intertwined. The function a street serves within various networks will directly shape its design approach. Each mode of transport brings specific mobility performance characteristics and spatial needs, and vehicle dimensions further influence critical elements like lane widths and turning radii.

To reach the desired outcomes, it is crucial to consider contextual criteria to select the appropriate speed for a given street. This choice is translated into design parameters.

This chapter provides key definitions of design parameters that are critical when designing for safe speeds. These concepts are embedded in the remaining chapters of this publication.

3.1

## Design, Control, and Managed Vehicle

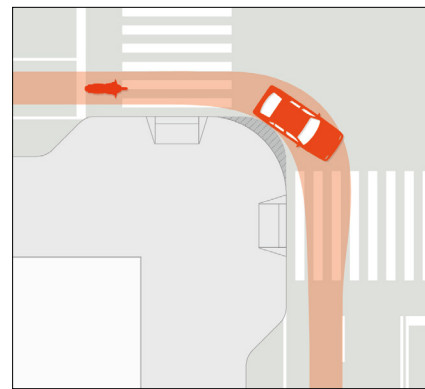
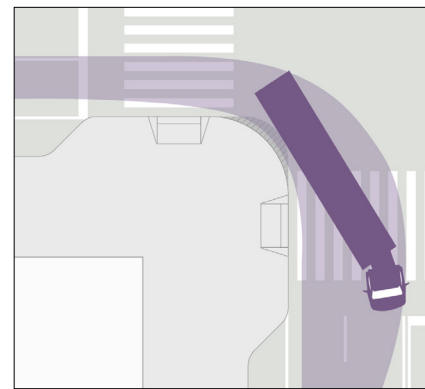
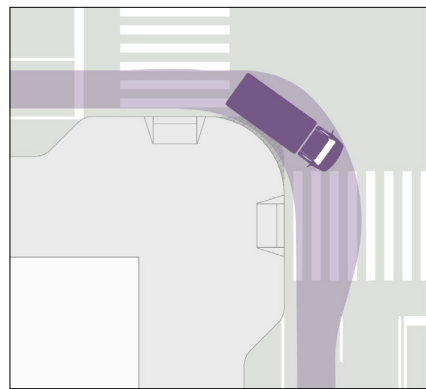
One of the main challenges in ensuring safe speeds through design is accommodating the different types and sizes of vehicles that circulate on a given street, while managing the speeds of smaller, more frequent ones.

It is a common misconception that streets should be designed for the comfortable use of the occasional large truck, which results in overly wide roads or high-speed turns by cars, and opportunities are lost to create space for other, more frequent users such as pedestrians.

This misconception is often reinforced by laws, regulations, or the standards used by key stakeholders like emergency services. Addressing this may require regulatory updates, coordination with emergency responders to allow for smaller design vehicles, and a shift in institutional practices to prioritize frequent users like pedestrians, cyclists, and transit users.

### Selecting Design, Control, and Managed Vehicle

The proper selection of design, control, and managed vehicles depends on context and is critical to prevent the overdesign of a facility, impacting the choice and design of speed management devices.<sup>1</sup>



#### DESIGN VEHICLE

The design vehicle is the least maneuverable vehicle that will routinely use the street.

In a neighborhood setting, a small delivery truck is a typical design vehicle, allowing for a tighter radius. For major streets and downtown settings, a larger truck can be used as the design vehicle.

In streets with frequent city bus routes, a 12-meter bus (or the equivalent in the city's context) can be selected as a design vehicle, but at intersections, this should affect only the streets where there are scheduled/planned bus routes.

#### CONTROL VEHICLE

The control vehicle is the least maneuverable vehicle that is ever planned to use a street, but potentially at very low speeds or with multipoint turns. This would normally be the largest vehicle that circulates in a certain street, but there are exceptions.

The control vehicle is seldom seen on the streets—which enables the implementation of temporary interventions such as flaggers or street closures—and may use multiple lanes and mountable street elements to make turns.

#### MANAGED VEHICLE

The managed vehicle is the most common vehicle that circulates in the street. In most urban streets, the managed vehicle is a passenger vehicle or a taxi.

For the managed vehicle, choose the smallest turn radius and curve that accommodates routine or frequent use.

Motorized two- and three-wheelers can be frequent—or even predominant in many cities and countries—and their users also benefit from measures directed to the managed vehicle.

3.2

## People Capacity

A conventional approach to street design prioritizes *vehicle* throughput, focusing on maximizing capacity to accommodate more vehicles and avoid traffic congestion—a strategy that often results in higher speeds. This emphasis on capacity is closely associated with an increased risk of crashes, particularly during off-peak traffic hours.

Street space is limited and increasingly in demand in growing urban areas. Active modes and transit are more space-efficient than private cars, as they can move more people with the same or less space. Prioritizing moving or storing private vehicles fails to reflect today's challenges.

Redistributing space for walking, cycling, and transit not only promotes a shift to more sustainable, accessible, and inclusive modes but also supports broader public goals. These include addressing climate change, improving public health, and creating more livable urban environments. Such redesigns can also accommodate essential non-mobility elements, like seating and resting areas, bus stops, trees, planting, and other green infrastructure strategies.

*Great street designs focus on people capacity rather than vehicle capacity, moving, and serving more people and different uses within the same space.*

### PEOPLE CAPACITY OF DIFFERENT MODES

The illustration shows the hourly capacity of a 3-meter-wide lane (or equivalent width) by different modes at peak conditions with normal operations. Ranges relate to the type of vehicles, traffic signal timing, operation, and average occupancy.<sup>2</sup>

Private motor vehicles  
**600 - 1,600 people/hour**



Mixed traffic with frequent buses  
**1,000 - 2,800 people/hour**



Two-way protected bikeway  
**6,500 - 7,500 people/hour**



Dedicated transit lanes  
**4,000 - 8,000 people/hour**



Sidewalk  
**8,000 - 9,000 people/hour**



On-street transitway, bus or rail  
**10,000 - 25,000 people/hour**



## Through and Access Travel Function

Motorized through traffic leads to additional volume, creating more speeding opportunities, deteriorating the environmental quality of a street, increasing crash risks, and inhibiting other uses.<sup>3</sup> Drivers passing through an area—especially if they're not stopping locally—tend to prioritize speed and efficiency. They are less attentive to local activity and may drive faster than is safe for the context.



- Through traffic street
- Local access street
- - - Traffic limited street
- Car free street (pedestrians and cyclists)

### THROUGH TRAFFIC

Although grid networks provide connectivity with frequent intersections, they also pose an undesired opportunity for through traffic, especially led by navigation apps.

Network changes that alter motorized traffic connectivity and access rules can make streets less appealing as a through route, reducing traffic volumes and improving conditions for other uses and users.

### LOCAL ACCESS

If the context of the street requires, provide safe local access to motorists, allowing access to garages, loading areas, etc.

Even in corridors, local access is a priority over through function. It directly relates to how streets support livability and economies in cities.

*The streets in a network play different and complementary roles. Traffic volumes should be aligned with the street's function and surrounding land use — for example, lower volumes on residential or commercial streets and higher volumes on key connectors or thoroughfares.*



→ London, UK

### ENSURE CONNECTIVITY FOR PEDESTRIANS AND CYCLISTS

The network must provide maximum connectivity for people walking and cycling. Unlike motorized traffic, they bring positive externalities for the street such as increased personal safety, higher retail sales, and increased property values.

This can be achieved by ensuring safe and convenient connectivity for active modes, even when access for motorized vehicles is reduced, for instance using principles like filtered permeability. *For more information, see 7.4.1 Modal Filters.*



# 4 Strategies

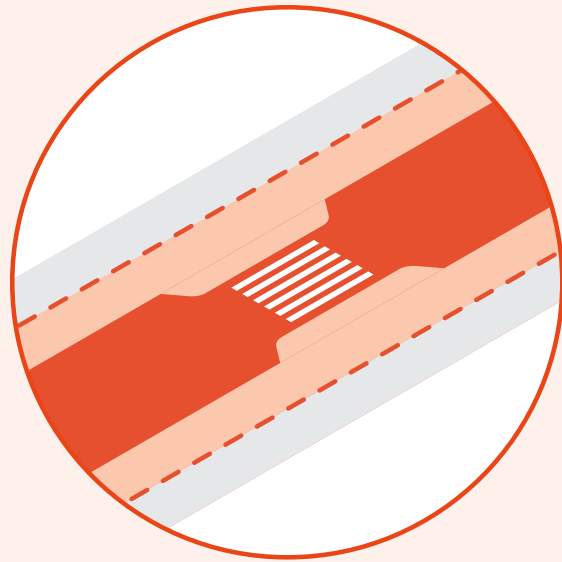
Safe speeds are foundational for good street design. Transformations that improve public health and safety, economic and environmental sustainability, mobility and access, livability, and quality of life start with a people- and place-oriented approach to speeds.

Changes in design are an opportunity to reimagine a street's form and function, and every strategy does not need to focus solely on speed management. Instead, strategies articulate different street elements to achieve an array of co-benefits while reducing vehicular speeds and improving road safety to save lives.

This chapter presents four strategies for using physical and operational changes to self-enforce a street's target speed. These strategies will be applied later in the guide to demonstrate how safe speeds can be achieved on streets and corridors.

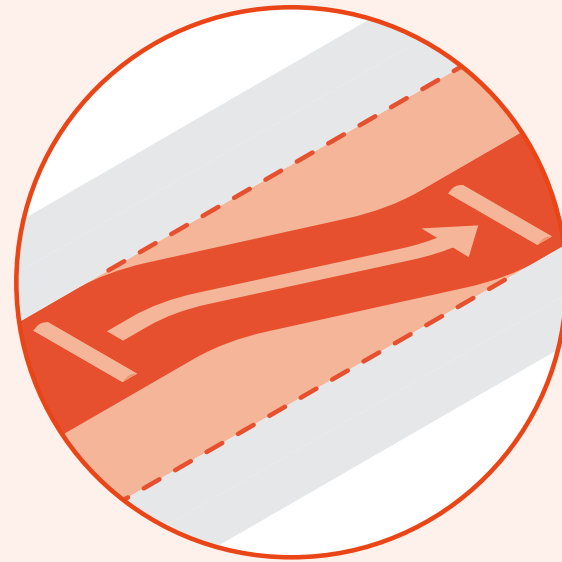
## Street Design and Operational Strategies

Managing speeds requires applying a comprehensive set of design and operational strategies. These strategies are presented here to guide practitioners' thinking from the very start. They help align project goals with speed management objectives and ensure that all potential opportunities for reducing speeds are considered. By limiting motorists' opportunities to speed, they also lower the maximum speeds at which drivers feel comfortable.



### RIGHTSIZE STREETS

The available lane and roadway widths directly influence motorists' speeds. Design compact roadways to remove speeding incentives, improve the visibility of vulnerable users, and reduce their crossing distances. Repurpose the reclaimed space for sustainable modes or to enhance the public space.



### ADJUST THE STREET PACE

Long, unimpeded street segments create speeding opportunities. Add vertical and horizontal deflection elements, or require motorists to stop to reduce speeds at strategic locations. Set these features closer together to reduce the overall pace of the street.



### REDUCE TURN SPEEDS

Good intersection design is critical to reduce conflicts and improve safety for all users. Set target turn speeds lower than the posted speed limits. Reduce the speed of turn conflicts by making corner radii smaller, adding features like islands or centerline hardening, and using signal techniques like leading pedestrian intervals.



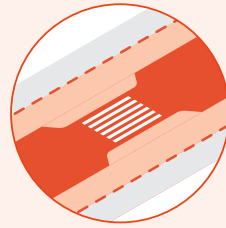
### DESIGN LIVABLE STREETS

Livable streets promote safer and more responsible behavior of all users. Manage pavement materials, add streetside vegetation and furnishing, and promote active façades and sidewalks to encourage safe speeds. Manage vehicular access and volumes through operational changes to reduce speeds while transforming a street's function and feel.

## Rightsize Streets

Rightsize or repurpose travel lanes—not just in width but also in number—to reduce speeds, increase people-throughput, and enhance public spaces.

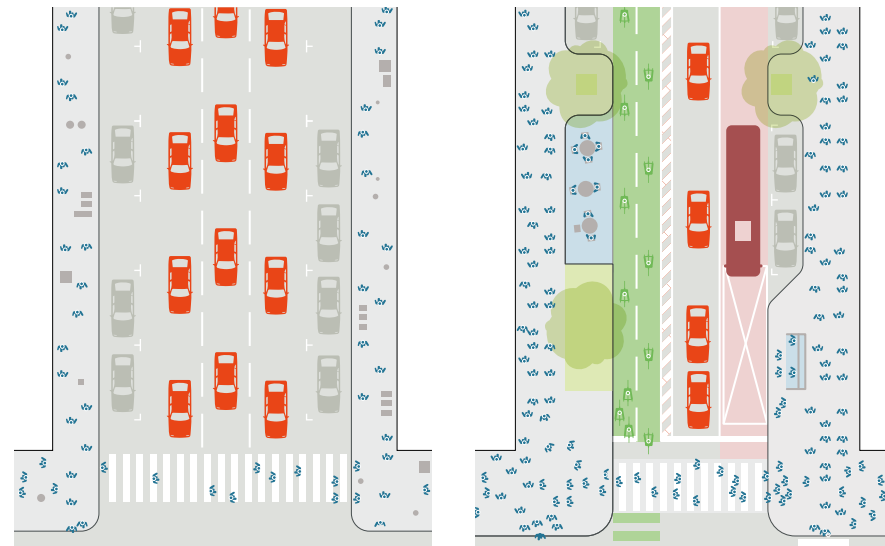
Compact lanes and roadways discourage speeding, improve the visibility of vulnerable users, and shorten their crossing distances. Because street space is finite, the area reclaimed through this approach should serve the greatest number of people and functions possible—whether by supporting sustainable travel modes or enhancing public spaces. *For more details, see 5.1 Safe Lane Geometry.*



### Speed Reduction

Wide multilane roadways that follow highway-like design standards to determine lane widths incentivize unsafe speeds for urban contexts while making an inefficient use of valuable street space.

Repurposing this space to balance the need of all street users is a key strategy to make sustainable—and higher-capacity—modes a viable alternative to driving, addressing congestion at its root cause. Additionally, this approach reduces crossing distances and frees up space to expand public spaces.



Car-oriented street

Multimodal street

	Car-oriented street	Multimodal street
Travel lane widths	4 m	3 m
Roadbed width	12 m	6.3 m
Crossing distance	17 m	9.3 m
People-capacity	12,300 people/h*	30,100 people/h*
Public space	500 m <sup>2</sup>	900 m <sup>2</sup>

\*Considers the hourly capacity of a 3 m-wide lane (or equivalent width) by different modes at peak conditions with normal operations. Assumes (in people per hour) 8,000 for pedestrians, 7,000 for cyclists, 6,000 for transit riders, and 1,100 for private motor vehicles.<sup>1</sup> *For more information, see Global Street Design Guide Chapter 1.7.*

### Substrategies



→ Buenos Aires, Argentina

#### RIGHTSIZE ROADWAY WIDTHS

Redistribute roadway space to rebalance the needs of different street users and reduce speeds.

Motor vehicle lanes should typically be 3 m wide or narrower and no wider than 3.3 m in urban settings. *For more information, see 5.1 Safe Lane Geometry.*

Research has shown that narrower lanes:<sup>2,3</sup>

- Lower speeds by increasing a motorist's proximity with other moving vehicles or the roadway edge.
- Maintain vehicular capacity while improving safety.
- Reduce crossing distances thus reducing the exposure of crossing pedestrians and cyclists.

#### SUPPORT SUSTAINABLE MOBILITY

Reallocate street space to prioritize sustainable modes of transport — such as walking, cycling, and transit. This helps create safer, more inclusive streets with greater overall capacity.

Sustainable transport modes are many times more space-efficient than private cars, meaning they can move more people in the same amount of space.

The reallocation of roadway space for sustainable mobility can significantly reduce speeds on urban streets. Studies show that streets with fewer and narrower traffic lanes are associated with lower driving speeds.<sup>4,5</sup>

#### MAXIMIZE PUBLIC SPACE USE

Repurpose space on the street for non-mobility uses and to enhance green and blue infrastructure such as trees and water features.

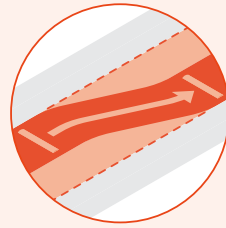
Make public spaces inviting and useful for people of all ages, abilities, and genders, by adding opportunities for seating, resting and playing, transit stops, street trees, bioswales, and other.

Repurposing street space previously dedicated to traffic poses opportunities to improve quality of life for communities, and economical sustainability for businesses. *For more information, see 6.4.6 Maximize Public Space Use.*

## Adjust the Street Pace

Add speed reduction measures at frequent intervals to achieve the appropriate speed.

Long, unimpeded street segments allow motorists to reach and sustain higher speeds. Implement speed reduction measures (both physical and operational) at frequent intervals to help self-enforce the target speed on a given street. Plan interventions at the network level to adjust roadway lengths to appropriate ranges based on the local context and desired speed.



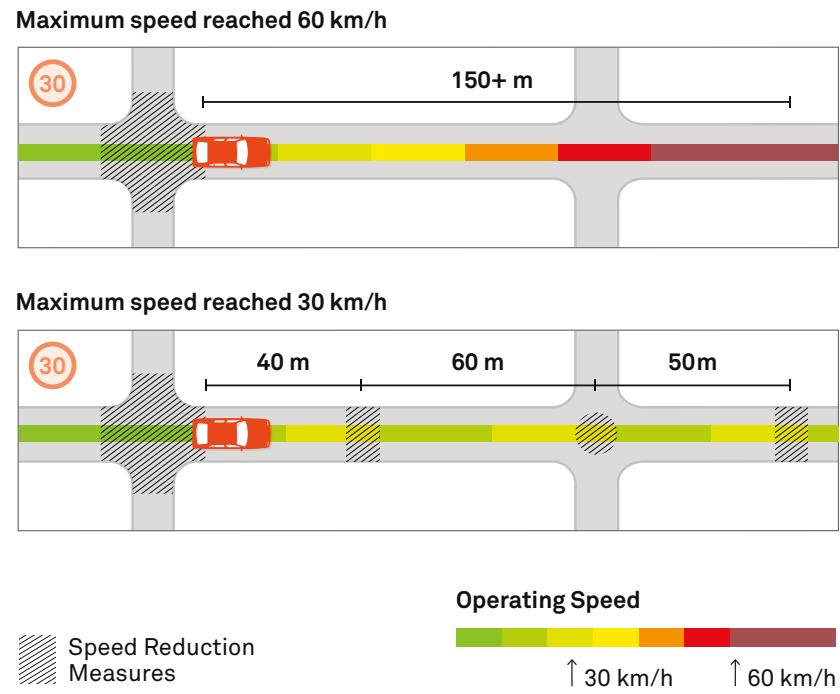
Permeable streets are those where pedestrians of all ages and abilities can cross safely in a crosswalk or at a traffic signal, for example. Increased street permeability generates virtuous circles supporting sustainable mobility, making walking, cycling, and taking transit safer and more convenient for people of all ages, abilities, genders, and income levels.

### Speed Reduction

Practitioners should identify and address long, uninterrupted road segments. Segments are determined by the presence of physical and operational measures that require drivers to reduce speeds or completely stop, such as traffic calming measures, protected crossings, or traffic signals.

Specific design speeds can be achieved by adjusting the spacing between these measures, with different speed ranges corresponding to different intervals.

The diagrams represent the operating speeds reached by a driver on a given street, with posted speeds of 30 km/h, before and after a transformation to manage speeds. In the before conditions, the distance between speed reduction measures is greater than 150 m and high-end speeds were higher than 50 km/h. After the intervention, the spacing was adjusted to 40–60 m, ensuring top speeds were within the street's target speed.



### Substrategies

#### MANAGE THE SPACING BETWEEN MEASURES

Set an intentional spacing (based on the design speed) between physical and operational speed reduction measures.<sup>6,7,8,9,10,11,12,13,14,15,16</sup>

Include vertical and horizontal deflection devices such as speed humps, raised pedestrian crossings, chicanes, and pinch points to reduce speeds. *For more information, see 7.2 Vertical Deflection and 7.3 Horizontal Geometry Tools.*

Organize how different street users take turns and move safely through intersections. Consider intersection treatments that reduce speeds of vehicles approaching from all directions, like raised crossings and mini roundabouts.

#### MAKE THE STREET EASIER TO CROSS

Increase permeability by creating frequent opportunities for pedestrians to cross all street types, including avenues and large streets. Place pedestrian crossings every 80-100 m and no more than 200 m apart. *For more information, see Global Street Design Guide Chapter 6.*

Set short signal cycles. Shorter cycle lengths reduce waiting times for pedestrians and can reduce travel time for vehicular traffic, especially outside more congested hours. *For more information, see Global Street Design Guide Chapter 6.*

Signal cycles over 90 seconds can transform large avenues into barriers that divide neighborhoods. *For more information, see 7.4.2 Signal Progression and Coordination.*

#### SET SAFE SIGNAL PROGRESSION SPEEDS

Set safe signal progression speeds to manage the street's pace.

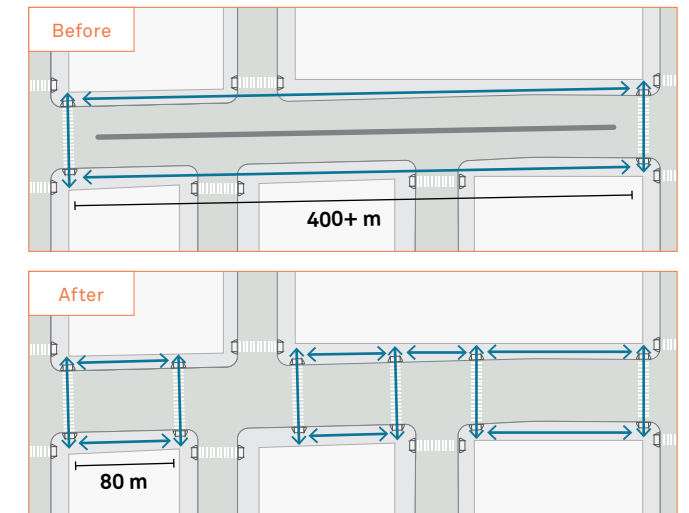
Coordinate traffic signals to promote safe driving speeds over short distances. Long coordination zones with high progression speeds can unintentionally encourage speeding. *For more information, see 7.4.2 Signal Progression and Coordination.*

Design Speed	Measures Spacing
≤ 20 km/h	25–50 m
30 km/h	50–80 m
40 km/h	80–120 m
50 km/h	120–150 m

The recommended spacing of traffic calming measures presented here is based on international research and guidelines from countries including the UK, USA, Australia, New Zealand, Denmark, Sweden, France, Italy, Spain, Lithuania, and Colombia.

These values should be treated as indicative ranges rather than fixed standards, since actual performance depends on factors such as the type and geometry of the measure, roadway and lane width, street typology, pavement, land use and activity, vehicle mix, and national design standards. Additional considerations include the presence of motorcyclists and cyclists, emergency vehicle requirements, and country-specific design standards.

For these reasons, the figures provided should be understood as indicative ranges rather than prescriptive values, and always adapted to the local context. Whenever possible, on-site testing is recommended to adapt spacing to the local context.



→ New York, USA

## Reduce Turn Speeds

Optimize intersection geometry to reduce turn radii and speeds.

Intersections and driveways are where most street users interact—and where many conflicts occur. At these locations, different users leave their dedicated space and cross paths. Managing the speed of turning vehicles is critical to reducing conflicts and improving road safety.

Manage turning speeds, using both physical and operational measures, to protect vulnerable road users while supporting efficient multimodal operations. *For more information, see 5.2 Safe Turn Geometry.*



### Speed Reduction

#### TARGET TURN SPEEDS: 5–15 KM/H

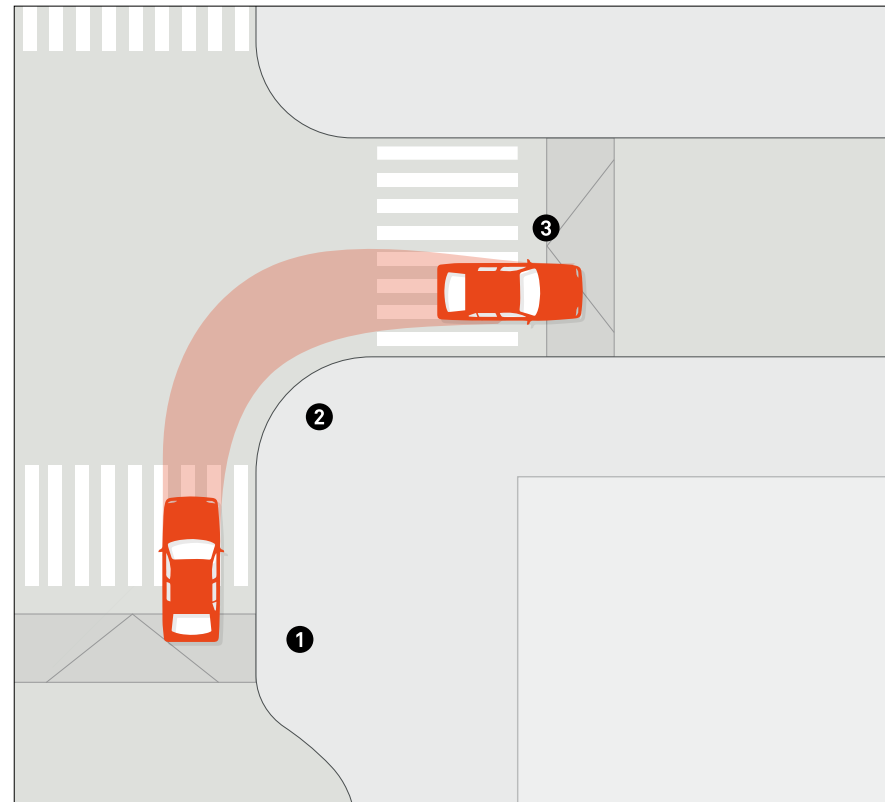
Designers have traditionally adopted design speeds higher than posted limits in an attempt to accommodate drivers' errors. This approach leads to oversized corner radii which, in turn, results in elevated turning speeds, compromising safety for all street users.

Target turn speeds must be lower than the intersecting streets' speed limits and, in urban settings, should seldom exceed 10 km/h and never exceed 15 km/h. Use geometric design, signal operations, and other perceptual cues to self-enforce this target speed.

#### TURN SPEED MANAGEMENT

Design and operational interventions can be combined to:

- 1 **Manage the Approach Speed** to ensure a smooth transition into the curve.
- 2 **Reduce the Inner Radius** to require drivers to slow down while turning.
- 3 **Adapt the Receiving Geometry** to accommodate turns of vehicles of different sizes.



### Substrategies

#### DESIGN COMPACT INTERSECTIONS

Reduce the roadway width of the approaching streets to reduce the intersection footprint, crossing distances, and the effective turn radius.

Simplify the intersection's geometry by breaking down complex intersections into more compact ones, normalizing angled approaches, aligning curbs, etc.

Increase pedestrian space as a result of the optimized geometry.

*For more information, see 5.2 Safe Turn Geometry.*

#### OPTIMIZE TURN GEOMETRY

Reduce the corner radius to manage speeds of turns onto near-side lanes.

Use central islands or circles to manage turns onto far-side lanes.

Adapt the geometry to manage speeds of vehicles of different sizes. Deploy mountable elements to define different geometries for larger and smaller vehicles.

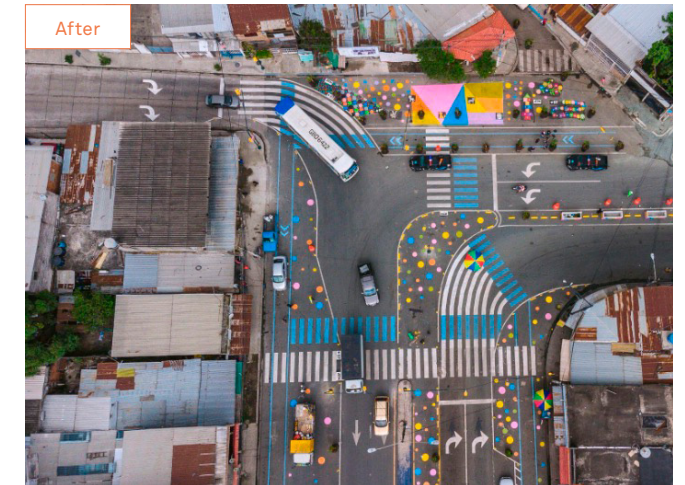
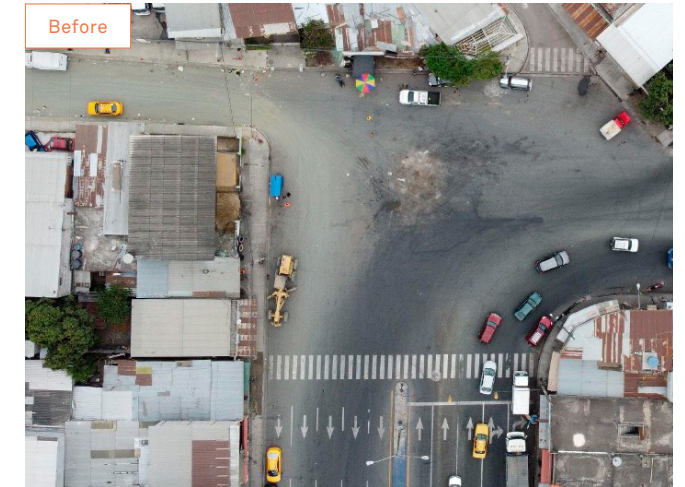
*For more information, see 5.2 Safe Turn Geometry.*

#### RESTRICT DANGEROUS MOVEMENTS

Remove or relocate high-speed, conflictive turn movements to eliminate fast turns from the network.

Remove slip lanes and realign the corner to eliminate high-speed interactions between motor vehicles and pedestrians.

*For more information, see 6.5.4 Reconfigure Street Operations and Design.*



→ Guayaquil, Ecuador



→ Fortaleza, Brazil

## Design Livable Streets

Design streets as human-scaled and people-friendly environments to make speeding uncomfortable.

A street should function as an outdoor room, surrounding its occupants in a space that makes speeding feel uncomfortable and inappropriate. Use perceptual cues to communicate to motorists what speed is adequate to the given street. That subconscious layer reinforces the posted speed limit, which is communicated through signage.

Use changes in materials and dimensions to inform motorists they are entering a lower-speed street in transition points.

The presence and visibility given to the most vulnerable road users also bring positive impacts to motorist's behavior.

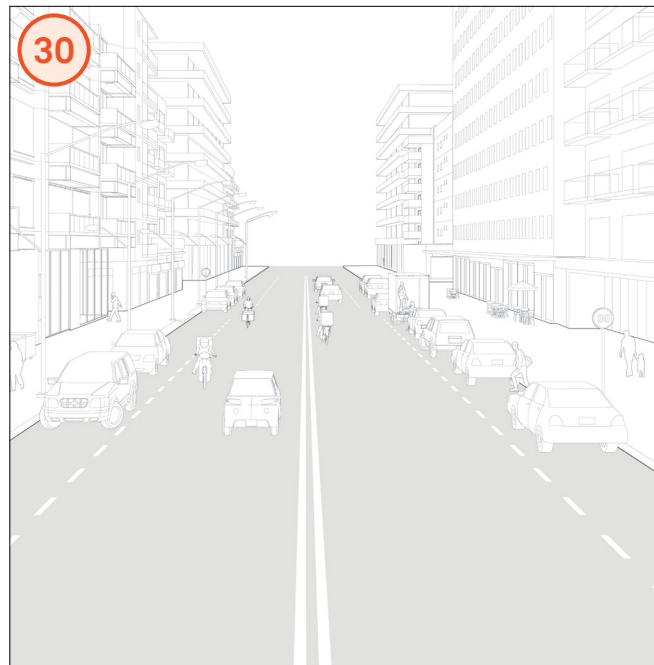


### Speed Reduction

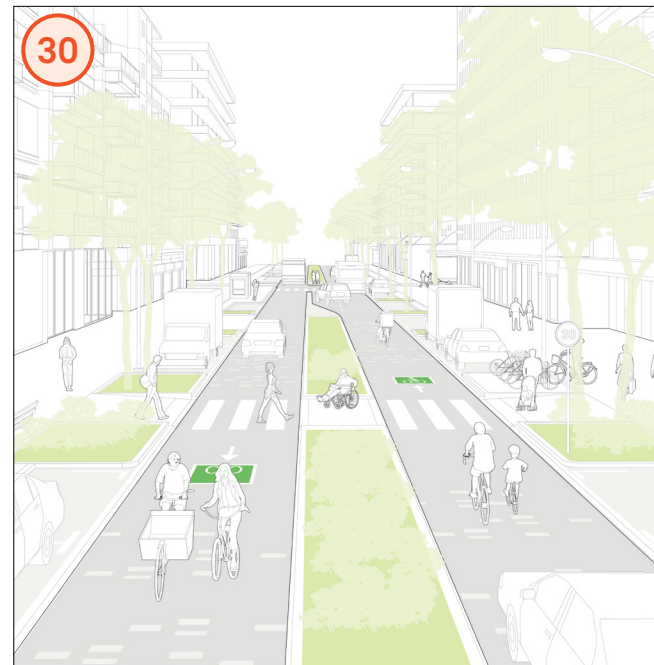
Lower vehicle speeds are often influenced by characteristics of the street environment. That includes street-side characteristics, like the presence of green infrastructure,<sup>17</sup> the proximity of building façades to the roadway, sidewalk widths and the frequency of buildings in urban blocks, and slow zone gateway treatments.<sup>18</sup>

Changes in how people use streets had similar effects. Lower speeds were observed after limiting car trips through neighborhoods, in streets with increased pedestrian and cyclist volumes<sup>19</sup> and on shared streets.<sup>20</sup> Good street design that enhances livability tends to also promote safer behavior from all users.

### SAME SPEED LIMIT, DIFFERENT DESIGN SPEEDS



→ Different characteristics of the street represented above encourage unsafe speeds. That includes the wide roadbed, the asphalt pavement, lack of green infrastructure and street trees, among other factors.



→ The same street, with a very different design, can actively transform a motorist's perception of the space and lead to safer speeds. The width of the roadway and travel lanes is much narrower and more balanced in comparison to the sidewalk. Bulb-outs are filled with green infrastructure, trees, street furniture, and activity.

## Substrategies

### MANAGE THE ROADWAY NETWORK

Filter motor vehicle traffic on certain streets to reduce both speeds and volumes, thus enhancing livability, and cycling and walking conditions. Low speeds and volumes create the conditions for good-quality shared streets. Motorists intuitively reduce their speeds in the presence of pedestrians.<sup>21</sup> For more information, see 6.4.4 Mixed-use Streets.

Consider converting multilane one-way streets into two-way. Two-way streets, especially those with narrower profiles, encourage motorists to be more cautious and wary of oncoming traffic.<sup>22</sup>



→ London, UK

### EMPHASIZE SPEED TRANSITIONS

Configure gateways at the transition points from a higher- to a lower-speed environment. Use several tools such as signs, curb extensions, vertical deflection, etc. to mark the transition into a safe speed zone.

Highlight context transitions along a corridor. The same urban corridor may have different target speeds as its context changes through the city.

For more information, see 7.2.2 Sidewalk-level Crossings and 7.3.3 Pinchpoints.



→ Budapest, Hungary

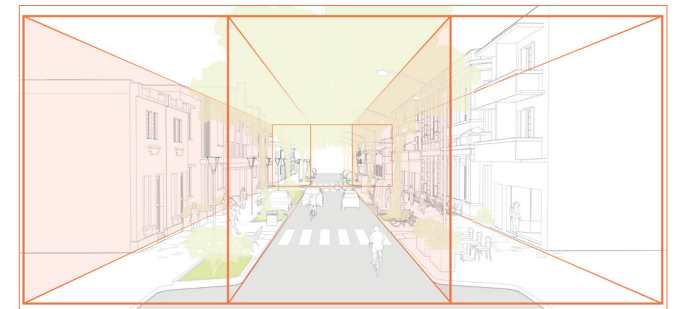
### CREATE A SENSE OF ENCLOSURE

Design the multiple horizontal and vertical planes that enclose the roadway space, both at the edge of the roadbed and next to the property lines.

Treat the roadway pavement materials and markings to match the design speed. For more information, see 7.1.3 Materials.

Add frequent vertical features on the street side to break down the scale of the street and change motorists' speed perception. For more information, see 7.1.5 Streetside Design.

Add dedicated cycling facilities to provide safe and comfortable routes for cyclists. Activate sidewalks, building façades, and street edges to encourage pedestrian activity and create a vibrant street environment.





# 5

## Safe Speed Geometry

The use of safe street geometry is essential to achieve environments that self-enforce the target speed. Aligning street design with the desired behavioral outcomes from street users helps to create safer streets for all.

With a goal of optimizing the spatial configuration of streets and intersections, thoughtful geometric design, combined with the street design and operational strategies, can influence vehicle speeds, improve road safety, and promote more inclusive and efficient street environments.

This chapter explores key geometry parameters for designing streets that prioritize safe speeds. The first part focuses on safe lane geometry and the second part focuses on safe turn geometry. Through a combination of best practices and design insights, city leaders and practitioners can rethink the relationship between street geometry and speed management.

## Safe Lane Geometry

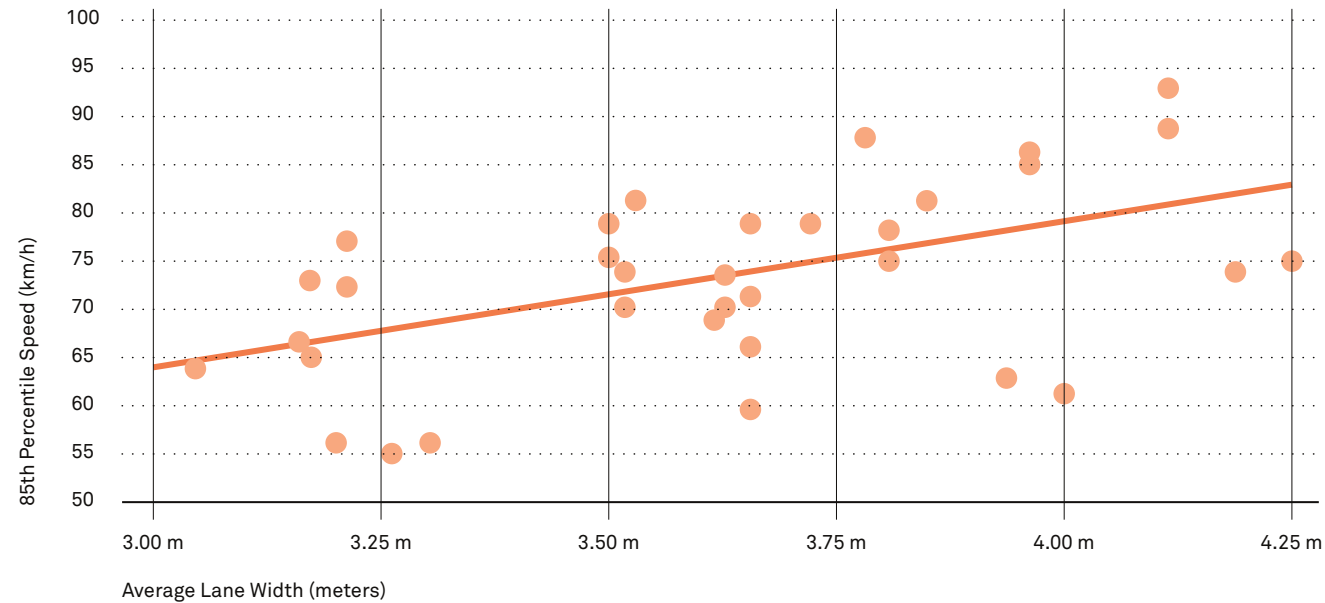
In many cities, wider travel lanes have been favored in street design under the claim of creating a more forgiving buffer between vehicles to avoid conflicts. However, research has shown that oversized lanes and roadways encourage higher driving speeds, leading to poorer safety outcomes. Rightsized lanes support safer speeds and allow space to be reallocated for other uses.

### Lane Width and Speeds

Lanes over 3.4 meters wide are associated with 33% higher impact speeds rates.<sup>1</sup> Wider lanes provide drivers with a sense of comfort, often leading to faster speeds. This effect is compounded by an increase in the total number of lanes and the overall width of the right-of-way.

These conditions not only encourage higher speeds but also reduce safety for pedestrians and cyclists.

### Wider travel lanes are correlated with higher vehicle speed



Adapted from Relationship Between Lane Width and Speed Review of Relevant Literature, (Parsons Transportation Group, 2003)

Studies show that narrower lanes can influence driving speeds through a number of psychological mechanisms. When motorists see wide, straight stretches of pavement with no obstructions on either side, they feel that it is safe to drive fast. The extra effort required to negotiate a vehicle down a narrower lane results in increased cognitive load which forces motorists to reduce their speed. A combination of narrow road beds and streetscape elements can also enhance the sense of enclosure, which results in slower speeds. For more information, see 4.1.4 Design Livable Streets.

### Narrower Lanes and Roadways are Safer

A 2015 study that analyzed crash databases from Tokyo and Toronto found that wider lanes (over 3.3–3.4 m) are associated with **33%** higher impact speed rates and higher crash rates.<sup>2</sup>

Several studies found that reducing lane widths results in a reduction in speed when other factors are held constant. One study in the United States concluded that both peak and off-peak operating speeds, as well as crashes, are significantly related to traffic lane width on urban arterials. During off-peak hours, narrowing lanes by **0.3 m** tend to reduce speeds by **1 km/h**.<sup>3</sup>

A study funded by the European Commission under the Transport RTD Program found that with decreased lane width, drivers show improved lane keeping, more accurate steering behavior, and a reduction in driving speed usually.<sup>4</sup>

In London, UK, parking protected cycle facilities were implemented on Royal College Street. These reduced the vehicle lane width, making it less comfortable for motorists to speed, and leading to a **21%** reduction in traffic speed when measured six months after the works were complete.<sup>5</sup>

In Minnesota, USA, researchers found that converting four-lane undivided roadways to three-lanes with a center two-way left turn lane resulted with a median reduction in both the mean and 85th percentile speeds of **3.2 km/h**.<sup>6</sup>

The expansion of cycling facilities in Fortaleza, Brazil, was primarily achieved by reducing the width of traffic lanes. In 2017, the Fortaleza City Government conducted a before-and-after study with a comparison group on streets where these facilities were implemented. The results indicated an average potential **29%** reduction in injury crashes on streets where lane widths were reduced to introduce a cycle lane.<sup>7,8</sup>

A study from Johns Hopkins University with seven cities in the USA has found that a lane width increase from 9 feet (2.7 m) to 12 feet (3.6 m) is significantly associated with an approximately 1.5 times higher number of crashes.<sup>9</sup>



→ Fortaleza, Brazil



The conventional practice of dividing the roadbed by the intended number of desired lanes often results in unsafe oversized lanes. Always define travel lane dimensions intentionally, striving for safer speeds and an efficient use of street space.

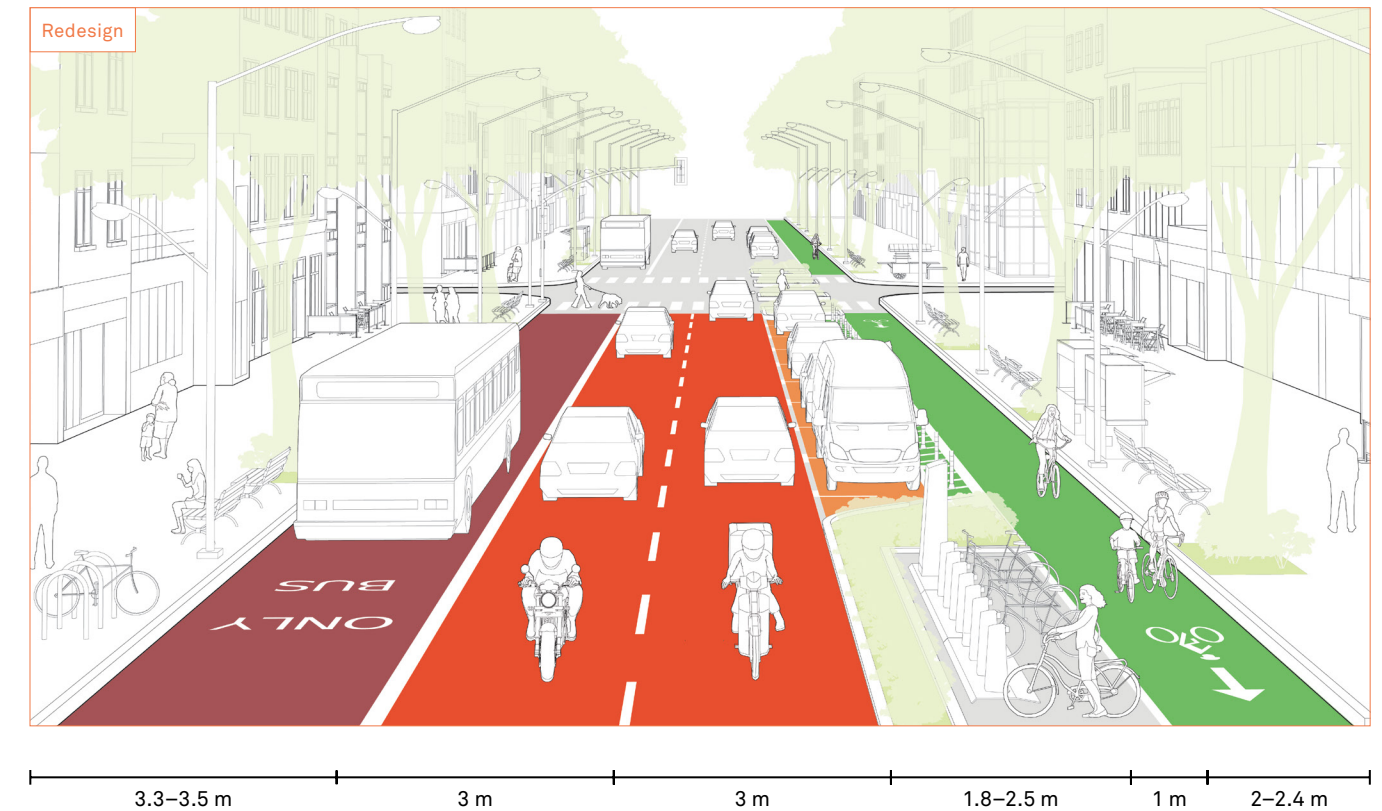
While the forgiving design features of wider lanes can minimize crash severity on highways, their application in urban streets result in severe unintended consequences.

#### TRAVEL LANE WIDTH

Lane widths of **3 m** or less are appropriate in urban areas and improve street safety without impacting traffic operations. One travel lane of **3.3 m** may be used in each direction for designated truck or transit routes. The wider lane should be the outside lane (curbside or next to parking). Inside lanes should continue to be designed at the minimum possible width. Lanes greater than **3 m** are discouraged as they enable unintended speeding, double parking, and consume valuable right-of-way at the expense of other modes. Wider lanes also can encourage motorcyclists to ride between vehicles, a behavior linked to higher rates of pedestrian crashes.<sup>10</sup>

Lane widths of less than 3.5 m have been assumed to decrease traffic flow and capacity, a claim that research refutes.<sup>11</sup>

For curbside lanes, the recommended dimensions outlined in this chapter remain the same, and the gutter space should be included within them.



#### SELECT THE APPROPRIATE DESIGN VEHICLE

Define a design vehicle or design user to set characteristics of the roadway, transitway, sidewalk, and cycleway. Designing for comfortable use by the occasional large truck often results in overly wide roadways or high-speed turns by cars, and opportunities are lost to make better use of this valuable space. Select a design vehicle as well as a control vehicle to prevent the overdesign of a facility. Safe design means tailoring elements for the most vulnerable street user rather than the largest possible vehicle. *For more information, see 3.1 Design, Control, and Managed Vehicle.*

#### BALANCE THE SPACE ALLOCATED FOR EACH MODE AND FUNCTION

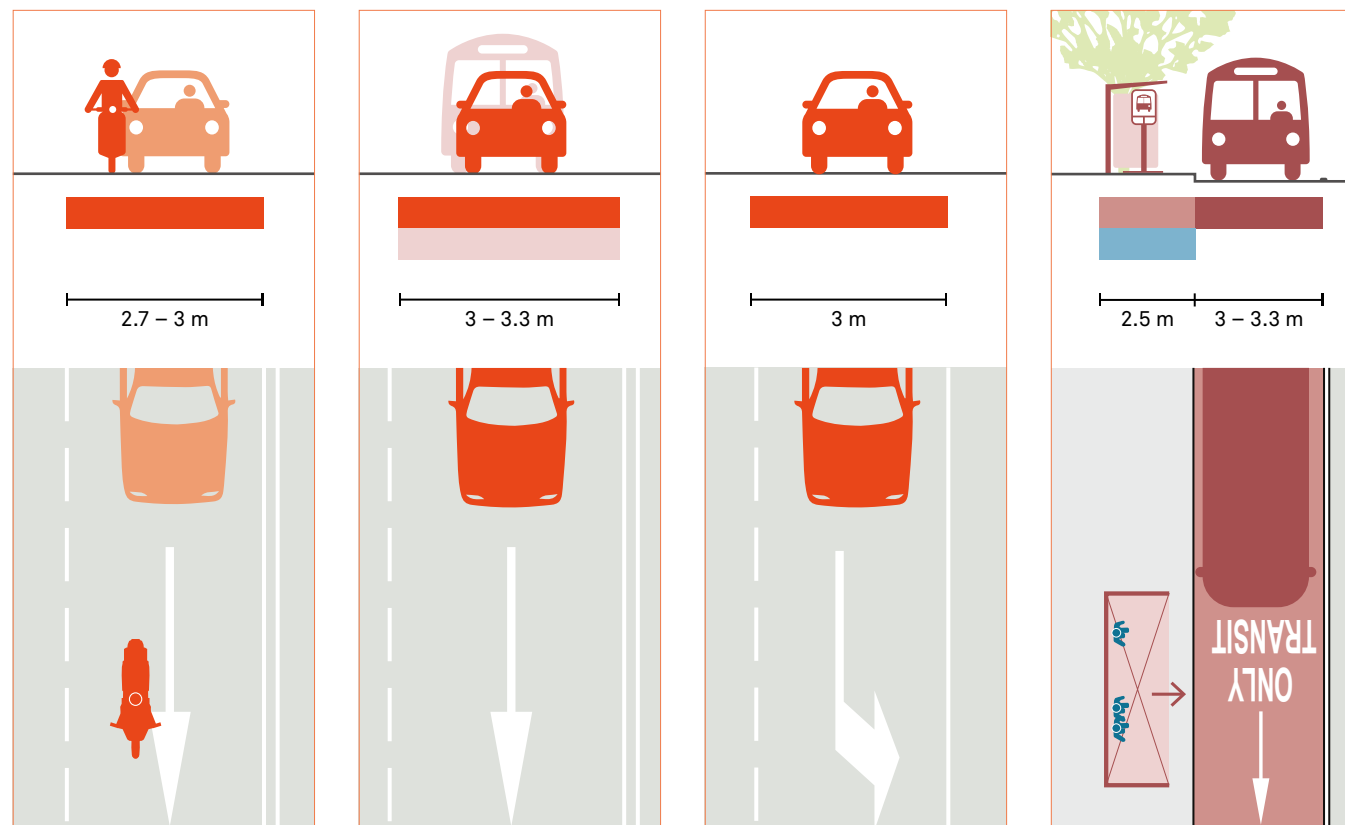
When designing the profile of a street, every centimeter counts. Rightsize over-dimensioned lanes to fit the design into the available right of way. Small amounts of space reclaimed from multiple lanes can add up to meters and make room for new facilities. Repurpose travel lanes entirely for even more significant street transformations.

#### ANALYZE EMERGENCY ACCESS

Many times, lanes are over-dimensioned to accommodate trucks and emergency vehicles. Although this is contextual, fire departments in many parts of the world require wider lanes to ensure sufficient clearance for emergency vehicles. This is usually not difficult to achieve on multi-lane streets but could present challenges on streets that have one travel lane in each direction, on-street parking, and/or raised medians. In these circumstances, consider adding cycle facilities, mountable curbs on medians, median breaks, or flush medians with periodic raised medians for plantings.

## Vehicular Lane Dimensions

Define travel lane widths intentionally based on the managed, design, and control vehicles that will use each lane. *For more information, see 2.2 Through and Access Travel Function.* Do not widen travel lanes due to high expected driving speeds. Rather, keep roadways compact to increase motorists' awareness and prevent speeding behavior.



### MIXED TRAFFIC LANES

The recommended width for through lanes shared by cars and motorized two- and three-wheelers in multilane streets is **2.7 m**. For lanes with occasional full-size transit vehicles, the recommended width is **3 m**. This width serves all of these vehicles while discouraging high speeds.

### LARGE VEHICLE LANES

Through lanes of mixed traffic such as trucks or buses routes may be **3–3.3 m** wide. Curbside travel lanes may also be **3.3 m** wide. Excess width should not be added to the lane but used for buffers, medians, and green infrastructure or to expand pedestrian or cyclists space.

In streets with cycle lanes, always adopt minimum travel lane dimensions to protect or widen the protected facility.

For lanes adjacent to protected cycle lanes, **3 m** wide generally suffices.

### TURNING LANES

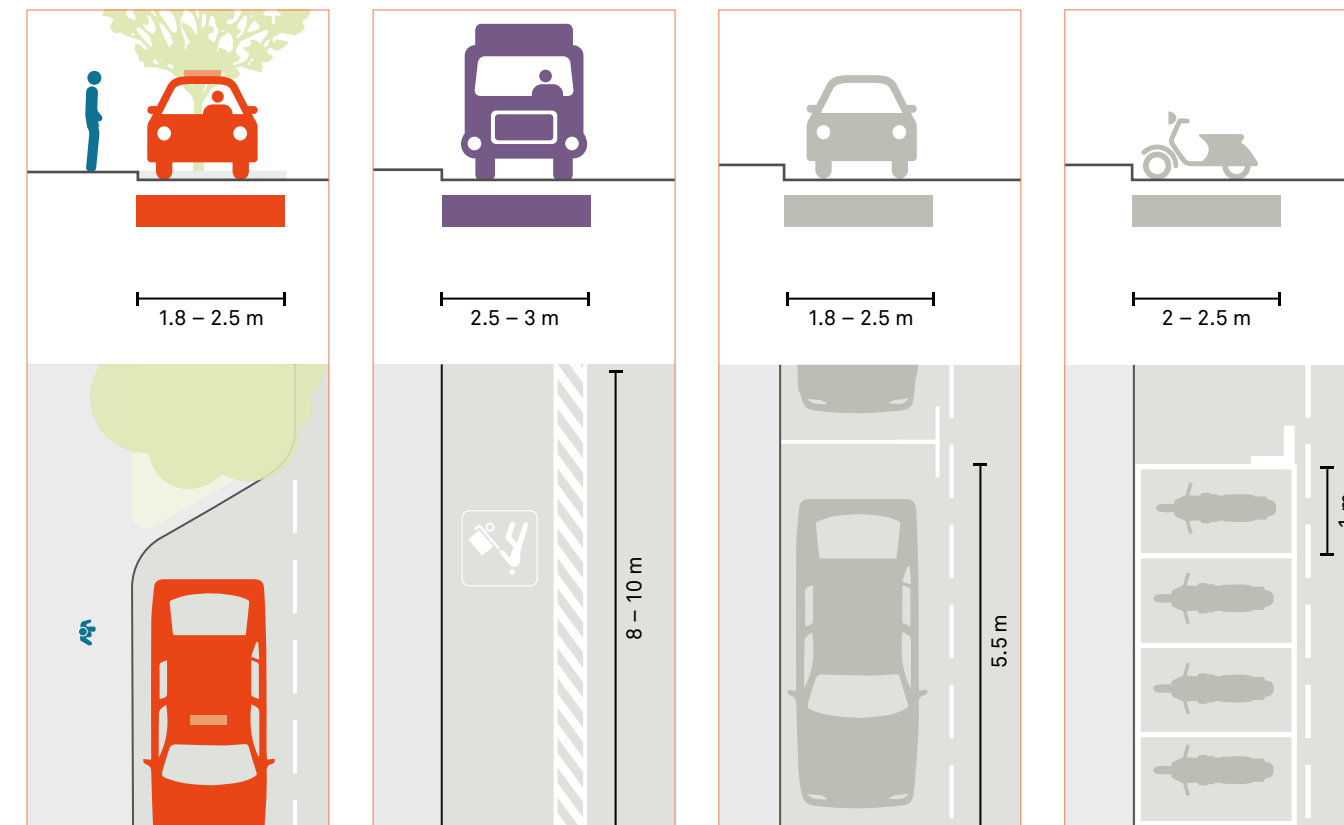
The recommended width for turn lanes or pockets is **3 m** or narrower. When large vehicles are frequently turning, channelization, recessed stop bars, or curb extensions are preferable to wide curbside turn lanes. *For more information, see 5.2 Safe Turn Geometry.*

### DEDICATED TRANSIT LANES

A **3 m**-wide lane allows for a comfortable low-speed operating space, if the lane is not adjacent to a curb. When operating along the curb or in a bidirectional transit configuration, a **3.3–3.5 m** width allows for comfortable operation with low risk for mirror clips or side-swipes. Designate exclusive transitways with pavement markings and signs. *For more information, see Global Street Design Guide Chapter 6.5.*

*In urban streets, travel lanes should always be designed at the minimum viable width for better safety and operational outcomes.*

*Oversized travel lanes lead to higher driving speeds and fail to increase motor vehicle capacity or reduce travel times.*



### FLEXIBLE ZONES

Flexible zones provide a more diverse range of streetside elements and activities than continuous parking lanes.

Remove parking from corners to improve visibility at intersections and manage turn speeds. Add bulb-outs or parklets with multiple purposes, such as green infrastructure (without obscuring pedestrian crossings), bicycle parking, transit islands, play spaces, and vendor spaces.

### LOADING BAYS

Loading bays are designated areas where goods are loaded onto or unloaded from vehicles, such as trucks or vans. These should be located away from intersections to reduce conflicts and prevent visibility impairment and also in areas where services will not block sidewalks or cycle lanes. Loading bays' use should be restricted to certain times of the day, outside of peak hours, particularly in areas with intense pedestrian activity.

### PARKING LANES: PARALLEL

Parking lanes should typically be **1.8–2.5 m** wide. Parking lanes should always be marked to communicate where to park or accommodate cycle or car share vehicles. Parking lane width includes the gutter space, unless drainage type makes it impractical.

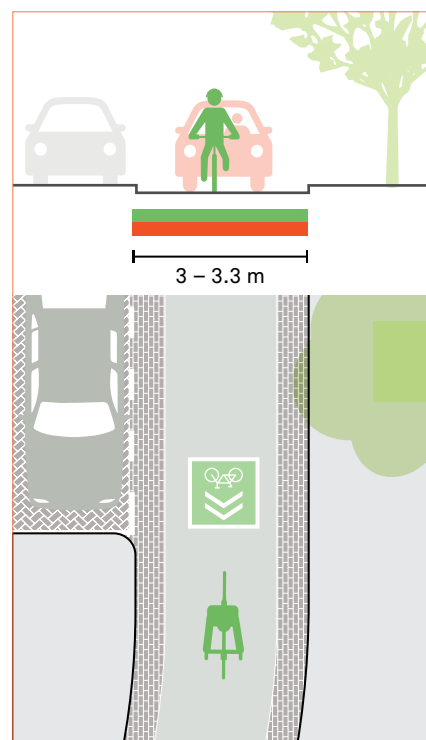
### MOTORCYCLE PARKING

Parking spaces are recommended to be **2–2.5 m** long and at least **1 m** wide. This type of parking should be provided where the use of motorcycles is common. They can be provided in conjunction with cycle and automobile parking. Providing dedicated spaces for motorcycles allows sidewalks to remain clear and safe for pedestrians.

## Cycle Streets

These are streets that accommodate high cycle flows and motorized traffic is kept low. Cyclists take a primary position by design, motorists are invited to use the street as guests, and motor vehicle access is limited in some stretches. **Speeds on such streets should not exceed 30 km/h.**

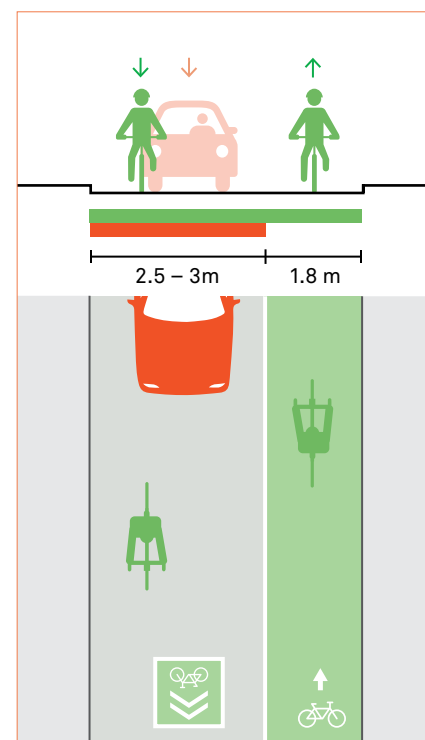
Cycle streets use design and operation to manage motor vehicle speed and volume and restrict through-traffic while maintaining connectivity for cyclists. Cycle streets should not be implemented on streets with more than one travel lane per direction. For more information, see *Global Street Design Guide Chapter 6.4*.



### UNIDIRECTIONAL CYCLE STREET SEGMENT

The overall lane width between curbs and vertical barriers must allow the control vehicle to navigate the space—usually between **3–3.3 m**. To compensate for the extra width, adopt a **1.6–2.4 m** lane on a smooth surface, where the cyclist can ride in the center of the lane.

Unidirectional cycle street segments should be complemented by an alternative route on a nearby cycle facility running in the opposite direction. Those can be a similar cycle street or a cycle track in the opposite direction in the same street.

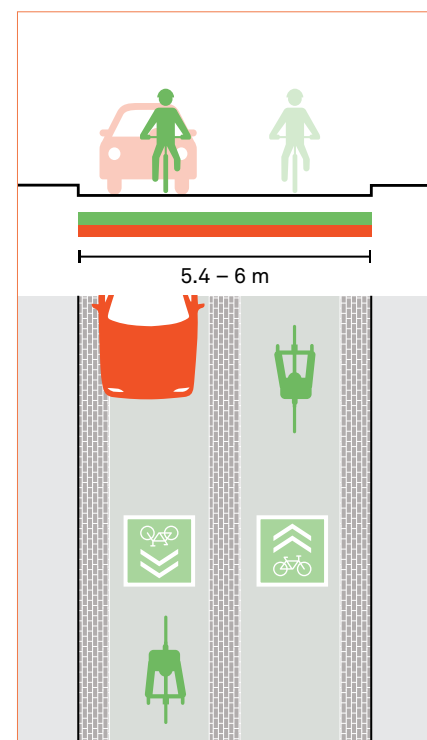


### CONTRAFLOW CYCLE STREETS

Contraflow cycle streets are one-way streets for motorized vehicles in which cyclists are allowed to ride in both directions. Cyclists can either ride on a shared or a dedicated facility.

These streets encourage more people to cycle, as they allow cyclists to use redirect routes, avoiding unnecessary detours. Contraflow cycle streets have been proven to be safer than other one-way streets.<sup>12</sup>

For dedicated contraflow facilities, the recommended width is **1.8–2 m** and the shared lane can be as narrow as **2.5 m**, and never wider than **3 m**. At these speeds (not above 30 km/h), contraflow may not require physical separation, but intersections must be carefully designed since other users may not expect it.



### TWO-WAY CYCLE STREET

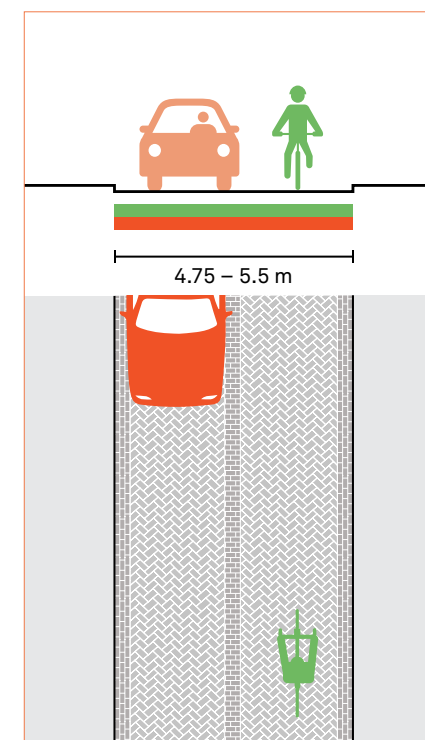
Travel lanes on cycle streets should be kept narrow to control vehicular speeds. The recommended total width for both directions of traffic is **5.4–6 m**.

Motorists must invade the opposite lane in order to overtake cyclists on these facilities. A **0.6 m** raised median can be added to discourage overtaking.

Use pavement materials and/or different colors to create a smooth **1.6–2.4 m** cycleway clearpath. Cyclists should be encouraged to ride in the center of the travel lane, making them more visible and requiring drivers to reduce their speed to increase safety. Use textured materials next to the lane to reduce driving speeds by visually narrowing the lane and reducing driving comfort.

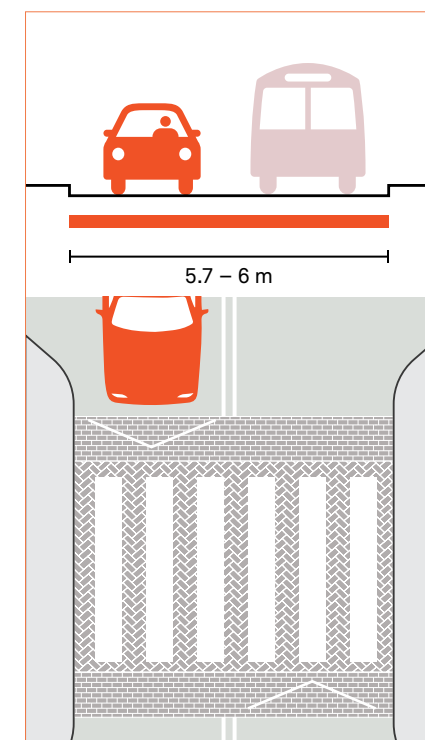
## Undivided Two-way Streets

Undivided, one-lane-per-direction streets are very common, usually associated with constrained rights-of-way. Compact travel lanes free up critical space for other uses on narrow streets. Such cases include a wide spectrum of situations, from quiet residential streets to busy corridors with high volumes, transit, and freight. Lane dimensioning depends on the local context and traffic composition, but managing speeds is a universal need.



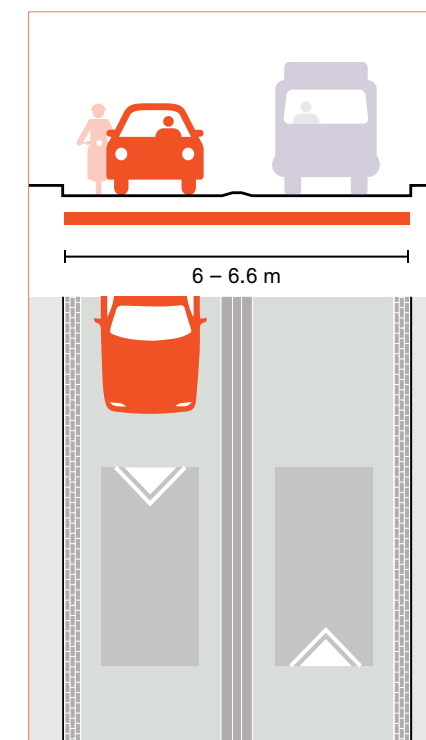
### LOW-VOLUME TWO-WAY STREETS

In low-volume two-way streets where large vehicles are rare or not permitted, the recommended width for both directions of traffic is **4.75–5.5 m**. In such cases, vehicles moving in opposite directions can yield to one another as they pass at low speeds. This allows for significantly more compact roadways and a more balanced and efficient use of space to prioritize walking and cycling, which is particularly valuable on narrow streets.



### WITH OCCASIONAL LARGE VEHICLES

Undivided two-way streets used occasionally by large vehicles such as ambulances or waste collection trucks can have a total roadway width of **5.7–6 m** for both directions of traffic. This requires the drivers to slow down while passing one another.



### WITH FREQUENT LARGE VEHICLES

If large vehicles are frequent users—usually due to a lack of alternative routes in the network—adopt widths ranging between **6–6.6 m**. A mountable, textured, or striped centerline can help mitigate the speed incentives generated by the extra width. They discourage overtaking and visually narrow the travel lanes for all users, discouraging speeding. Combine this treatment with additional speed reduction measures especially if vulnerable road users frequently share the roadway space.

## Streetside Elements and Activity

Studies show that streetside elements and activity can contribute to lowering speeds and improving road safety. Highway design guidance recommends creating clear zones on the sides of roads free of fixed objects. This approach does not translate well to urban environments. In the lower speed environment of cities, streetside elements serve important functions and enhance character.



### 1 Green Infrastructure

Trees and vegetation can affect driver behavior positively, resulting in lower speeds and safer streets.<sup>13</sup> The tree canopy can enhance the sense of enclosure of a street.

Do not remove trees due to the risk of car crashes; instead, lower speeds for better safety outcomes. Be careful with plant placement and height near pedestrian crossings as not to obscure visibility of approaching pedestrians.

Consider maintenance requirements such as trimming, watering, and leaf fall (and associated costs) as part of the project design and an ongoing need.

### 2 Pedestrian and Cycle Facilities

Street furniture and amenities such as lighting, benches, kiosks, transit facilities, utility poles, signs, tree pits, and cycle parking should be placed in the sidewalk's street furniture zone. They must not obstruct the pedestrian clear path. *For more information, see Global Street Design Guide Chapter 6.3.4.*

Care should be taken to ensure the visibility of pedestrians and cyclists at key conflict points. Observe minimum shy distances from the roadbed.

Wide, accessible sidewalks can increase foot traffic. Higher densities of pedestrian and cyclists are associated with safer speeds.<sup>14</sup>

Cycle facilities attract new users and increase driver awareness of this transportation mode. Those also result in narrower roadway spaces, enhancing the enclosure perception.

### 3 From Parking to Flexible Zones

Transform parking lanes into flexible zones by providing a more diverse range of streetside elements and activities.

Remove parking from corners to improve visibility at intersections and manage turn speeds.

Add bulb-outs or parklets with multiple purposes, such as green infrastructure and landscaping, bicycle parking, play spaces, seating, waste collection, and vendor spaces.

Support multimodal transportation by adding transit islands, bicycle parking and sharing, taxi stands, car and motorcycle parking, and loading zones.

### 4 Building Edges

When a building sits on a property line, or with only small setbacks, it helps to provide a sense of enclosure to the street. If buildings have large setbacks, consider how fencing, landscaping, and other elements might help to reduce the scale of the street, making it feel more human-scaled.

A higher frequency of buildings, entrances, and windows is associated with more intense street activity and lower speeds.<sup>15</sup>

## Flexible Zones

In some contexts, the curbside of a street can be occupied almost entirely by parking. However, this space can serve a much broader purpose. By introducing different elements, curbside areas can be transformed into flexible zones that support activity for all street users. Flexible zones can accommodate people doing business, play, utilities, seating, landscaping, green infrastructure, stormwater management and community life. Design flexible zones that respond to changing contexts and local needs.



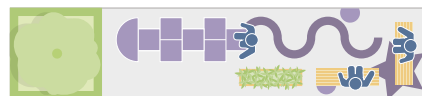
### SMALL LIBRARY OF OPTIONS

This section shows examples of elements that are part of the design of flexible zones. Depending on the street context, they can support a range of activities and uses, helping streets adapt to local needs and enhance everyday life.

Seating and resting areas



Play area



2 Cycle share stations



Trees



4 Loading bays



Curb extension



Essential services



Cycle racks and corrals



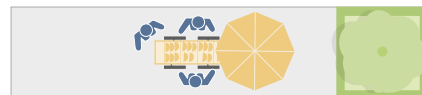
Landscape and permeable paving



5 Pick up and drop off and parking



Vendor stands and people doing business



1 Parklets



3 Transit stops and shelters



Green infrastructure



Taxi stands



## Share the Street

In commercial areas, shared streets can significantly contribute to the public space network, adding vibrancy and activity with outdoor dining, public seating, artwork, and landscaping. In residential areas, shared streets become the extension of front yards, places to meet neighbors, and build communities. Shared treatments make streets safer for all users.

To function as shared spaces, streets must have low traffic volumes and ensure motorists stay at appropriate speeds, with the target being 10–15 km/h. Implement volume and access management strategies in combination with speed reduction devices throughout the street to create conditions for shared streets.

### Residential Shared Streets

Many low-volume residential streets effectively already operate as shared spaces in which children play and people walk and cycle, sharing the roadway with drivers.

By adjusting traffic volumes and speeds, these spaces can turn into flexible areas for the community, where children can play, people can meet, and even do business.



### Commercial Shared Streets

On small downtown streets where local transit serves a high density of destinations, high pedestrian activity levels and low vehicle volumes often create shared conditions. Such underperforming rights-of-way can be transformed into an inviting plaza-like shared space while facilitating key transit connections.

Shared commercial streets are designed to enable a wider array of activities, including those that support local businesses like adding outdoor dining areas and facilitating loading and unloading at designated hours.



### COMBINE VOLUME MANAGEMENT AND SPEED REDUCTION MEASURES

Design clear gateways onto the shared street, with narrow vehicle path entries to slow vehicular traffic to appropriate speeds. Consider implementing filtered permeability at key intersections to disincentivize through traffic and reduce vehicular volume within the area.

Use curbs and surface treatments that create unusual geometries to enhance the feeling of shared environments and encourage drivers to reduce speeds by diverting their path of travel.

Designate zones for parking, landscaping, and flexible activities to create a chicane condition and slow vehicular traffic. *For more information, see 7 Safe Speeds Toolbox.*

### ENSURE PEDESTRIAN PRIORITY IS CLEARLY COMMUNICATED

Use textures and street furniture to reinforce pedestrians have the priority throughout the space.

Maintain a clear path for people cycling and motor vehicles. The path can be defined using landscape, street furniture, parking zones, bollards, street utility poles, or textured pavers.

Change materials and colors to demarcate different zones. Parking and loading/unloading zones must be clearly marked to avoid motorists stopped in undesired areas. Also establish designated times for parking and loading/unloading, ensuring they are well communicated to motorists and businesses.

### CREATE SPACE FOR SOCIAL INTERACTION

Add benches, tables, play elements, and other urban furniture to allow people to spend quality time in the street. Consider adding flexible zones so residents and business owners use them according to their needs, helping the community take ownership of the street space.

Experiment with car-free hours or test shared streets using temporary materials to evaluate the potential impact on traffic operations. Use planters or other movable elements to restrict vehicular traffic access and enable these experiments.

Light the streets evenly to create a safe and inviting environment. Light poles and fixtures for shared streets can be designed to add character and a sense of the local context.



→ London, UK



→ Istanbul, Türkiye



→ Barcelona, Spain

## Safe Turn Geometry

The street geometry at intersections is critical to achieving safe turning speeds and minimizing conflicts. Turning movements are often high-risk, as they often involve interactions between multiple road users and require precise maneuvering by motorists. Larger turn radii can lead to higher speeds, reduced visibility, and increased potential for crashes.

By reducing the effective turn radii, practitioners can create compact intersections that naturally encourage safer speeds and reduce risks for all users. Compact intersections with small corner radii can also enhance predictability and ensure that they are accessible and functional for all.

### Turn Radius and Speeds

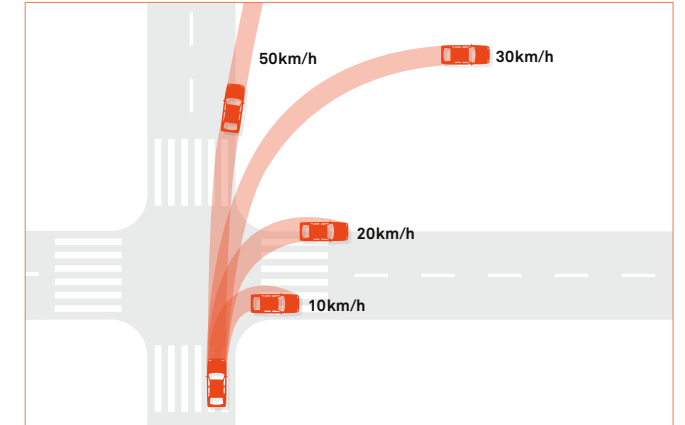
Larger corner radii enable vehicles to turn at higher speeds, increasing the risk of collisions, especially with pedestrians and cyclists. Larger corner radii also increase crossing distances, making intersections less safe and accessible. Reducing the turn radius is a fundamental strategy to achieve safer, lower-speed turns while improving safety for all road users.



→ Mexico City, Mexico

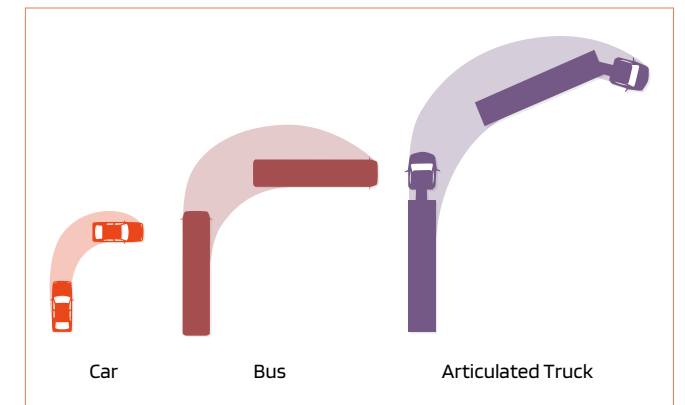
### TURN SPEED AND SPACE

Adopting the right design speed to design intersections is critical. Adopt design speeds between **5–15 km/h** for any urban context. Turns with higher design speeds are unsafe and require impractical amounts of space for most urban intersections. For modeling purposes, adopt speeds of **5–10 km/h** for the managed vehicle and no more than **5 km/h** for the design and control vehicles. Field testing or observation can be conducted as software may be inaccurate at low speeds.<sup>16</sup> For more information, see 3.1 Design, Control, and Managed Vehicle.



### VEHICLE MANEUVERABILITY AND SPACE

Less maneuverable vehicles require more space to turn. Longer vehicles are generally less maneuverable than smaller ones, but exceptions exist. For example, long articulated buses can be more maneuverable than standard 12-meter city buses. Defining design parameters, especially what vehicle types are your design, control, and managed vehicles, is a key determinant of intersection geometry and overall compactness. Large vehicles don't need to access every street in a city. Instead, strive for the smallest practical vehicle set. For more information, see 3.1 Design, Control, and Managed Vehicle.



### Reduce radii, reduce turning speeds

In NYC, left turns are three times as dangerous as right turns. As part of the NYC DOT's Turn Calming Program, the city has implemented flexible plastic posts or rubber speed bumps to treat left and right turns at critical intersections. As a result of different applications that reduced turning radii, including rubber speed bumps, median left turn speeds have decreased by **54.3%**, and median right turn speeds have decreased by **32.7%**. Given these elements are implemented in portions of the intersection that are highly exposed to vehicle traffic, frequent maintenance might be needed.<sup>17</sup>

A study done in Washington D.C, USA, found that centerline hardening applications that aim to reduce turning radii helped reduce mean left-turn speeds by **9.8%** and the odds of left-turning vehicles exceeding 15 mph or 24 km/h by **67.1%**.<sup>18</sup>

A study of a slip lane removal in an urban context in Darebin, Australia found that the removal of the slip lane had the effect of reducing average speeds on a 40 km/h limit intersection to between **15-20 km/h**. This did not just serve to slow turning traffic but also forced straight-on traffic to slow to wait while turning vehicles completed a turn that would have otherwise been made in the slip lane.<sup>19</sup>



EVIDENCE

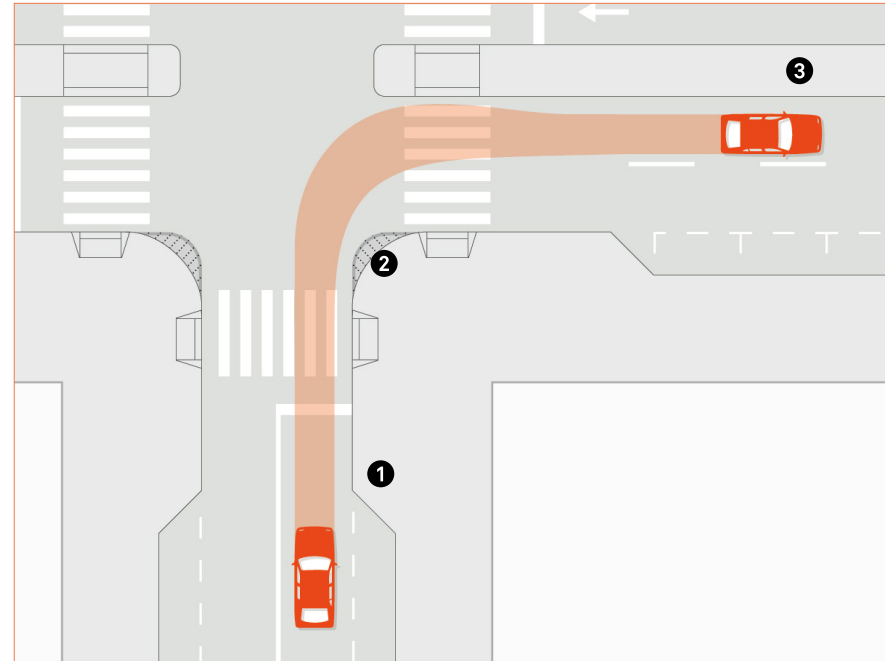
## Understanding Turn Geometry

Optimal turning geometry balances safety, efficiency, and functionality at intersections to ensure safe turning movements through design. Evaluate vehicle types, pedestrian and cyclist needs, and available space constraints to design a configuration that encourages safe turning speeds and provides a comfortable environment for all users.

### Use Design and Operations to Self-Enforce the Target Turn Speed

Consider these three aspects when designing safe turning speeds: 1) *Managing the speed and position of motorists approaching the intersection*; 2) *Adjusting the corner radius to control the inner turn path*; and 3) *Conforming the geometry of the receiving lanes*. Geometric design techniques limit the available space to manage turn speeds, while accommodating smaller and larger vehicles. For more information, see 3.3. *Through and Access Travel Function*.

To ensure safe turns, it is essential to consider how different design elements interact with one another. Design choices made for each component will affect the others. Contextual constraints, such as the presence of an existing tree or the need for additional public space at a corner, may require compromises in one aspect of the turn design. However, these can be balanced by implementing stricter measures in the remaining components.



#### 1 Manage the Approach Speeds

To manage turn speeds, start by controlling the approach speed on the origin street, as this impacts subsequent steps. Apply the four street design and operational strategies to ensure safe turning speeds. To manage speeds in midblock locations, narrow or repurpose travel lanes, use vertical and horizontal deflection elements, create pinchpoints, or adjust pavement materials. Reconfiguring the overall street environment can also be effective. For more information, see 4 *Strategies*.

Adjusting sightlines at intersections is critical for conflict management and directly impacts approach speeds. Proactively lower speeds near conflict points to ensure adequate sightlines and predictable movements.

#### 2 Tighten Corner Radius

The corner radius will define the amount of space available on the inner side of the turning path. While standard corner radii are **3–5 m**, in urban settings, smaller corner radii of **1.5 m** are preferred and corner radii exceeding **5 m** should be the exception.

Use mountable elements to manage the speeds of vehicles of different sizes. For more information, see 5.2.3 *Near-side Lane Turns*.

Besides having an impact on the turning speed, minimizing corner radius is critical to creating compact intersections. It reduces pedestrian crossing distances and allows more area for better pedestrian ramp alignment.

#### 3 Manage Receiving Geometry

Due to the nature of vehicle turning paths, receiving lanes often require a wider space than approach lanes. Larger vehicles, such as city buses and trucks often generate a more spacious turning path on the receiving lane or lanes.

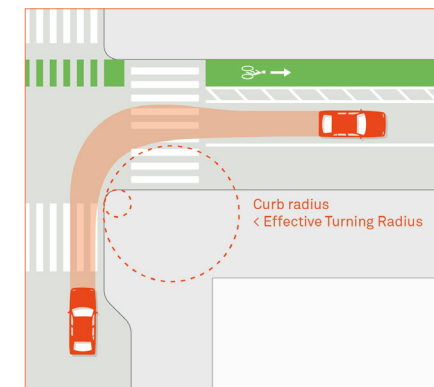
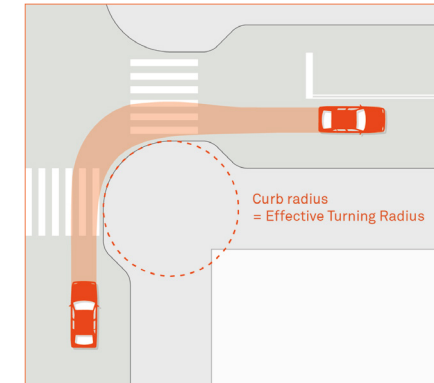
Use geometric design to limit the available space at receiving lanes to self-enforce safe target turning speeds.

Under certain conditions, designers can assume that selected vehicle types may invade adjacent or opposite lanes while turning if those spaces are not being used during the simultaneous movement. Counterintuitively, this approach can lead to better safety outcomes, particularly for vulnerable road users, as it allows for more compact designs and safer speeds. For more information, see 5.2.3 *Near-side Lane Turns*.

### Corner and Effective Turning Radius

The effective turning radius is often confused with the corner radius. While both impact turning speeds, corner radius refers explicitly to the curvature of the curb at the intersection. In contrast, the effective turning radius refers to the entire space motorists use to make the turn. The effective turning radius, for both near- and far-side turns, is determined by the curb radius and the geometric design of the whole turning area. It is impacted by elements such as on-street parking, cycling infrastructure, the number of travel lanes, medians, traffic control devices, and others. The less compact a turning area is, the wider the effective turning radius will be.

Narrow streets with curbside travel lanes may require larger corner radii because the effective turning radius mirrors the actual corner radius. The same holds for streets with curb extensions. Streets should not be designed with larger corner radii in anticipation of the entire roadway being used for vehicle traffic at some point in the future.



### Risks of Turns onto Far-side and Near-side Lanes

#### 1 Turns onto Far-side Lanes

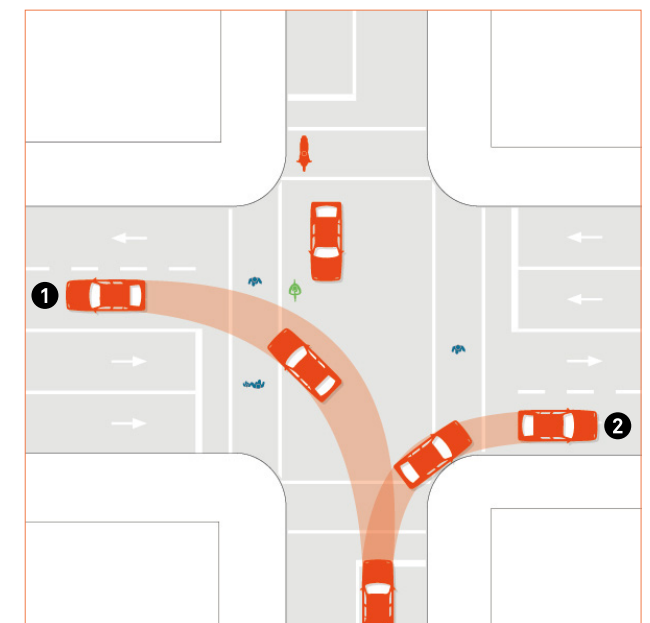
Ensuring safe speeds for far-side lane turns (typically left turns in right-hand traffic countries) presents specific challenges due to its geometric configuration. Unlike near-side turns, far-side turns usually lack a physical barrier on the inner part of the curve and have longer turn distances, resulting in larger effective turn radii. These factors enable motorists to navigate far-side turns at higher speeds.

The risk to pedestrians is also greater, as the potential conflict area during crossing is larger than for near-side turns.

On two-way streets, far-side lane turns additionally conflict with oncoming traffic from the opposite direction, increasing the risk of head-on collisions.

#### 2 Turns onto Near-side Lanes

These involve turning into a lane on the same side of the intersection as the originating street. Near-side lane turns generally have fewer conflicts and smaller turn radii compared to far-side turns. However, managing corner radii remains critical to achieving safe target turn speeds.



## Compact Intersections

Compact intersections enhance road users' safety by reducing through and turn speeds, improving visibility, and shortening crossing distances. Moreover, this approach allows for a more efficient use of urban space. By reducing the roadway footprint of intersections, it's possible to allocate more space for pedestrian amenities, greenery, and community gathering areas, contributing to a more vibrant and livable urban environment.



→ Córdoba, Argentina

### SIMPLIFY GEOMETRY

Break complex intersections into multiple, simpler, more compact ones to increase legibility, uniformity, safety, and minimize conflicts. Consider removing redundant or particularly conflicting vehicular movements to simplify intersection geometry further, save signal time, and maximize public space potential.

Free-flow slip lanes should be repurposed as pedestrian spaces or protected corners for cyclists. *For more information, see 5.2.3 Near-side Lane Turns.*

To reach the most compact intersection possible, design the corner radius selecting the appropriate design, control, and managed vehicles, reduce the number of lanes, and narrow lane widths. More compact intersections result in shorter pedestrian and cyclist crossing distances, increasing visibility and reduced speeds of motorized vehicles near conflict points. *For more information, see 3.1 Design, Control, and Managed Vehicles.*

Use additional elements such as medians, curb extensions, corner realignments, and mini roundabouts to delineate safer turning movements. *For more information, see 7 Safe Speeds Toolbox.*

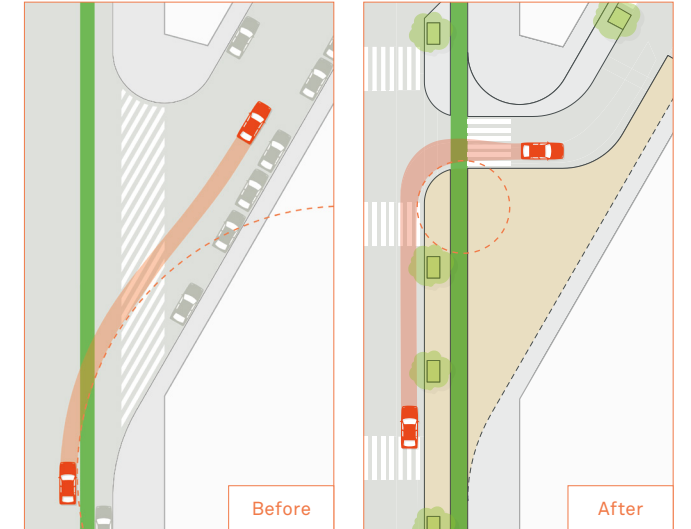
### NORMALIZE THE INTERSECTION

When two or more streets meet at an angle that differs from 90 degrees, the resulting intersection is usually very wide, and it can also be confusing due to the amount of possible movements. Normalizing the intersection helps make it more compact and more legible.

Redesign streets to be as orthogonal as possible and consider aligning the geometry of opposite legs of an intersection to improve sight lines and visibility.

Orthogonal intersections help manage turning speeds by reducing the curb radius of the intersection and the crossing distances of pedestrians and cyclists and thus their exposure to a crash. Ensure that these crossings are aligned with desire lines and serve key destinations.

This approach fosters a safe environment and contributes to an increase in overall pedestrian space, particularly at the corners, converting underused space into valuable public spaces for local communities to enjoy.



### INCREASE PEDESTRIAN SPACE

Increase pedestrian space while redesigning intersection geometry, consolidating spaces in logical and usable areas.

Connect plazas to busy sidewalks or key destinations to create attractive pedestrian spaces and enhance accessibility.

To accommodate pedestrian volumes, incorporate protected refuge islands in pedestrian crossings that facilitate two-phased crossings. Connect public spaces by attaching them to existing sidewalks or pedestrian spaces. Avoid designing public spaces surrounded by roadways. Public spaces that are not connected to other pedestrian spaces lose the opportunity for ground floor building activation and force pedestrians to cross vehicular traffic to access the space, making them less usable and appealing.

Enhance plazas with seating, shading, lighting, and play elements to create inviting spaces for people of all ages throughout the day. *For more information, see Designing Street for Kids.*



→ Recife, Brazil

## Near-side Lane Turns

Near-side lane turns, where motorists don't cross lanes of opposing traffic, generally involve fewer conflicts than far-side lane turns and benefit from reduced turn radii, which naturally encourages lower speeds. However, managing the corner radius remains critical to achieving safe turn speeds. Proper design of near-side turns can further enhance safety by maintaining low and consistent turn speeds.



→ Fortaleza, Brazil

### Rightsize Corner Radii

Smaller corner radii are crucial for creating compact intersections and encouraging safe turning speeds. While not the sole determinant, the corner radius directly impacts motorist turning speeds and pedestrian crossing distances. It's important to define proper dimensions according to the context, target speed, and design vehicle.

Target turning speeds should be limited to 10 km/h or less, accommodating tighter corner radii. Minimizing turning speeds is crucial to pedestrian safety, as corners are where drivers should expect to encounter pedestrians crossing.

The corner radius also directly affects the length of pedestrian crossings—the smaller the radii, the shorter the crossing distance. Shorter crossings enhance safety by reducing exposure to risk and also provide more space for pedestrians, improving ramp alignment and waiting areas.

The radii at which a corner can be constructed is determined by the types of vehicles and frequency that they will use it. Intersections with high bus and extended vehicle usage will require larger turning radii. However, designers should strive to use the tightest radii possible to reduce turning speeds as much as possible.

Consider using methods that restrict the turning speed of smaller vehicles while accommodating large vehicles when needed to avoid unnecessary widening of the intersection. Using mountable curbs, different surface materials, and/or markings allows the generation of different radii for different vehicle types at the same corner.

### Mountable Elements Optimize Turning Speeds

A mountable element refers to a structure designed to be traversed or driven over by vehicles, although not at a high speed. The surface material used should be less inviting to drive over than the regular roadbed pavement—generally by using bumpier materials at the corner. This allows designers to define two different turn radii on the same corner, one for smaller and the other for larger vehicles. The majority of small vehicles will use the more inviting—yet sharper—turn path, while larger, less frequent vehicles perform a wider-radius turn over these structures, still at safe speeds.



→ New York City, USA

### TEMPORARY MATERIALS

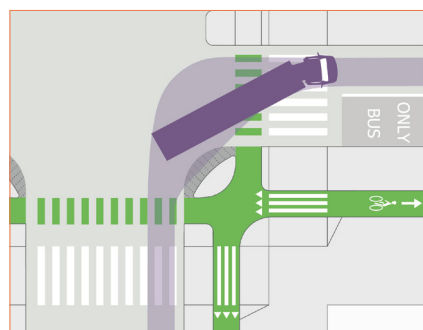
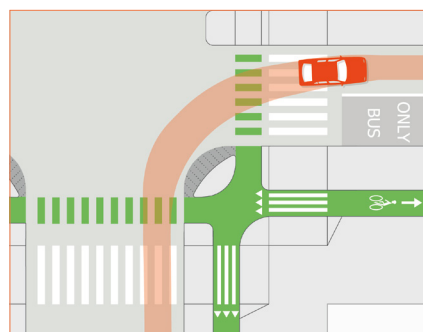
Use signage materials and temporary elements to define the mountable area to implement an interim solution before construction. This is useful when resources are limited, or a local proof of concept is required. In addition, various technical constraints, such as drainage impediments, may hinder the implementation of a permanent solution. In such cases, using temporary materials can offer an effective short-term response, allowing for flexibility and timely implementation. Examples of temporary mountable elements include rubber speed bumps, road studs and other features.



→ Sopot, Poland

### CAPITAL CONSTRUCTION ELEMENTS

The use of rugged materials in capital construction is a clever way to define the less inviting mountable area. Cobblestones, for example, can define a very compact geometry in asphalt, enabling a wider and rugged space for larger vehicles to turn. Small vertical deflection devices, such as mountable ramps outside a wider geometry, can hinder the turns. To select the proper element for a specific context, it is key to evaluate materials and color usage, drainage standards, and other local constraints.

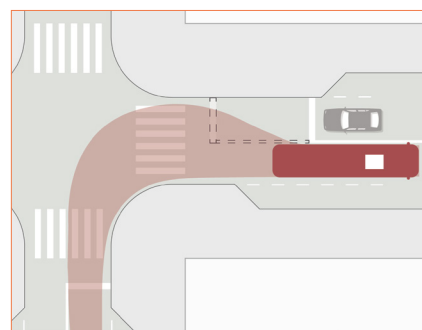
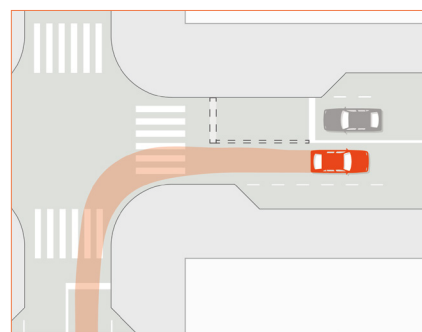


### MOUNTABLE CORNER

Mountable corners accommodate a range of turn radii on the same corner by providing a sloped or textured surface that vehicles can pass over. The edge of the mountable area defines the smaller radius, while the inner corner defines the wider one. Drivers of larger vehicles can drive over the mountable corner to make the turn, still at very low speeds, while the ones on smaller vehicles will prefer to drive around it.

Use materials that are not comfortable to drive over to discourage drivers who do not need the extra space from using it. Bumpy edges and materials, steep slopes, textured surfaces, and vertical deflectors can be used to build mountable corners. *For more information, see 7 Safe Speeds Toolbox.*

In cases where the outer curve of the turning path is limited, as in tight intersections or streets with medians on the receiving leg, having this kind of flexibility at the corner enables the accommodation of different vehicle turn radii without widening the intersection.

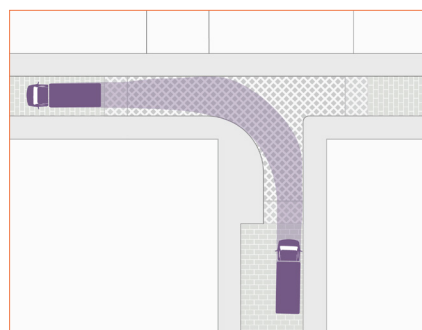


### RECESSED STOP BAR

At signalized intersections, recessed stop bars accommodate the turn radii of different vehicle types without increasing the corner radius. Recessed stop bars can enable more compact geometries in neighborhood streets where city buses have to navigate tight intersections. Compared to alternatives, such as adding mountable elements at corners, this solution is effective in ensuring safe turn speeds while keeping bus passenger comfort a priority.

Design the curb radius and recessed stop bar by allowing the design vehicle to invade the opposite direction lane of the receiving leg when needed. This happens when motorists in the cross street have a red light. For very infrequent larger control vehicles, assume those can also invade the adjacent approach lane to turn at crawling speeds.

In multilane streets, recessing the stop bar for only one of the lanes offers an alternative.



### NARROW STREETS

In narrow streets, such as in historic areas or some residential neighborhoods, travel lanes are often adjacent to the curb. In such cases, the corner radius should mirror the effective turn radius of the design vehicle. Raise the intersection to manage the approach speed while facilitating universal accessibility solutions. Bollards (or other physical elements) may be needed to avoid pedestrian space encroachment. Placing bollards only at strategic intersection locations helps to ensure emergency vehicle access.

In cities or areas with narrow streets, governments can update regulations and procurement processes to permit access to only smaller public service vehicles for such areas. That can include mini-buses, compact fire trucks, garbage collection vehicles, etc. Through that approach, cities can avoid costly and inequitable land acquisition and, in turn, build safer, more compact intersections.

### SLIP LANE REMOVAL

Slip lanes encourage high speeds by allowing vehicle free-flow at very wide turning radii while increasing the pedestrian crossing distances. This allows drivers to turn without having to pause or reduce the speed, where pedestrians are more exposed to risk.

Remove the slip lane and incorporate the turning movement in the travel lane, forcing drivers to reach the intersection and pause before turning. This will also force drivers entering the intersection to slow down and wait while turning vehicles complete the turn.

Extend the sidewalk, reclaiming the slip lane and the traffic island as pedestrian space. Alternatively, the space can be repurposed as a protected corner for cyclists. *For more information, see Global Street Design Guide Chapter 6.*

### ACCESS RAMP CALMING

As cities revise their roadway infrastructure and approach to speeds, retrofitting highway-like street designs will often be necessary. When a complete corridor reconstruction is not feasible, measures like visually narrowing lanes using markings and adding vertical deflection elements like raised crossings can be cost-effective ways to self-enforce updated, safer speed limits. Still, a more profound transformation of such corridors to match and enhance their urban context can bring an array of co-benefits.

## HP Junction

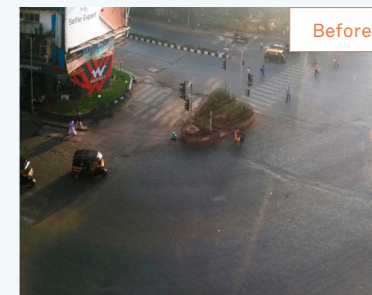
**Location** Mumbai, India

**Implementing Organization** World Resources Institute (WRI), Mumbai Traffic Police, Municipal Corporation of Greater Mumbai

**Implemented in** 2017

### OVERVIEW

At HP Junction, Mumbai, a large intersection with undefined geometry was redesigned to prioritize safety. The design reclaimed residual space to create pedestrian refuge islands, and a slip lane was eliminated to create public space and reduce turning speeds. Removing the slip lane reduced vehicle-pedestrian conflicts and enhanced navigation for all users. During the trial, average speeds dropped by 15%, and high-risk conflicts per hour fell by 71%.



SNAPSHOT

## Medellín

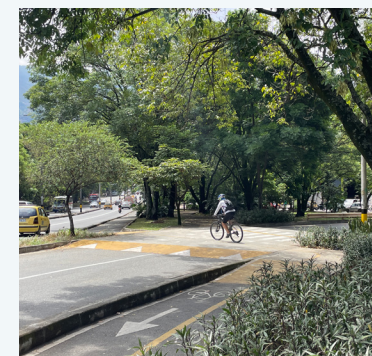
**Location** Medellín, Colombia

**Implementing Organizations** Aburra Valley Metropolitan Area and the Medellín Urban Development Company

**Implemented in** 2019-2020

### OVERVIEW

Highway-like designs in urban corridors create critical safety challenges for vulnerable road users. Often, pedestrians and cyclists have no choice but to cross multiple lanes of traffic or dangerous access ramps as part of their daily journeys. As part of Medellín's plans to connect the region's two main university campuses, the city retrofitted access ramps to become safer and more comfortable for active mode users to cross. The intervention was part of the Educational District Corridor cycle track implementation and included a raised crossing that forces vehicles to slow down while ensuring universal accessibility and conveying clear priority for people walking and cycling.



SNAPSHOT

## Far-side Lane Turns

Turns onto far-side lanes typically allow for larger effective turning radii, which can lead to higher turning speeds and increased conflicts with road users moving in different directions. Careful design and geometric adjustments are essential to mitigate these risks, ensuring predictable movements and safer user interactions.



→ Córdoba, Argentina

### USE MEDIANS

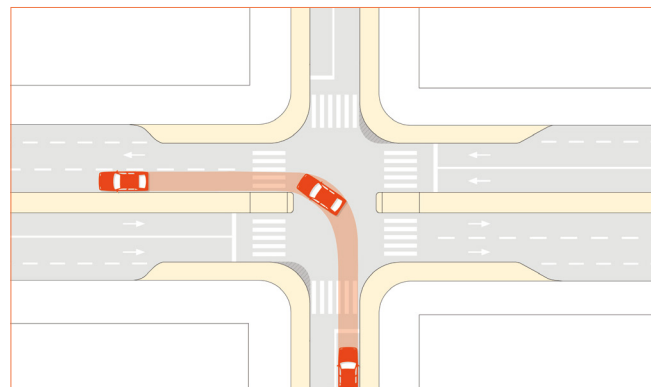
Medians and refuge islands prevent motorists from cutting corners and thus turning faster. They also generate refuge spaces for pedestrians and cyclists, allowing two-stage crossings.

All pedestrian refuges at intersections should have a tip or nose that extends past the pedestrian crossing. This protects people waiting on the median from moving vehicles and slows turning motorists.

Align median tips with sidewalk edges to reduce the speed of turning vehicles and maintain pedestrian crossings aligned with the clear path.

Pedestrian refuge islands should be at least **1.8 m** deep but have a preferred depth of **2.4 m**. This allows someone in a wheelchair or with a bicycle or a caregiver with a young child or pushing a stroller to wait safely.

They can also organize traffic at intersections, impact approaching speeds, or block access at strategic points.



### CENTERLINE HARDENING

The centerline hardening refers to installing physical elements along such markings near the intersection. Those can be mountable, like rubber speed bumps that discourage use by smaller vehicles, or vertical, flexible posts that virtually prevent any vehicles from passing.

Similar to median tips, this is an effective technique to avoid motorists cutting through the center line to turn faster.

Frequent maintenance should be planned for, given that these elements are placed in highly exposed locations.

Pedestrian crossings and desire lines should be observed to prevent such treatments from becoming tripping hazards for people crossing the street.



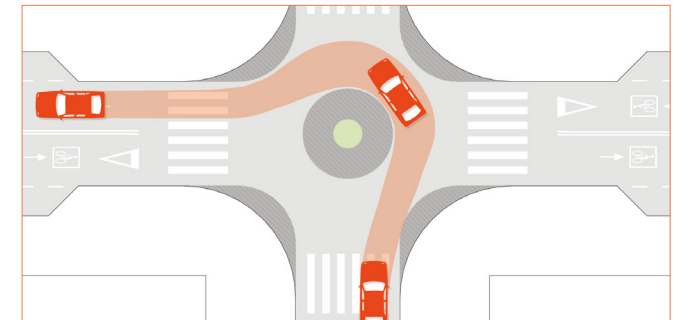
→ Paris, France

### MINI ROUNDABOUT

Mini roundabouts are round islands at intersections that reduce speeds and organize traffic, reducing conflicts. These compact circular intersections help manage far-side turns by requiring motorists to maneuver around the inner circle.

In this type of intersection, motorists must yield to pedestrians and vehicles already in the intersection. Pedestrian crossings should be marked to clarify where pedestrians should cross and that they have priority.

Multilane roundabouts should be avoided as they lose their speed management effectiveness while also creating additional conflicts, as motorists may need to change lanes entering and exiting the roundabout and merge into one lane to access the approach streets. Existing larger circular intersections can be retrofitted in multiple ways to reduce speeds and minimize conflicts. *For more information, see Global Street Design Guide Chapter 11.*



→ Hamburg, Germany



# Street Transformations



# 6

## Street Transformations

Designing streets for safe speeds is an integral part of any successful road safety strategy in cities. Moreover, safe speeds set the baseline for any people-centered street transformation, directly affecting livability and supporting active modes as viable mobility choices.

This chapter presents ambitious yet practical examples of how existing streets can be transformed to reduce speeds while achieving additional goals. These are a mix of real project case studies and contextualized examples of transformation that break down their components and codify some of the lessons learned from these precedents.

Every city and every street is unique. More than presenting one-size-fits-all solutions to be replicated globally, cities should use these examples as inspiration and adapt their approach to their local contexts. Local implementation standards, culture, environment, mobility patterns, and traditions will influence adaptations to make them relevant to the city's needs, possibilities, and ambitions.

This chapter is rooted in the content presented in *Chapter 4 Strategies* and *Chapter 5 Safe Speeds Geometry*, and is complemented by *Chapter 7 Safe Speeds Toolbox*, which expands on the details and implementation of specific speed management treatments. Street transformations apply all the different strategies and tools, showcasing how they come together in different contexts and at different scales. For additional street transformation examples, see *Global Street Design Guide Chapters 10 and 11* and *Designing Streets for Kids Chapter 4*.

Street design changes are opportunities for cities to address multiple crises and achieve several objectives at once. This design guidance focuses on achieving safe speeds on city streets. But it also acknowledges that road safety is often one of many challenges a city is facing, and there is huge potential for streets to address multiple goals at a time, from responding to the needs of different users and larger social, economic, and environmental goals and challenges.

This chapter presents an approach to understanding a street transformation project site, setting comprehensive project goals, selecting the right speed, redesigning at different scales, whether for street, corridor, or zone, and evaluating its effectiveness in managing speeds.

## 6.2 | Network-level Considerations

Proper understanding of the road network in a city and how to manage it to promote safe speeds is essential for street transformations. In addition to road network management strategies, this section offers basic street design principles that should govern the street transformations presented in the latter sections of this chapter. It also lays out tools to analyze the street to start a project; a methodology for selecting context-appropriate target, posted, and design speeds; and speed metrics for project impact evaluation.

## 6.3 | Safe Speed Corridors

In the context of this publication, corridors are defined as streets—or a sequence of multiple connected streets—that provide long, continuous, and direct connections within the city's street network. They link different areas of the city and can even be part of intercity routes.

Safe speed corridors follow a multimodal approach. The various typologies presented either accommodate all modes along the same corridor or, where appropriate, serve a structural role for specific modes or systems (like cycling, transit, and nature) while only retaining a local access function for private motor vehicles.

## 6.4 | Safe Speed Streets

Safe speed streets are defined as streets that primarily fulfill a local access function in all or most modes' networks. They comprise a broad range of typologies, from a calm low-density residential street to a busy central shopping street. In common, they favor local access and pedestrian activity and hence need to be designed for safe speeds to be effective.

## 6.5 | Safe Speed Zones

This section offers guidance on an area-wide approach to promote safe speeds. Some of the network-level strategies introduced in this chapter will serve as enablers for certain safe speed street treatments, such as shared streets and pedestrian plazas.

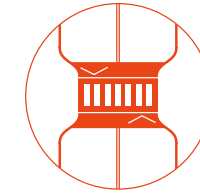
## Key Design Principles

All of the transformations presented in this guide are based on achieving great streets through safe speeds and follow the Global Street Design Guide design principles.



### Streets for Everyone

Design streets to be equitable and inclusive, serving the needs and functions of diverse users with particular attention to people with disabilities, seniors, and children. Regardless of income, gender, culture, or language, whether one is moving or stationary, streets must always put people first.



### Streets for Safety

Design streets to be safe and comfortable for all users. Prioritize the safety of pedestrians, cyclists, and the most vulnerable users among them: children, seniors, and people with disabilities. Safe streets have lower speeds to reduce conflicts, provide natural surveillance, and ensure spaces are safely lit and free of hazards.



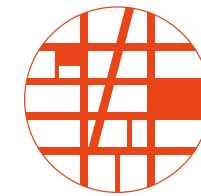
### Streets are Multidimensional Spaces

Design the street in space and time. Streets are multidimensional, dynamic spaces that people experience with all their senses. While the ground plane is critical, the edges and the canopy play a large role in shaping a great street environment.



### Streets for Health

Design streets to support healthy environments and lifestyle choices. Street designs that support active transportation and integrate green infrastructure strategies improve air and water quality, can reduce stress levels, and improve mental health.



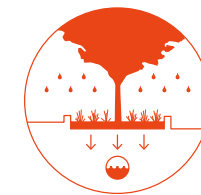
### Streets are Public Spaces

Design streets as quality public spaces as well as pathways for movement. They play a big role in the public life of cities and communities, and should be designed as places for cultural expression, social interaction, celebration, and public demonstration.



### Streets are Multimodal

Design for a range of mobility choices, prioritizing active and sustainable modes of transportation. Safe, efficient, and comfortable experiences for pedestrians, cyclists, and transit riders support access to critical services and destinations and increase the capacity of the street.



### Streets as Ecosystems

Integrate contextual green infrastructure measures to improve the biodiversity and quality of the urban ecosystem. All designs should be informed by natural habitats, climate, topography, water bodies, and other natural features.



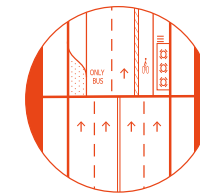
### Great Streets Create Value

Design all streets to be an economic asset as well as a functional element. Well-designed streets create environments that entice people to stay and spend time, generating higher revenues for businesses and higher value for homeowners.



### Streets in Context

Design streets to enhance and support the current and planned contexts at multiple scales. A street can traverse diverse urban environments, from low-density neighborhoods to dense urban cores. As the context changes, land uses and densities place different pressures on the street, and inform the design priorities.



### Streets Can Change

Design streets to reflect a new set of priorities that ensures appropriate distribution of space among different users. Push boundaries, try new things, and think in creative ways. Implement projects quickly using low-cost materials to help inform public decision-making, allowing people to experience and test the street in different ways.

## Network-level Considerations

Vehicular capacity and speeds are closely linked. Efforts to increase vehicular capacity on urban streets have often contributed—albeit unintentionally—to the conditions that enable or encourage unsafe speeds. Widened roadways and intersections and car-centered street environments are associated with higher speeds and crash, injury, and fatality rates.

Shifting the balance of networks across modes allows cities to reduce car dominance and better achieve their goals by prioritizing the safety of vulnerable users and promoting sustainable transportation options. While large-scale network changes may require significant resources, cities can approach these transformations incrementally—testing strategies, adjusting speeds, and phasing investments over time—while still moving toward broader safety and urban design goals.

Investing in safe infrastructure for transit, cycling, and walking provides a foundation for these gradual shifts and supports long-term network change.

### Network Management

Streets form a web of overlapping uses, functions, and transportation modes. A street network that provides equal conditions for all modes does not lead to equitable access.

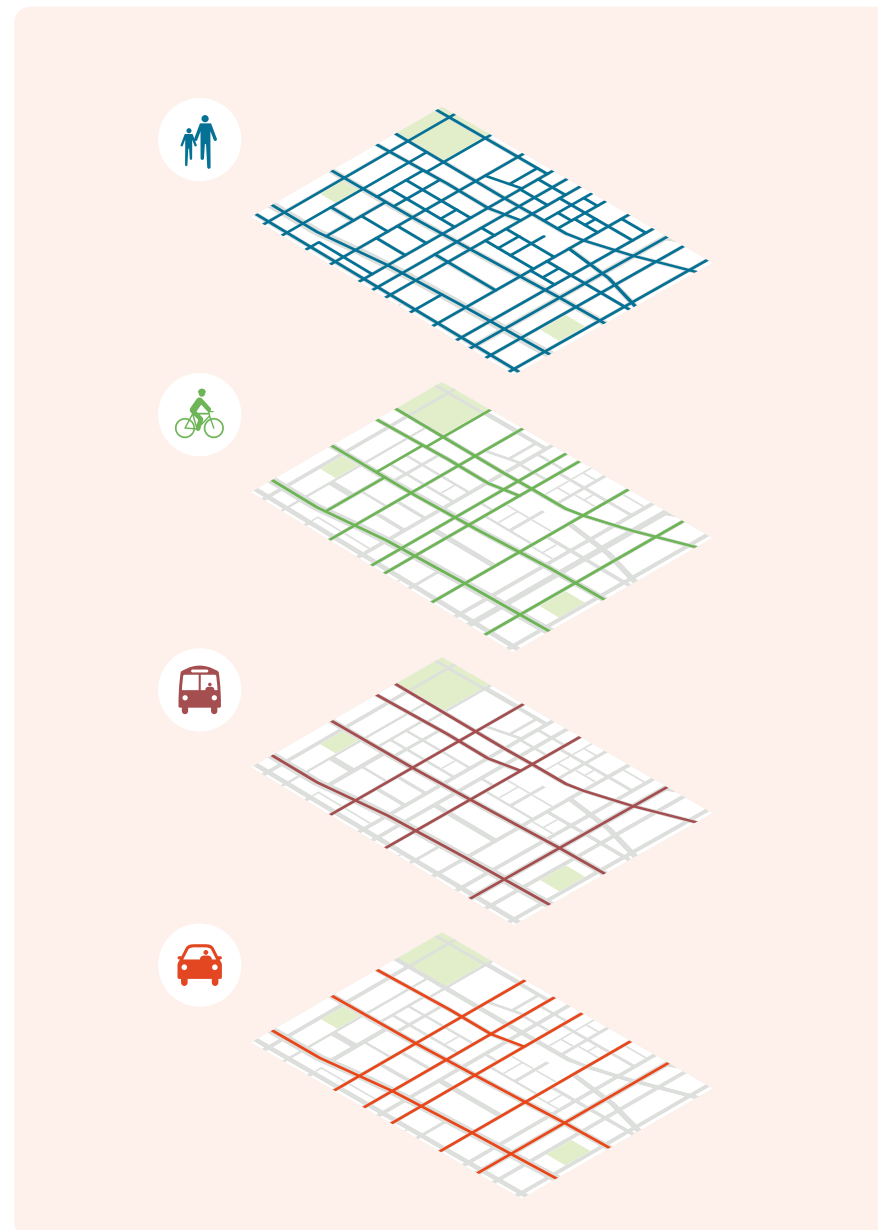
Motorized traffic puts people walking and cycling at risk, particularly when dedicated facilities are not provided, pushing more people to drive.

Cities have based their road systems on the notion of vehicles' speed and flow as the defining indicator, alienating people from the concept of mobility through street efficiency evaluation systems based on vehicle-centered metrics.

Approaching street design with a network management framework allows cities to organize safe and functional streets at all times and for all people by using time and space efficiently.

An effective street network should provide personal motor vehicle access to the city but not at the expense or disruption of other modes of transport.

A significant share of vehicle trips results from a lack of safe and efficient options for active or collective modes of transport. These trips could be shifted to walking, cycling, or public transit if those modes were made equally safe, convenient, comfortable, and attractive.



### Safe Speed Networks



#### ADDRESS NETWORK SPEEDS

Set a safe and appropriate speed limit for the network and specific areas. *For more information, see 2 Addressing Speeds in the City.*

Motor vehicle travel times in urban areas are more affected by intersection-wait times than top posted speeds.

Reducing speed limits is often mistakenly considered a cause for congestion.<sup>1</sup> Address road capacity issues by investing in more space-efficient modes, like walking, cycling, and transit, rather than widening roadways to increase vehicular capacity.

Remove opportunities for speeding at the network level by implementing operational techniques like narrowing roadways, making intersections more compact, breaking down block length with traffic calming strategies and crossing opportunities. *For more information, see 4 Strategies and 5 Safe Speed Geometry.*

Multilane traffic corridors are traditionally the highest-speed corridors in a roadway network and often have the highest crash, injury, and fatality records. With wide roadways designed to maximize vehicle capacity, such streets often get congested at peak times while allowing for unsafe speeds off-peak.

Safe speed corridors follow a multimodal approach to address these issues, resulting in narrower roadways and more compact intersections, removing speeding opportunities and reducing motor vehicle volumes at the network level. This multimodal approach, paired with safe speed design strategies and more secure tools presented in *Chapter 4 Strategies* and *Chapter 7 Toolbox*, result in a safe, livable, and efficient urban street network with accessible and attractive roads for people to walk and cycle, improved last-mile connectivity for transit systems, and more enjoyable public spaces.

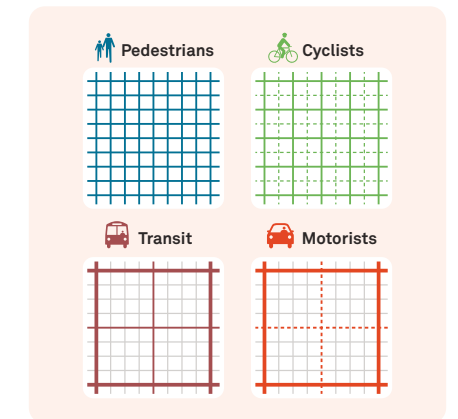


#### BALANCE MODAL NETWORKS

Shift from vehicle-capacity to people-capacity as the key design parameter for street networks. Prioritize people over vehicles in a network configuration.

Dedicated walking, cycling, and transit facilities make these safer, more sustainable, and efficient options to driving, addressing traffic congestion effectively.

Rely on high-capacity modes to increase people's mobility along corridors without compromising safety, public health, economic activity, or livability.



*Adapted from Designguide för Smarta gator, 2022.*

#### MANAGE NETWORK DENSITIES

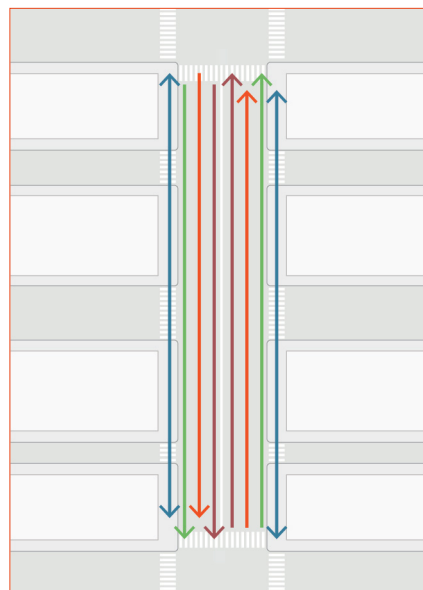
Network density refers to the concentration and distribution of different modal networks within a city.

When planning network density, consider the strategic design and distribution of streets and transportation routes within the city, ensuring that each modal network—whether for pedestrians, cyclists, transit, or private vehicles—has varying densities to optimize access, safety, and efficiency for all users.

Not every street must fulfill a through movement function for all users. Some corridors may function as structural transit or cycling connections while offering only local access for motorists.

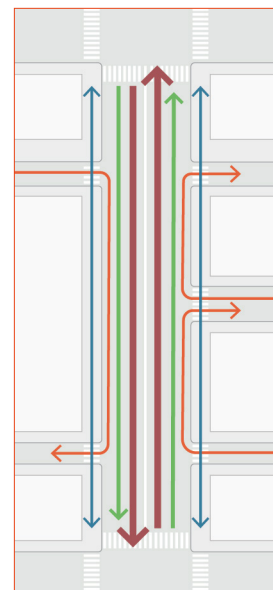
Network density corresponds to the characteristics of the different street users, from their size, travel times and distance traveled, and required effort for their mobilization. Pedestrian network should have the most complete and direct connections to destinations in a city, hence, the densest network from all modes.

## Setting the Network on Different Scales

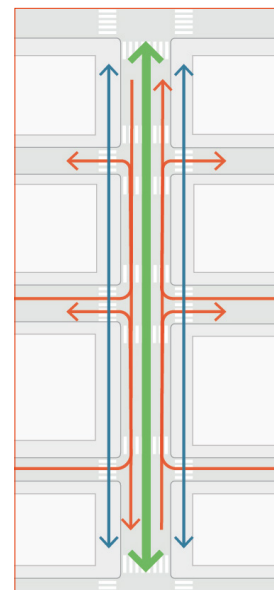


Multimodal corridor

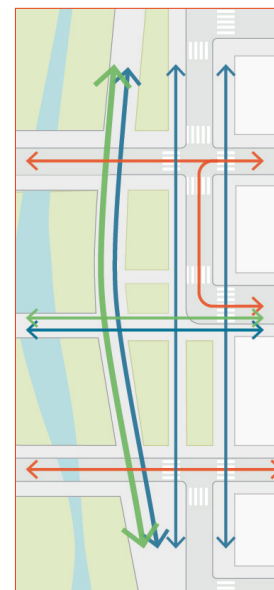
Street networks operate at various scales, each requiring a tailored approach to ensuring safe speeds. However, these scales work together to achieve the overall safe speed goals of the network. Cities should strive to balance the through movement function of corridors with the local needs of zones and streets.



Transit-priority



Cycle-priority



Nature-priority

### CORRIDOR-LEVEL SCALE

Urban corridors enable main direct connections between different areas of a city. Such streets play a critical role in ensuring the movement of people and goods in a city.

Avoid corridors becoming barriers that segregate communities by increasing permeability with more frequent access and safe crossing opportunities for all modes.

The construction of new expressways should be avoided in urban contexts. Where they already exist, they should either be redesigned into urban corridors or strict land use controls must be implemented, and alternative routes for other transportation modes should be provided to effectively mitigate their potential road safety impacts.

Main routes for different modes of transportation can overlap or be disentangled depending on the context and connectivity needs of different areas.

#### Overlap

Create multimodal corridors with facilities for walking, cycling, and transit. Prioritizing sustainable mobility modes will impact speeds, increase people capacity, and mobility efficiency.

Implement strategies for motor vehicles to move at safe speeds, with frequent opportunities for pedestrians and cyclists to cross the street.

Multimodal corridors can operate at a maximum of 40 km/h speed limit. Although, higher speeds are not encouraged, some corridors with appropriate and protected infrastructure for pedestrians and cyclists can accommodate speeds up to 50 km/h.

#### Disentangled

Create specialized corridors that prioritize different transportation modes, such as cycling or transit, or to support functions of other networks, like nature.

Specialized corridors can operate in combination with other parallel streets that fulfill complementary functions.

Manage vehicular volumes or access to these corridors through filtered permeability strategies.

Specialized corridors can operate in a range of maximum speeds from 10 km/h to 30 km/h depending on the prioritized mode of transport of the corridor and its contextual parameters. *For more information, see 6.2.2 Speed Selection.*

### STREET-LEVEL SCALE

Filtering through traffic allows a range of street redesigns such as school streets, shared streets, and plazas. *For more information, see 6.4 Safe Speed Streets.*

Plazas and public space pockets improve livability. Create safe environments for students and caregivers in streets around schools. Pedestrian circulation areas, waiting areas, and playing environments can be included as part of the design.

Shared streets provide pedestrians the right-of-way. This strategy can be consolidated in areas with high pedestrian activity or low-vehicle volumes, like residential, mixed-use and commercial zones.

Discourage through vehicle movements in streets with zone-wide metering strategies.

Keep operating speeds between 10 km/h to 30 km/h. Identify street user interactions to set an adequate speed for each context. *For more information, see 6.2.2 Speed Selection.*



→ Bogotá, Colombia

### ZONE-LEVEL SCALE

A city and its street network can be subdivided into zones in multiple ways, based on administrative boundaries such as neighborhoods and districts, land use functions such as residential, commercial, institutional or educational areas, or from a network and street hierarchy perspective. Zones may be defined based on the concentration of similar activities, the presence of a particular function (like a hospital or institution), or the morphology of the street network. While some zones are relatively homogeneous, many are multifunctional, combining different uses within the same area.

Filtered permeability strategies enhance the quality of local streets by reducing through traffic, creating a more pedestrian- and cyclist-friendly environment.

Area-wide traffic metering strategies discourage through movements and manage vehicle volumes within the area, supporting a more balanced and efficient street network.

Motor vehicle travel times are more often influenced by parking availability and intersection-wait times than by speed limits and top operating speeds. Use parking and vehicle entry pricing as tools to discourage unnecessary motor vehicle use within the network.

Set speed limits between 10 km/ and 30 km/h. The maximum speed is determined by the activities or destinations they enclose.



→ London, United Kingdom






## Multiple Intervention Possibilities

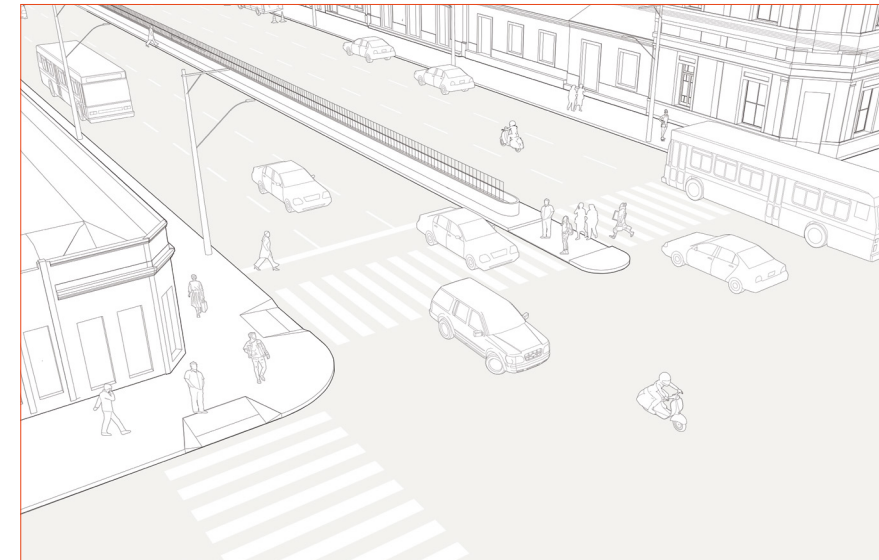
Street transformations can have many different starting points—whether shaped by available budget, political will, project scale, or urgency of needs. For inspirational purposes, this publication emphasizes the higher end of the spectrum—where significant investment and political commitment make transformative projects possible. The guide also highlights pathways to achieve similar safety outcomes through lower-cost materials, quicker implementation strategies, and phased approaches. No matter the starting point, there are actionable opportunities to reduce speeds and create safer streets for all users. *For more information, see How to Implement Street Transformations.*

### One Project, Multiple Implementation Phases

Depending on the project goals, available resources, political will, and timeline, a project can be developed over time in different phases. These phases can be either progressively incremental in one area, or distributed in different areas along a corridor as part of one big project.

Quick-build materials or phased solutions provide opportunities to quickly demonstrate change at lower costs, and therefore can be easier to approve and implement.

<b>Political will</b>	 Resistant decision-maker	 Hesitant decision-maker	 Committed decision-maker
<b>Budget available</b>	 \$	 \$\$	 \$\$\$
<b>Implementation phase</b>	 Addressing urgent needs	 Interim Phases	 Full reconstruction



#### Phase 1 ADDRESSING URGENT NEEDS

Identify data-based critical issues within the intervention area.

Determine possible strategies and the elements that can better resolve urgent needs. Depending on the context, a pop-up, interim, or capital project may be preferred.

Determine a clear timeline for each phase, with the scope and funding.

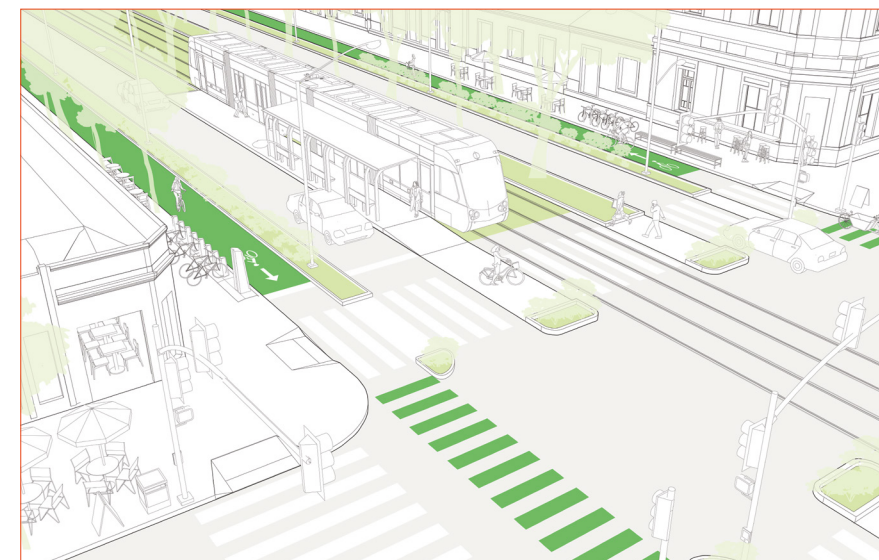


#### Phase 2 INTERIM PHASES

Interim phases complement the strategies and actions taken in phase one.

Prioritize actions depending on how they address the identified needs and its complexity.

Low to moderate cost and semi-durable materials are preferred for interim phases.



#### Phase 3 FULL RECONSTRUCTION

A capital intervention is the ultimate goal of a street transformation project.

It can be the product of pop-up and interim street transformations results or be executed directly.

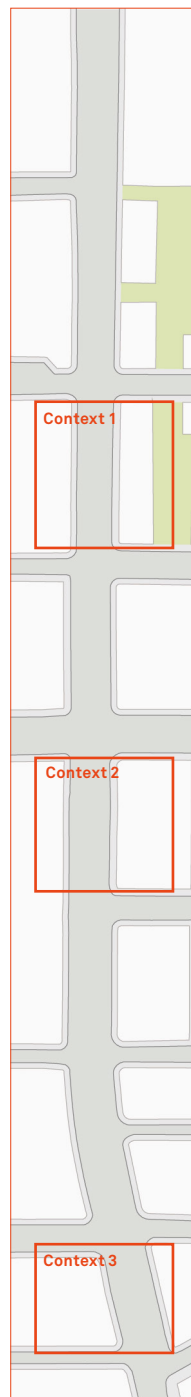
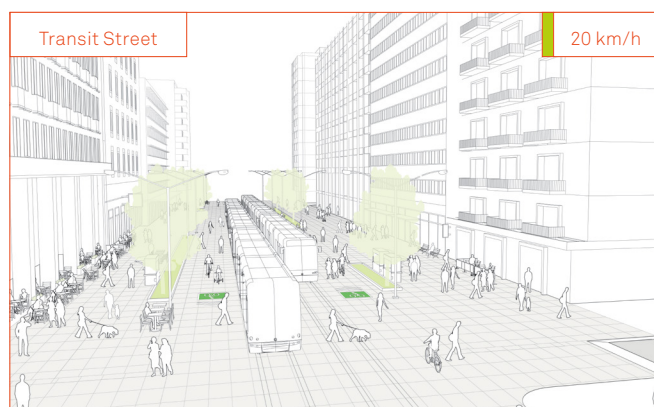
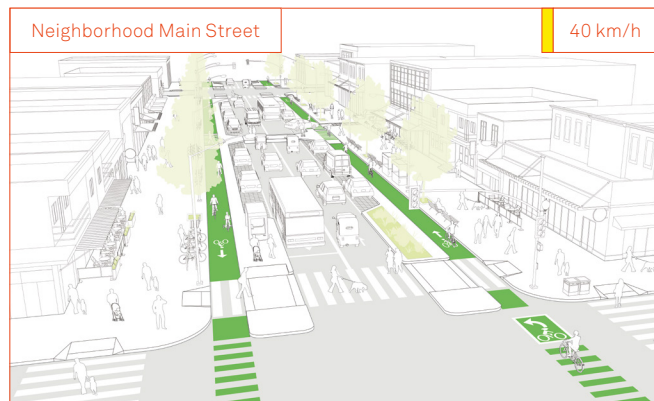
Capital interventions generally require less maintenance than interim interventions.

## One Street, Different Contexts, Different Speeds

In a street network, a single street or corridor can run through the city and serve various activities and interactions. Factors like density, land use, urban facilities, and travel patterns shape urban dynamics, making context crucial in street design, and hence the selection of an adequate target speed for a safe street operation, which can vary along the same street.

Effective design should align with the surrounding area's character and adapt as needs evolve.

The following illustration shows a single street at three locations, each with a different design approach tailored to its context and intended speed.



### Context 1 NEIGHBORHOOD MAIN STREET

- A mix of residential and commercial ground floor uses line each side of the street in a low-to-mid-density context.
- Transit is provided in mixed traffic.
- Dedicated cycle tracks are created in both directions.
- On-street parking is maintained.
- Green infrastructure and trees are added.
- Transit stops are provided on boarding islands.

### Context 2 CENTRAL TWO-WAY STREET

- Transit lines run along a dedicated center-running transit lane.
- Side-loading transit stations are connected with raised crossings.
- Parking is exchanged for wider sidewalks to support higher pedestrian volumes.
- One travel lane is maintained in each direction with slow speeds and limited access, and is shared with cycles.

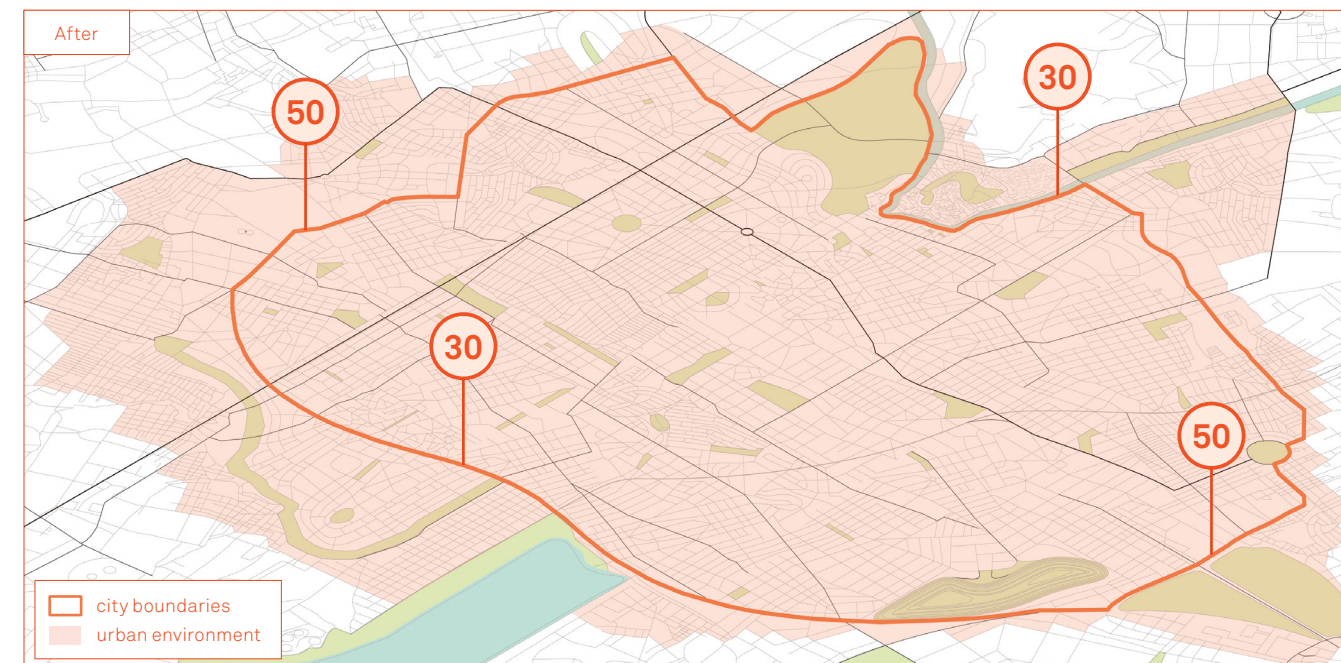
### Context 3 TRANSIT STREET

- The street transitions into a transit mall in a high-density context, serving large volumes of pedestrians.
- Commercial activity extends from storefronts, and new street furniture supports a high-quality public realm.
- Collective transport moves through the space at slow speeds, allowing all users to safely navigate the mall.
- A mix of uses keeps the space active and engaging through the day and evening.

## Adapting Corridors to Urban Growth

The limits of a city often extend beyond their original boundaries. Roads and ring roads that were once designed as high-speed corridors on the urban edge can become embedded in dense neighborhoods as cities grow.

When this happens, streets that were built for fast-moving traffic must be rethought to reflect their new urban surroundings. What once functioned as a bypass may now cut through areas full of homes, shops, and community life. Effective design requires adapting these corridors with lower target speeds, safe crossings, and urban street elements that support the people and activities around them.



## Speed Selection

To determine a safe speed for a street or corridor, consider the people who use it today and will use it in the future, as well as the street redesign itself. Take into account the level of physical separation between the most vulnerable users and motorized traffic, together with the demand for pedestrians to cross the street.

### Contextual Parameters

#### LEVEL OF SEPARATION

The level of physical separation between the most vulnerable street users and motorized traffic should guide speed limits.

Consider the infrastructure quality (e.g. cycle tracks vs. cycle lanes) and adopt more conservative parameters if the separation is poor.

In the context of a street transformation, consider the projected street configuration.

The parameters below are the base for the speed selection matrix at right. They are presented in general ranges (e.g. low, medium, or high) to account for the diversity of contexts in cities globally, but cities are encouraged to develop methods using specific metrics and thresholds suited to their contexts and practice.



#### Fully Shared

**10–15 km/h**  
When pedestrians share the roadway with motorized traffic. Despite being shared streets, they may have clear paths for pedestrian use only. Vehicle volumes should be managed to ensure the street is safe and comfortable for all users.



#### Shared by Cyclists and Motorists

**30 km/h or lower**  
Where pedestrians have dedicated facilities, but cyclists share the roadway with motorized traffic. Vehicle volumes should be managed to ensure the shared roadway is safe and comfortable for cyclists.



#### Fully Separated

**40 km/h or lower\***  
Where the interaction between people and motor vehicles is limited to frequent controlled crossings.  
  
*\*In cases where infrastructure quality is exceptionally high, 50 km/h can be acceptable.*

#### CROSSING DEMAND

In general terms, crossing demand is defined as the frequency at which pedestrians need to cross the street. The assessment of this parameter can include the following correlated characteristics.

**Pedestrian volumes**, the amount of pedestrians observed in the street at peak times.

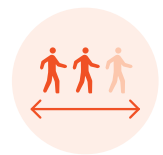
**Land use**, as commercial streets generally are correlated with more intense street activity.

**Key destinations**, such as schools, healthcare facilities, markets, parks, etc. which can attract high volumes of people and, in particular, children, older adults, and people with disabilities.



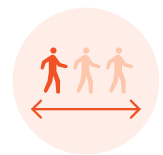
#### High Demand

**30 km/h or lower**  
Dense areas with intense activity levels, like central and commercial streets. For areas near key destinations with a high presence of children or older adults, adopt 20 km/h or lower.



#### Medium

**40 km/h or lower**  
Streets with moderate activity levels and crossing demand.



#### Low

**50 km/h or lower**  
Low-density areas with reduced crossing pressure. Grade-separated or limited access roadways.

### Speed Selection Matrix

The matrix below provides a practical method for determining the maximum safe speed for a street. For example, streets with good-quality facilities for pedestrians and cyclists can handle higher speeds with acceptable safety levels, while streets with poor or no separation require lower speeds to ensure the safety of the people who use them.

The design speed adopted in the street's design should match the selected target speed and be reflected as the posted speed limit. If posted speeds cannot be changed, practitioners can still adopt a lower design speed to ensure people's safety. *For more information, see Key Terms and Definitions.*



What should my target speed be? Match the Level of Separation and the Crossing Demand of a street to identify the maximum speed for it.

## Speed Selection Applications

Below are four examples of the Speed Selection Matrix applied to real cases. Rather than considering the street's existing condition, practitioners should use the projected street configuration and activities (after the transformation) to set the right design speed.



### SHARED COMMERCIAL STREET

In this commercial street, pedestrians and cyclists share the central lane with motorists and delivery providers circulating at low speeds. Additional clear paths are provided on the sides for exclusive pedestrian use.

On narrower streets, however, the pedestrian clear path may not be feasible. This treatment also relies on volume and access management strategies to ensure motor vehicle presence is reduced to an absolute minimum.

→ Auckland, New Zealand



### MIXED-USE NEIGHBORHOOD STREET

In this mixed-use neighborhood street, pedestrians have protected facilities to walk and opportunities to cross the street, while cyclists share the roadway with motorized traffic.

Crossing demand is defined as medium given the street user volumes, medium density, and mixed land use.

Through this street transformation, the city rightsized lanes and changed the pavement—adopting a 30 km/h design speed—to ensure operating speeds do not surpass the 30 km/h speed limit.

→ Bogotá, Colombia



### SCHOOL ZONE STREET

This school street has separated facilities for pedestrians and play areas, and the roadway is shared between motorists and cyclists.

Despite the medium density, crossing demand was defined as high because of the frequent presence of children. The separation between the roadway and walking facilities is not as intense as on a sidewalk with a buffer zone. For those reasons, a more conservative design speed of 20 km/h was selected. The roadway configuration is compatible with that speed selection.

→ Recife, Brazil



### NEIGHBORHOOD MAIN STREET

This street presents good-quality facilities for cyclists and pedestrians, separate from motorized vehicles, and the crossing demand level was evaluated as medium.

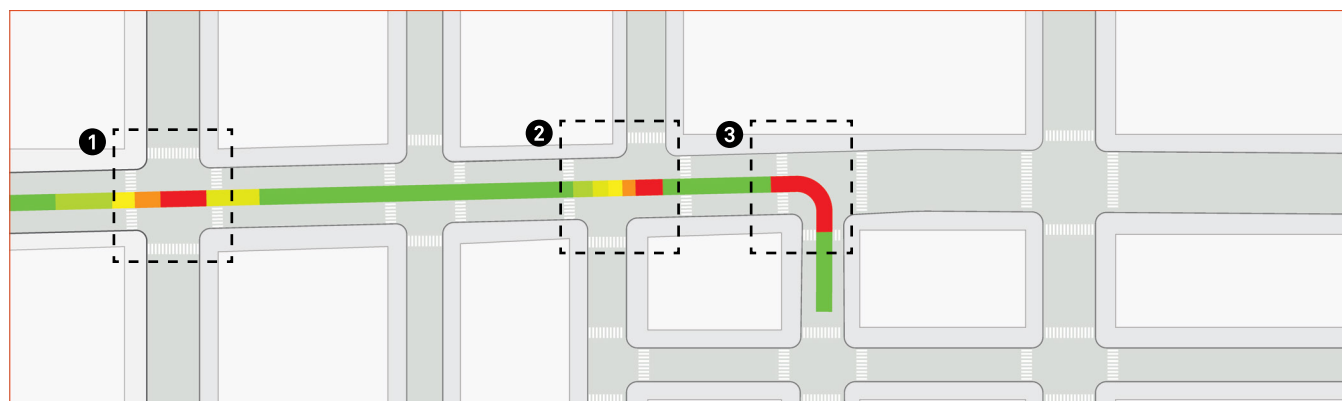
Such configuration allows for 40 km/h as a safe speed. The roadway pavement material, rightsized travel lanes and corner radii, and the presence of vertical deflection clearly communicate the selected speed to all users and help self-enforce safe driving behavior.

→ Sydney, Australia

## 6.2.3

## Measuring Speeds

Measuring the effectiveness of the design of a street to ensure safe operating speeds is crucial to indicate where design changes are necessary as well as to evaluate new implementations.



■ Within target speeds ■ Above target speed

Spot speeds refer to the speed of a vehicle at a specific moment and location; average speeds, on the other hand, refer to the ratio between distance traveled over the time.

① Given the high variation in motorist speeds within urban environments, measuring spot speeds—rather than average speeds—provides a more accurate understanding of speeding patterns and helps identify areas requiring design interventions. Spot speed data should be evaluated against the street's target speed.

Measure and analyze spot speeds for different types of vehicles, as they interact differently with the street design.

## HOW TO COLLECT SPEED DATA

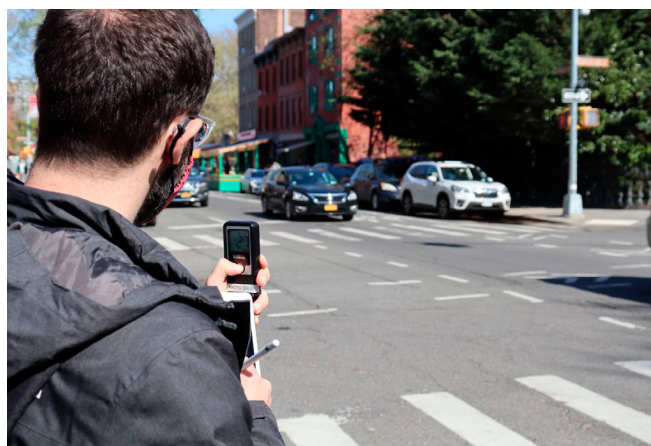
Speed data can be collected using a range of tools, with portable speed radars and speed guns offering flexibility for spot measurements across different locations. These tools are well-suited for targeted assessments in varied urban settings but are not ideal for large-scale or continuous data collection. If continuous or large-sample data is needed, pneumatic tubes, inductive loops, or camera-based systems might be better suited.

When using speed radars or guns, it is essential to verify the device's accuracy at lower speeds—particularly below 15–20 km/h—as some models may have reduced precision in this range. This limitation is especially relevant for measuring turn speeds and speeds in pedestrian-priority streets, shared streets, other streets and areas where target speeds are low.

In such contexts, consider using devices specifically calibrated for low-speed environments or supplementing radar data with video analysis or manual observation techniques. For more information, see *Measuring Vehicle Speeds in How to Evaluate Street Transformations*.

② Measure corridor speeds where motorists can reach free-flow travel and are potentially more prone to speeding, avoiding proximity to speed management elements and congested times.

③ Collect data for turn speeds, aiming for where motorists can navigate more freely. Turning speeds should be lower than 10 km/h and can have lower thresholds depending on the context of the street. For more information see 4.1.3 *Reduce Turn Speeds*.



→ New York City, USA

## FOCUS ON TOP SPEEDS, NOT TYPICAL BEHAVIOR

Analyzing how many motorists drive above the safe speed threshold is more representative of the risk posed by speeding than observing typical behaviors, like mean or median speeds.

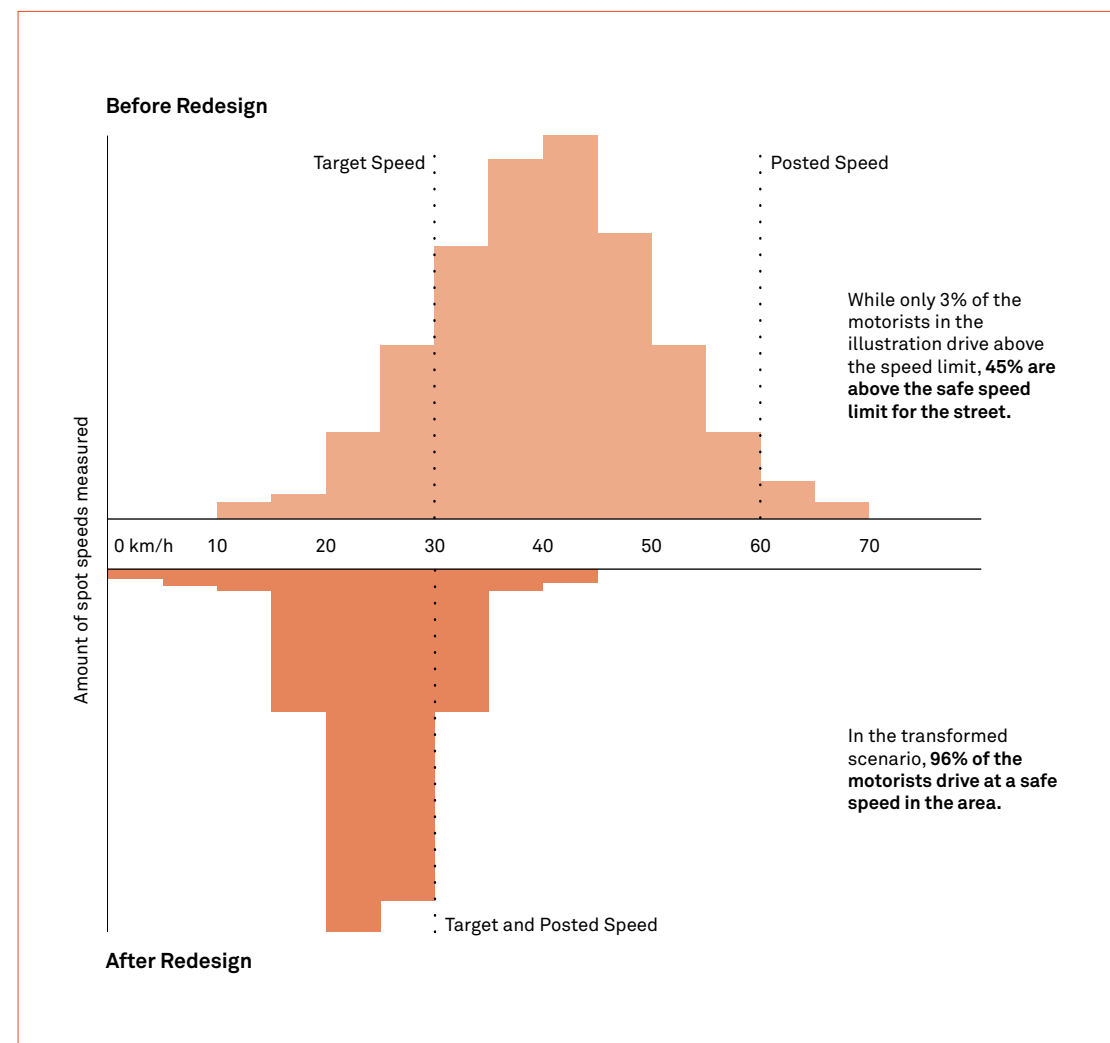
Frequency charts and high percentiles (90th or 95th) can provide important auxiliary information to understand spot speed distribution.

Analyze speeding data for each type of vehicle separately to identify specific speeding patterns. For instance, motorcyclists can avoid certain speed management devices and often showcase higher spot speeds than other vehicles.

## USE THE TARGET SPEED AS REFERENCE

Rather than the posted speed limits, measured spot speeds must be compared with the target speed, defined by what is safe and adequate for the context of the street.

This allows for a more robust analysis, as the posted speed might not reflect the target speed and also because signage and regulation can be changed in a redesign.



Frequency chart with illustrative speeds—not from an actual site—showing the impact of a mismatch between the posted speed limit and the safe speed limit.

# 6.3

## Safe Speed Corridors

6.3.1 Applying Strategies for Safe Speed Corridors

6.3.2 Transit-priority Corridors

6.3.3 Cycling-priority Corridors

6.3.4 Nature-priority Corridors

6.3.5 Narrow Multimodal Corridors ("All-in-One")

6.3.6 One-way to Two-way Corridors

6.3.7 Two-way Multimodal Corridors

6.3.8 One-way Multimodal Corridors

6.3.9 Grand Streets

In the context of this publication, corridors are defined as streets—or a sequence of multiple connected streets—that provide long, continuous, and direct connections within the city's street network. They connect different areas within the city and can also include stretches of an intercity route. Safe speed corridors address speeds using street design and operations and follow a multimodal approach. The various typologies presented either accommodate all modes along the same corridor or, where appropriate, serve a structural role for specific modes or systems (like cycling and/or transit) while only permitting local access for private motor vehicles, at speeds of 30 km/h or lower.

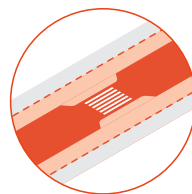
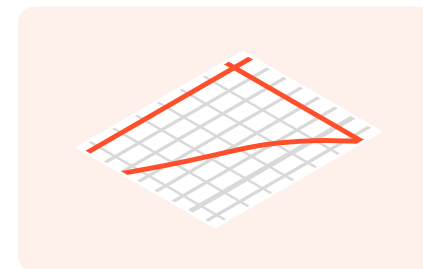
This section shows a range of examples from cycling priority corridors to grand streets and how design strategies can be applied when transforming streets to safe speed corridors.



## 6.3.1

## Applying Strategies for Safe Speed Corridors

Strategies for specific streets and situations can be applied at a corridor scale. Chapter 4 outlines recommended physical and operational changes that help self-enforce safe target speeds. The examples on the following pages illustrate how these strategies can be scaled up to transform entire corridors. When planning or evaluating a project, consider how these corridor-level applications can inform your approach.



### RIGHTSIZE STREETS

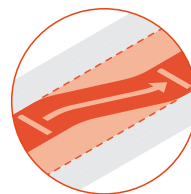
#### Rightsize Roadway Widths

Design travel lanes **3 m** wide or narrower. Adopt wider lanes only for designated truck or transit routes, yet no more than **3.3 m**.

#### Support Sustainable Mobility

Reclaim space for pedestrians and ensure universally accessible sidewalks. At target speeds of **40 km/h** or higher, add wider buffer zones to further separate the pedestrians clear path from moving vehicles.

Repurpose travel lanes as transitways, physically protected cycle facilities, or additional green and blue infrastructure.



### ADJUST THE STREET PACE

#### Manage Speed Reduction Measures Spacing

Identify the type of speed reduction measures to use according to the target speed. Space treatments **80–120 m** apart for a target speed of **40 km/h** and **50–80 m** for **30 km/h**.

At target speeds of **40 km/h** or higher add raised crossings or raised intersections with a ramp gradient not lower than **1:25**. For more information, see 7.2.2 *Sidewalk-level Crossings*.

Use speed cushions in lanes shared with transit vehicles to avoid passenger discomfort.

#### Increase Street Permeability

Increase frequency of pedestrian crossings (80–100 m between crossings, no more than 200 m). Offer protected refuge spaces for pedestrians and cyclists at medians and islands.

Replace pedestrian bridges with at grade crossings.

Consider opening continuous raised medians at intersections to increase permeability for all modes.

#### Set Safe Signal Progression Speeds

Adjust signal progression speed to the safe target speed. Keep the signal coordination zones short.

Program shorter signal cycles and add multimodal leading intervals.



### REDUCE TURN SPEEDS

#### Design Compact Intersections

Extend roadway narrowing through the intersection, which results in a more compact geometry overall.

Remove slip lanes and repurpose the space to enhance walking and cycling facilities.

#### Optimize Turn Geometry

Include deflection elements upstream of intersections to support safe turn speeds.

Reduce corner radii to manage turns onto near-side lanes.

Use medians and pedestrian islands to manage turns onto far-side lanes.

Add mountable corners to manage turns of large and small vehicles.

#### Restrict Dangerous Movements

Prioritize sustainable modes' movements and separate turn movements where high pedestrian volumes and vehicle turn movements coincide. Use separate turn phases or turn lanes, or move turns to a different intersection with fewer pedestrian crossings.



### DESIGN LIVABLE STREETS

#### Create a Sense of Enclosure

Use pavement material to reduce driving comfort, thus vehicular speeds.

Plant trees along the roadway to create a sense of enclosure.

Encourage building designs with varied heights and closely spaced entrances and windows. Add landscaping with elements of different heights. These changes will break up the scale and rhythm of the block, making speeding feel uncomfortable.

Foster well-designed sidewalks with amenities that enhance the walking experience to increase footfall and pedestrian activity.

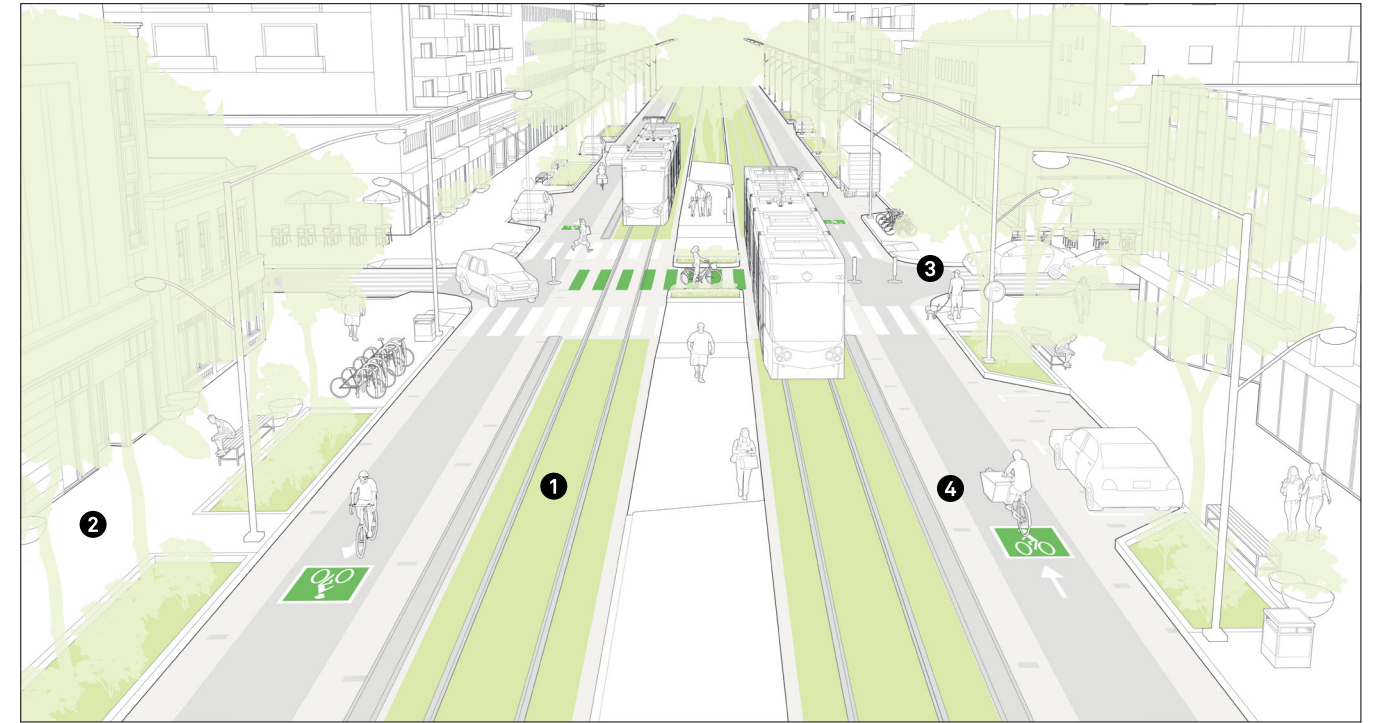
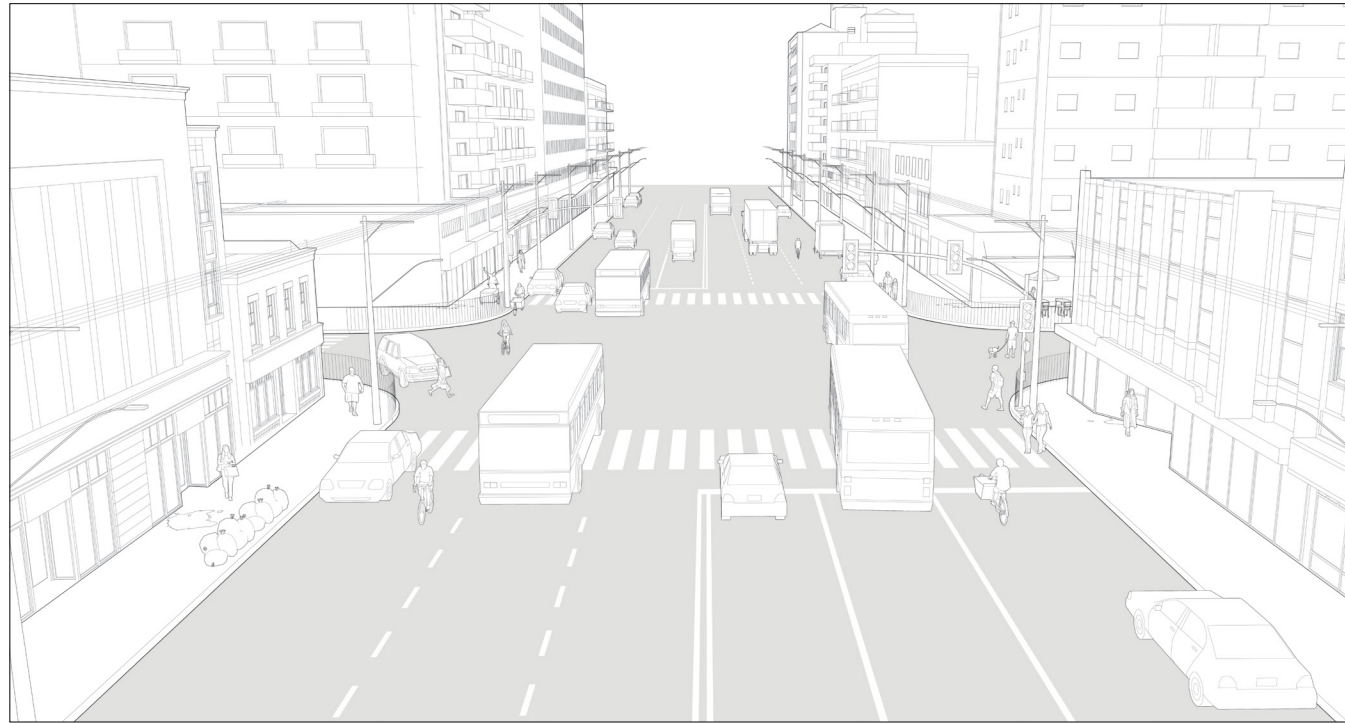
#### Emphasize Speed Transitions

Add continuous sidewalks to intersections with smaller streets, configuring gateways into lower-speed streets.

#### Manage the Roadway Network

Remove the through function for private motor vehicles on certain corridors by adding frequent forced turns.

Convert multilane one-way corridors to two-way operation to increase connectivity and reduce speeds.



Transit-oriented streets connect neighborhoods, commercial areas, and important destinations. As these streets approach the city center, they become busier due to increased activities and higher volumes of people.

The design of these streets prioritizes access for public transit over private vehicles, while still allowing some vehicular access. Requiring private cars to turn every 1-2 blocks can help reduce traffic volumes and improve the efficiency of public transit.

Establishing safe speed limits makes these streets more inviting and vibrant, which in turn can boost local economic activity that might be hindered by heavy traffic.

Moreover, the space reclaimed on these streets can be used to create high-quality facilities for walking and cycling, thereby improving overall street capacity.

**Existing Conditions**

This example depicts a central corridor that provides access to residents across different neighborhoods to the city center. However, buses operate in congested travel lanes, and passengers often wait on crowded sidewalks. Frequently, buses stop in middle lanes as they pass other buses or illegally parked cars.

Transit riders and pedestrians encounter unsafe conditions due to inaccessible and disconnected sidewalks and fast-moving traffic. High traffic speeds, along with noise and air pollution from vehicles, create an unwelcoming environment for pedestrians and cyclists, which in turn limits local economic activity.

Long crosswalk distances, lack of refuge islands, and high vehicular speeds expose vulnerable users to extremely unsafe conditions. Recessed crosswalks and fenced sidewalks make it challenging for most pedestrians, leading some to cross the street at desire lines despite the risks involved.






→ São Paulo, Brazil



→ Manila, Philippines

**Design Guidance**

- User Separation**  
Shared by Cyclists and Motorists 
- Crossing Demand**  
Medium 
- Speed**  
20 km/h 



→ Berlin, Germany

**RIGHTSIZE STREETS**

**1** Establish a center-running transit lane to increase the transit capacity, decrease transit travel times, and improve transit reliability.

Maintain a **3.3 m** wide travel lane per direction shared with cyclists.

**2** Widen sidewalks to improve pedestrian comfort and boost economic activity.

**ADJUST STREET PACE**

**3** Require vehicles to make right turns every **1-2 blocks** to disrupt roadway continuity for drivers, creating shorter segments and thus reducing the potential for speeding.

Remove corner railings and realign crossings with intersections and pedestrian desire lines to improve walkability, and shorten continuous vehicular movement.

Similar strategies could be implemented for transit priority streets with either buses or light rail.

**REDUCE TURN SPEEDS**

Reduce turning speeds by creating a compact intersection geometry with smaller corner radii.

Prohibit across-traffic turns and replace them with a system that forces motorists to drive around the block, thereby increasing transit efficiency.

**DESIGN LIVABLE STREETS**

**4** Limit motorists access by reducing travel lanes and redesigning them as cycle streets, allowing bicycles to share the road with vehicles.

Use different pavement surfaces to visually narrow the travel lane, convey cyclist priority, and reduce car dominance.

Incorporate trees, light poles, bus lane separators, and other streetside elements to create a sense of enclosure for motorists, which supports a low speed environment. Increased pedestrian activity and reduced car dominance can positively influence driver behavior.

## Cours de la Libération et du Général de Gaulle



**Location** Grenoble, France

**Implementing Organizations** Grenoble Metropolis and its municipalities

**Implemented in** Initial implementation in 2006; citywide speed limit reduction to 30 km/h in 2016



### OVERVIEW

Grenoble has been at the forefront of creating safer and more livable streets, with a particular focus on Cours de la Libération et du Général de Gaulle, a major urban corridor. As part of its transformation, the city redesigned intersections to improve pedestrian and cyclist safety, reallocated space to expand transit infrastructure, and introduced cycling infrastructure.

Raised crossings were installed near transit stops to enhance accessibility and slow down vehicles, while additional greenery was integrated to improve air quality.

These measures have not only calmed traffic but also fostered a more vibrant, multimodal, and people-friendly environment along one of Grenoble's main corridors.

### STRATEGIES

#### Rightsize Streets

Transit-dedicated center-running lanes were created from space previously dedicated to mixed traffic.

#### Adjust Street Pace

Vertical and horizontal deflection elements were introduced along the corridor, such as chicanes and raised crossings.

#### Reduce Turn Speeds

Reductions in corner radii were introduced to create more compact intersections.

#### Design Livable Streets

Green infrastructure was incorporated using the space previously allocated for mixed traffic, increasing the sense of enclosure for motorists, along with pedestrian-focused lighting and more clearly demarcated crossings.

### IMPACT

Decline in road crashes, with fewer severe injuries.

Speeds decreased in many areas, reducing dangerous driving.

Cyclists and pedestrians reported improved safety and comfort.

**9% reduction in light vehicle traffic**

**20% reduction in heavy vehicle traffic**

Source: Ville de Grenoble <sup>2</sup>

## King Street



**Location** Toronto, Canada

**Implementing Organization** City of Toronto

**Implemented in** Pilot in 2017; made permanent in 2019

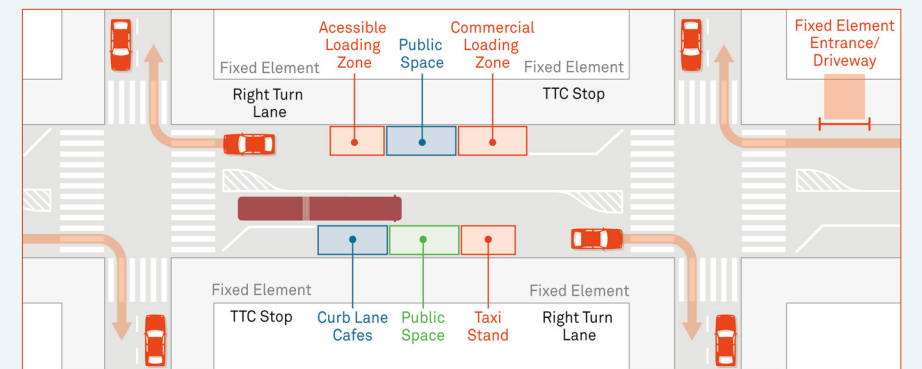


### OVERVIEW

The King Street Pilot Project in Toronto prioritized transit and active mobility by restricting through traffic for private vehicles between Bathurst and Jarvis Streets, and introducing design measures to reduce motorists' speeds.

The network was redesigned so as not to allow private motor vehicles to travel further than two consecutive blocks, ensuring local access but disincentivizing through traffic. The street section redesign also included dedicated streetcar lanes, more compact intersections, and improved pedestrian and cycling infrastructure.

Following a successful pilot, these changes became permanent in 2019, delivering significant improvements in transit speed and reliability while fostering a more pedestrian-friendly environment.



### STRATEGIES

#### Rightsize Streets

Transit-dedicated lanes were created from space previously dedicated to mixed traffic.

#### Adjust Street Pace

By reducing the network continuity for motorized vehicles, roadway lengths were reduced to match a lower target speed.

#### Design Livable Streets

Motorized traffic volume was reduced, also reducing car dominance and boosting pedestrian activity. The space reallocation also allowed for improved streetside design, such as incorporating more public seating.

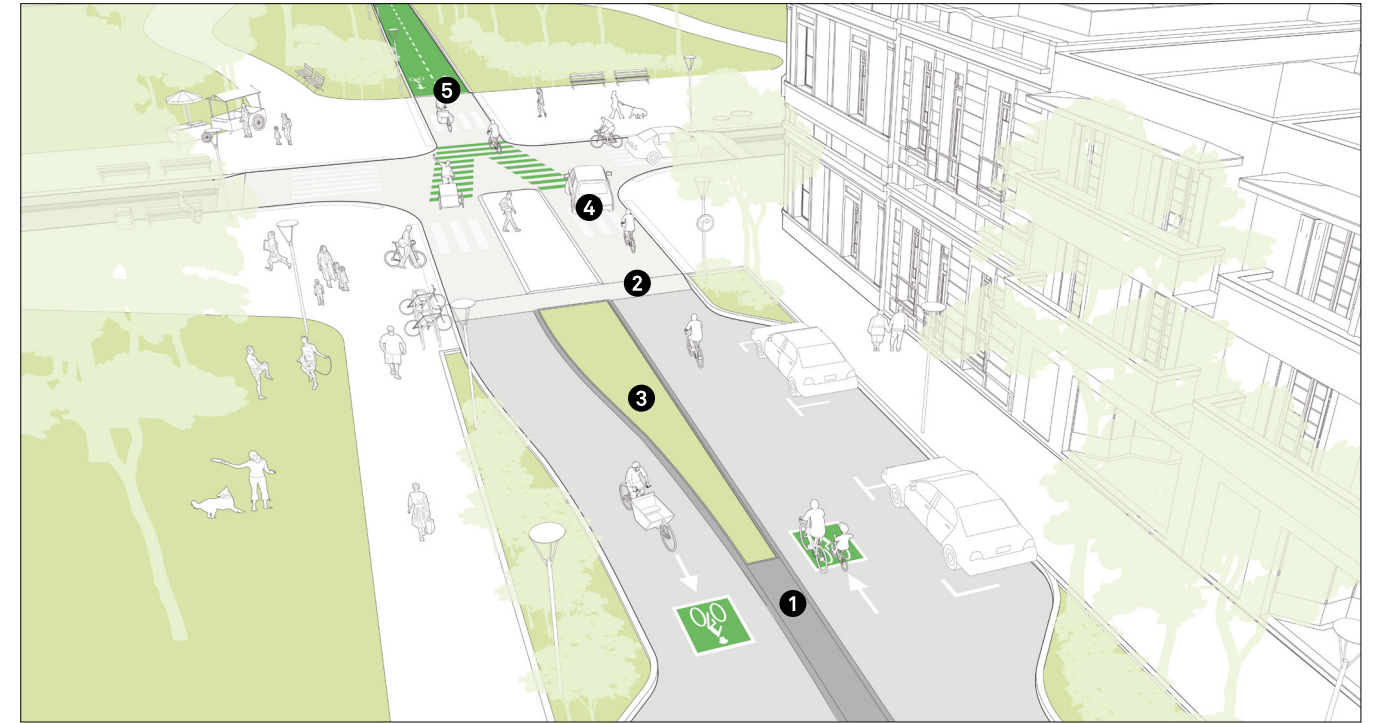
### IMPACT

Reduced delays at intersections, improving overall efficiency.

Increased pedestrian and cyclist activity, benefiting local businesses.

**16% increase in streetcar ridership**

Source: City of Toronto <sup>3</sup>



Cycling-priority corridors provide long, direct connections within the cycling network, but are not continuous for motorized traffic. Each corridor may consist of various street types, while still maintaining a through route for cyclists. Depending on the context, cycling facilities can be either fully protected or shared spaces alongside private vehicles. Filtered permeability strategies ensure that cyclists have continuous routes while allowing only local car access. This approach significantly reduces traffic volumes, creating a safer and more comfortable environment for shared space.

**Existing Conditions**

This example highlights a residential street that serves as a shortcut for private vehicles.

Only experienced cyclists feel confident enough to ride on this street, and children are rarely seen cycling. Furthermore, a park at the end forces cyclists to take a long route to access other streets in the network.

Drivers occasionally speed as they use this route to save time. The continuous parking lanes contribute to the perception of the street as a car-dominated area, leaving little room for pedestrians and often resulting in spots without proper sidewalks.



→ Denver, USA

**Design Guidance**

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
High



**Speed**  
30 km/h



→ Ghent, Belgium

**RIGHTSIZE STREETS**

1 Reconfigure oversized travel lanes into a cycle street design, while still allowing local and emergency vehicles access.

Use different pavement materials to visually narrow the shared lane and add clear signage indicating cycling priority.

Reduce crossing distances and improve pedestrian mobility with sidewalk extensions.

**ADJUST STREET PACE**

Install modal filters and mandate turns for through traffic to disrupt continuous vehicle flows and reduce speeding opportunities.

2 Provide vertical deflection with raised intersections on all approaching routes. For a target speed of **30 km/h**, add vertical or horizontal deflection devices **50 to 80 meters** apart.

3 Use medians and sidewalk extensions along with green infrastructure to create horizontal deflection.

**REDUCE TURN SPEEDS**

4 Provide curb extensions at intersections and reduce corner radii to limit turning speeds.

At raised intersections, ensure that the corner radii are narrow and clearly marked to maintain low turning speeds.

**DESIGN LIVABLE STREETS**

5 Limit motorists access and prioritize cyclists and pedestrian networks by removing vehicle lanes and implementing filtered permeability strategies. This ensures that cyclists outnumber motorists on this street, which can positively influence driving behavior by reducing speeds.

Prohibit cars from overtaking cyclists to improve their perception of safety. Construct a mountable raised median using a different pavement material to discourage vehicles from overtaking while promoting compliance with traffic regulations.

## Hackney Low-Traffic Neighborhood



**Location** London, UK

**Implementing Organization**  
Hackney Council

**Implemented in** 2020

### OVERVIEW

Low Traffic Neighborhoods (LTNs) are a key strategy in London's efforts to reduce car dependency, improve air quality, and promote active mobility. Implemented by Hackney Council, LTNs restrict through-traffic using filters like planters, bollards, and cameras while maintaining access for residents, emergency services, and waste collection.

The London Fields LTN is one of Hackney's 19 LTNs, covering 50% of the borough. By redesigning streets to prioritize cyclists and pedestrians, this initiative fosters safer, quieter, healthier streets. Measures include closing traffic lanes to through-traffic, adding bus gates, and creating protected cycling infrastructure.

The project improves local mobility, encouraging walking and cycling while reducing non-local traffic. London Fields LTN exemplifies how urban design can rebalance mobility priorities, making local journeys safer and more sustainable.



- Low traffic zones
- ↔ Entry and exit points for motor vehicles in low traffic neighbourhoods
- 🚗 Bus gate: only buses, cyclists, pedestrians and emergency and service vehicles can pass through

### STRATEGIES

#### Adjust Street Pace

Road segments were shortened and horizontal deflection elements were added, like chicanes and pinchpoints combined with green spaces.

#### Design Livable Streets

Modal filters with planters and bollards restricted through-traffic while maintaining access for residents, buses, emergency vehicles, and waste collection.

### IMPACT

Cycling increased 11% to 57% on key routes like Richmond and Middleton Roads.

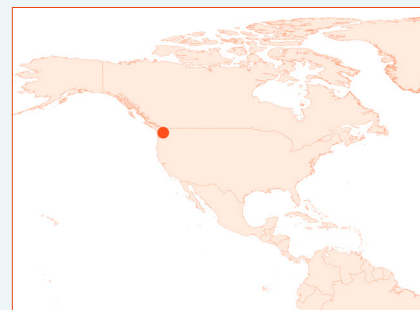
Air quality improved at 147 of 169 monitored locations within LTNs, with no pollution limit breaches.

Hackney's LTNs led to a 56% traffic reduction inside LTNs and 5% on boundary roads, cutting emissions and promoting active travels.

Overall east-west traffic declined by 11.57%, indicating fewer motor vehicle trips.

Source: Hackney Council <sup>4</sup>

## Thomas Street



**Location** Seattle, USA

**Implementing Organization**  
City of Seattle

**Implemented in** 2025

### OVERVIEW

The segment of Thomas Street that stretches from 5th Ave N to Dexter Ave N was redesigned to function as a safer, greener, and more accessible street for all users, as part of the Thomas Street Redefined plan.<sup>5</sup>

It addresses an important gap in the city's cycling network and creates a connection through the Cascade neighborhood, South Lake Union, and the Seattle Center.

The redesign features two modal filters at intersections, adjustments to traffic lanes, improvements in the cycling infrastructure, along with Seattle's first protected intersection.<sup>6</sup>

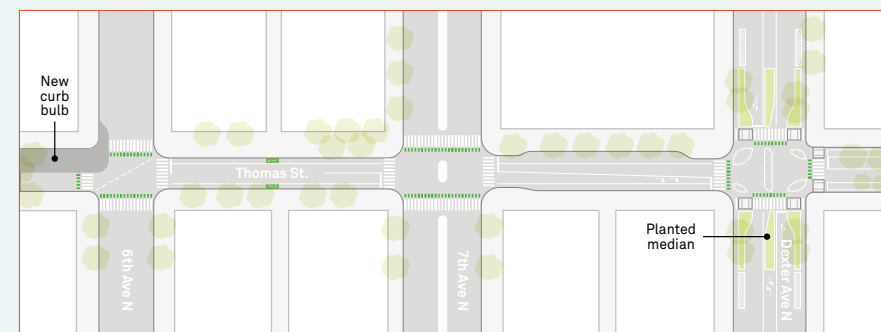
### STRATEGIES

#### Rightsize Streets

Traffic lanes were rightsized, and parking was reconfigured. Unidirectional cycle tracks were implemented on each side of the street.

#### Reduce Turn Speeds

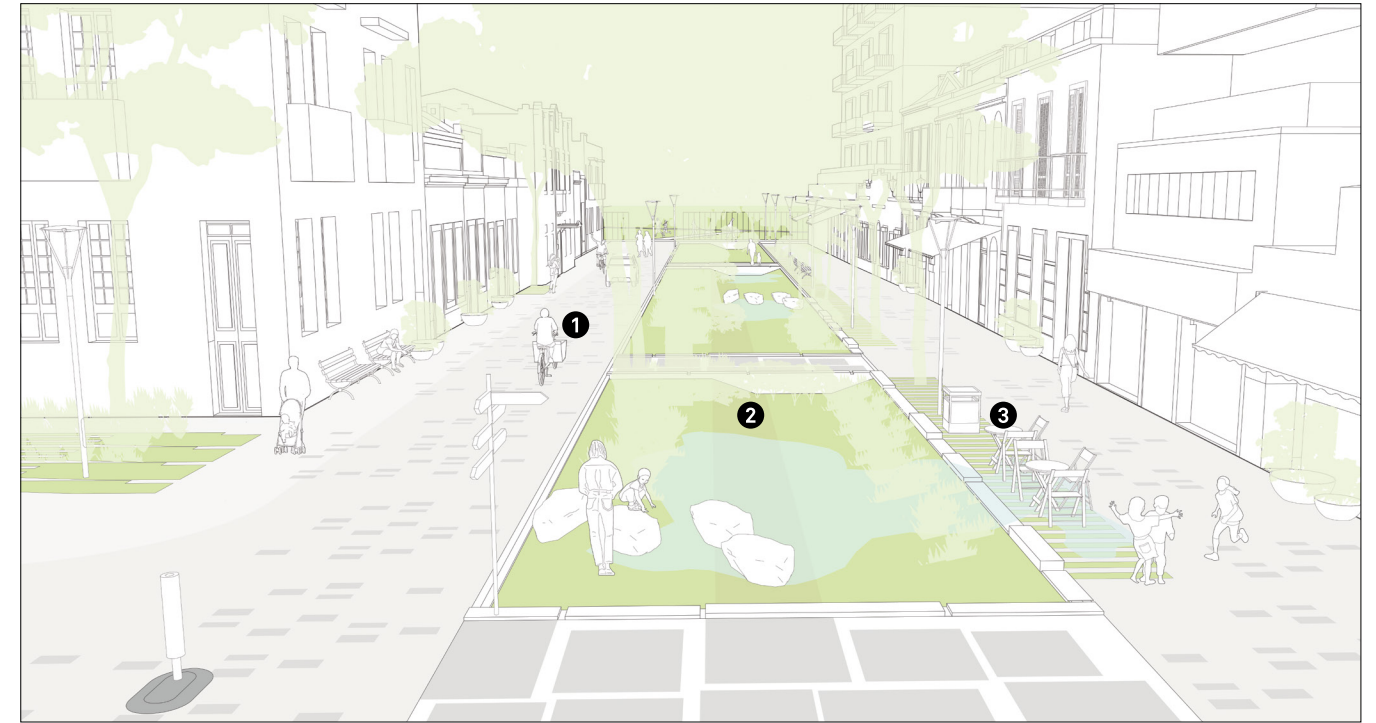
Turn radii were adjusted with the inclusion of curb extensions and protected intersections for cyclists.



#### Design Livable Streets

Two modal filters were installed, one at the intersection with Dexter Avenue and another at the intersection with 7th Avenue.

Sidewalks and landscaping were improved, with the addition of urban furniture.



Nature-priority corridors provide green connections between parks and other green spaces within a city. These corridors maintain continuity as green ecological corridors, such as linear parks. By implementing operational changes that restrict through traffic for motor vehicles, these streets can transform into inviting urban areas that encourage greater interaction with nature, among other co-benefits such as helping to manage water and heavy rains, reducing noise pollution, and improving air quality.




**Existing Conditions**

- This example depicts a street with low to moderate traffic, which provides drivers with opportunities to speed.
- The curbside often has cars parked illegally.
- The street is asphalt-paved and lacks tree coverage or greenery, contributing to the heat island effect.
- There are a few large trees that struggle to thrive due to insufficient growing space.
- The area frequently reports flooding during rain events, as rainwater exceeds the capacity of the sewage system.



→ Quelimane, Mozambique

**Design Guidance**

- User Separation**  
Fully Shared 
- Crossing Demand**  
Medium 
- Speed**  
10 km/h 



→ Paris, France



→ Niagara Falls, USA

**RIGHTSIZE STREETS**

- Maintain one rightsized travel lane that both cyclists and motor vehicles share.
- Create large planting areas to incorporate greenery, trees, and rain gardens by reclaiming asphalt from the travel lanes.
- Upgrade pedestrian facilities to enhance usability and provide enjoyable public spaces for people to experience nature.

**ADJUST STREET PACE**

Implement forced turns for motor vehicles to limit through movement and shorten road segments thereby reduce speeding opportunities. Provide horizontal deflection by alternating travel lanes with green spaces.

**REDUCE TURN SPEEDS**

Raise intersections with other neighborhood streets to lower approach speeds.

**DESIGN LIVABLE STREETS**

- Design the street as a public space. Use pavement materials, furniture, and other street elements to reshape the character of the area, prioritizing pedestrian and public space use.
- Encourage schools, retirement homes, or businesses or buildings facing these streets to take advantage of this transformation and provide outside activities.
- Incorporate trees and other vertical elements next to the shared travel lane to help reduce vehicle speeds.
- Increased street activity signals to drivers to be cautious and drive at lower speeds.
- Increase tree cover and implement green infrastructure to visually narrow the street, creating a more human-centered environment that improves driver behavior and encourages safer speeds.

## Passeig de Sant Joan (Green Corridors Program)



**Location** Barcelona, Spain

**Implementing Organization** Barcelona City Council

**Implemented in** 2011

### OVERVIEW

Barcelona's Green Corridors program enhances biodiversity, pedestrian connectivity, and sustainability by reclaiming street space for greenery and active mobility, fostering healthier neighborhoods.

Passeig de Sant Joan exemplifies this transformation. The 1.2 km boulevard redesign reduced car dominance, expanded pedestrian areas, and introduced a continuous tree canopy, improving shade and air quality. Sustainable drainage, permeable pavements, and green spaces mitigate urban heat, while seating and play areas create vibrant public spaces.

With improved cycling and walking infrastructure, the corridor strengthens Barcelona's ecological network and supports sustainable mobility. The transformation reduced unsafe speeds, reduced private vehicular dominance, and boosted local businesses by increasing foot traffic.



### STRATEGIES

#### Rightsize Streets

Sidewalks were widened from 12.5 m to 17 m, and a 4 m-wide two-way bike lane was added in the central median. Large planting areas replaced asphalt, incorporating trees and rain gardens.

#### Reduce Turn Speeds

Tighter turning radii and strategically placed greenery slowed vehicle turns.

#### Design Livable Streets

The corridor was redesigned with continuous walking paths, shaded plazas, and seating.

Increased tree cover and vertical elements visually narrowed the street, creating a more pedestrian-friendly environment.

## Ulic-ogrodów (Garden Street)



**Location** Łódź, Poland

**Implementing Organization** Łódź City Hall

**Implemented in** 2022

### OVERVIEW

The Ulic-ogrodów ("garden street") typology in Łódź, Poland, is part of a broader strategy to green the city, improving resilience, livability and social cohesion. It reimagines streets as pedestrian-friendly spaces with abundant greenery and reduced vehicle dominance.

In the Stare Polesie District, this typology is exemplified by the Pułku Strzelców Kaniowskich project. The street is being transformed with a focus on increasing green infrastructure and promoting sustainable mobility.

The project includes restricting through traffic, removing parking spaces, and integrating trees, shrubs, and urban furniture to create a peaceful, welcoming space for residents and visitors.

### STRATEGIES

#### Rightsize Streets

Vehicle lanes were rightsized, and the reclaimed space was used to prioritize pedestrians, cyclists, and green spaces.

#### Adjust Street Pace

Three chicanes and pinchpoints were implemented, using horizontal deflection to subdivide long roadway segments.



#### Design Livable Streets

Urban furniture, including benches, and vegetation were included, creating inviting spaces for social interaction and relaxation and highlighting other users and uses of the street.

The tree line of horse chestnuts and black locusts creates visual friction and increases the sense of enclosure for motorists.



Narrow multimodal corridors are undivided two-lane, two-way streets that perform long connections in the street network. They often serve as the only continuous routes linking the neighborhood to other parts of the city.

The streets are characterized by a vibrant mix of formal and informal commercial activity, with all modes of traffic sharing a very limited right-of-way. As a result, pedestrians often walk on the roadbed and cross the street at points without crosswalks. This situation creates a de facto neighborhood main street with significant through-traffic.

To protect vulnerable road users, the most effective solution is to implement extensive traffic calming measures, aiming to reduce speeds to 20 km/h.

### Existing Conditions

This example illustrates a busy two-way street located in a medium-density, low-rise urban area that is self-built.

Although this street serves as the only connection to the neighborhood, it was not designed to handle high traffic volumes or commercial activity.

The buildings along this street either lack setbacks or setbacks are used for parking.

Sidewalks are narrow and frequently interrupted by light poles, vendors, restaurant seating, business entrances, or parked cars.

Due to the absence of dedicated crosswalks, pedestrians often resort to crossing between moving traffic.

During late-night hours, with fewer vehicles on the road, speeding becomes common, and motorcycles frequently move at high speeds, even during congested times.

Additionally, cyclists have to navigate the limited space alongside motor vehicles.



→ Salvador, Brazil



→ Accra, Ghana

### Design Guidance

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
High



**Speed**  
20 km/h



→ Medellín, Colombia

#### RIGHTSIZE STREETS

Narrow travel lanes to the absolute minimum and reallocate the rest of the space to pedestrians. For more information, see 5.1 Safe Lane Geometry.

1 Implement a flex zone by alternating curbside parking, loading zones, furniture, landscaping, and street vendor pockets along the curbside. This efficiently uses limited space and includes all users and activities.

#### ADJUST STREET PACE

2 Add frequent pedestrian crossings and raise mid-block crossing to improve pedestrian movement, visibility, and comfort.

3 Stagger parking spots to accommodate two-way chicanes with pedestrian crossings.

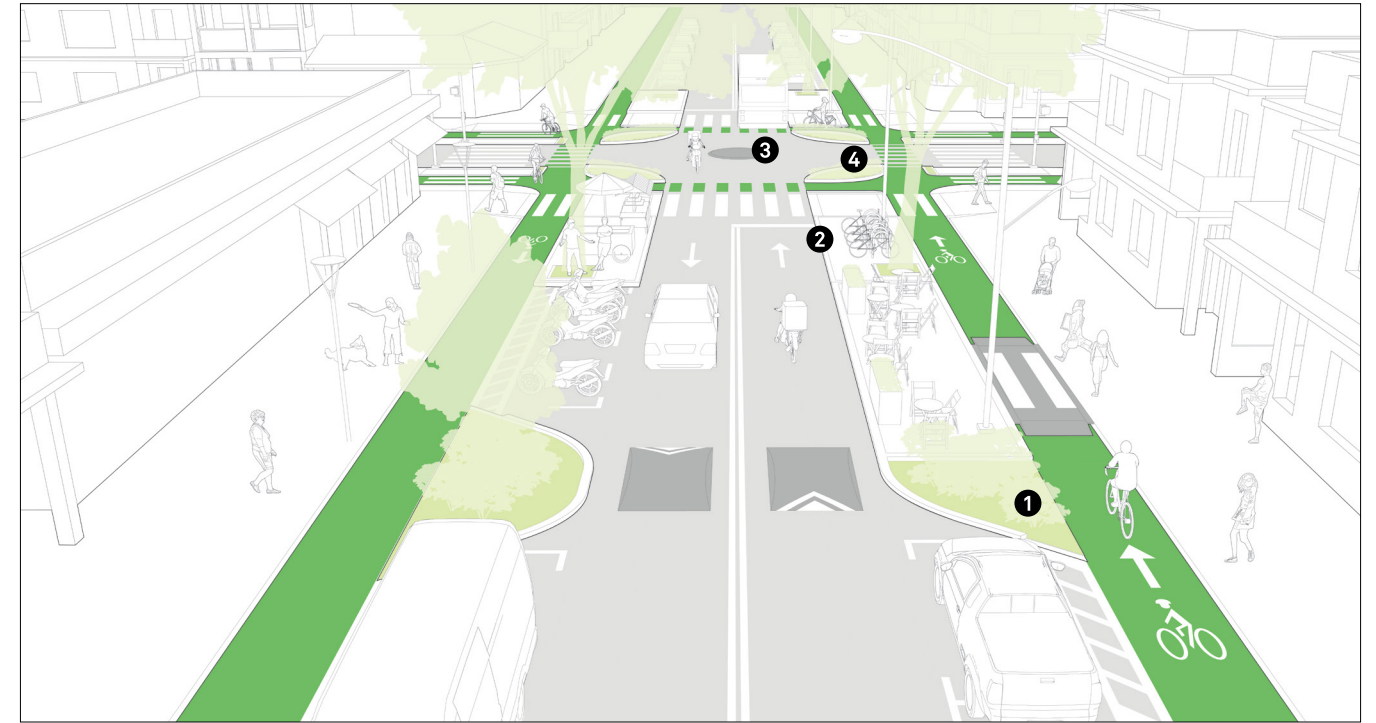
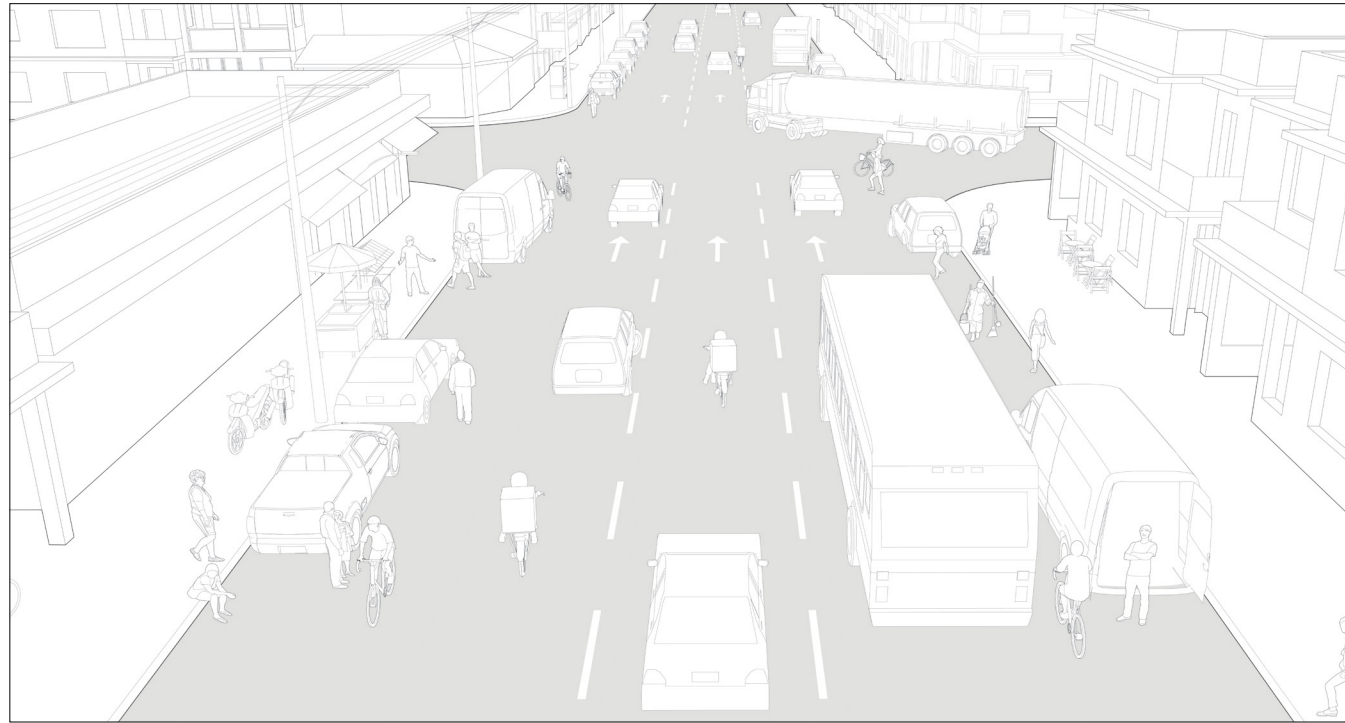
#### DESIGN LIVABLE STREETS

Use contrasting surfaces and pavement materials to break the visual continuity of the roadway space and to promote motorist awareness while driving.

4 Widen the gutter pane and median pavement patterns to narrow the travel lanes visually.

Adopt a half-height curb to delineate the road bed limit and to optimize space for pedestrian ramps.

Provide furniture, sitting, and resting areas to enhance the sense of enclosure, promote local economic activity, and encourage safe driving speeds.



Cities with regular street grid networks have historically converted two-way streets into multilane one-way couplets to enhance traffic capacity and simplify intersections areas near city centers and active commercial districts.

However, this approach encourages more people to drive and can lead to high speeds, unsafe streets, and less livable corridors overall. To address these issues, cities can revert these streets back to two-way corridors by implementing measures that promote safe speeds and prioritize places and accessibility.

By redesigning these couplets, cities can make parallel streets serve different functions, prioritize sustainable mobility, and support distinct contexts to create more livable and vibrant environments.

**Existing Conditions**

This example illustrates a wide one-way corridor with three travel lanes with curbside parking on both sides.

The wide lanes contribute to high speeds and force pedestrians to cross long distances without any refuge islands.

Additionally, road markings are unclear, leading to frequent lane changes by vehicles.

Transit riders and pedestrians face unsafe conditions due to inaccessible, disconnected and obstructed sidewalks, along with fast-turning traffic. The limited number of pedestrian crossings, combined with the lack of landscaping and trees, further exacerbates the harsh environment.



→ Guayaquil, Ecuador

**Design Guidance**

**User Separation**  
Fully Separated



**Crossing Demand**  
Medium



**Speed**  
40 km/h



→ Bogotá, Colombia

**RIGHTSIZE STREETS**

Reconfigure travel lanes to one right-sized lane in each direction, and repurpose reclaimed lanes into cycle tracks. Use two-way street directionality to induce slower speeds.

1 Utilize parking and loading zones to protect the cycle track.

2 Provide curb extensions to shorten crossing distances, and incorporate landscaping and street furniture to accommodate all users.

**ADJUST STREET PACE**

Install speed cushions to decrease the speed of smaller vehicles while minimizing discomfort for bus passengers.

3 At the intersection, use mountable mini-roundabouts to break corridor continuity and promote safer speeds on the corridor.

**DESIGN LIVABLE STREETS**

Redesign intersections with a corner island to enhance protection for cyclists and restrict turns for vehicles. For more information, see 7 Safe Speeds Toolbox.

4 Incorporate mountable areas on the corners to accommodate larger vehicles, if necessary.

Ensure the mini-roundabout is mountable to help manage far-side turn speeds while allowing local buses to navigate their turns as needed.

# La Jolla Boulevard



**Location** San Diego, USA

**Implementing Organizations** Bird Rock Community Council and City of San Diego

**Implemented in** 2007

## OVERVIEW

La Jolla Boulevard, the primary vehicular route connecting Bird Rock neighborhood to the La Jolla area in San Diego, was transformed from a wide, car-dominated corridor into a pedestrian-friendly, neighborhood-oriented street.

Facing concerns over safety, speeding, air pollution, and poor pedestrian crossings, a comprehensive traffic management plan was developed in collaboration with the community.

The redesign prioritized safety, accessibility, and local economic revitalization, reducing vehicle lanes, adding roundabouts, and introducing traffic calming measures to create a vibrant, multimodal corridor.

The 24 km/h (15 mph) design speed established for the corridor was achieved through roundabouts and traffic calming, creating a safer and more comfortable environment for cyclists to share the road.



## STRATEGIES

### Rightsize Streets

Travel lanes were reduced from five to two, reallocating space for wider sidewalks, bike lanes, and landscaped medians.

Thirty diagonal and parallel parking spaces were introduced to address parking shortages.

### Adjust Street Pace

Five new roundabouts replaced signalized intersections, slowing traffic and enhancing safety.

Crossing distances were shortened by 80% with refuge islands, providing safer pedestrian crossings.

Bulb-outs, speed bumps, raised medians, and clear markings improved pedestrian and cyclist safety.

### Design Livable Streets

Greenery was integrated into the streetscape, enhancing air quality, aesthetics, and traffic separation.

Transit access was improved with new bus pads, benches, and strategically relocated stops.

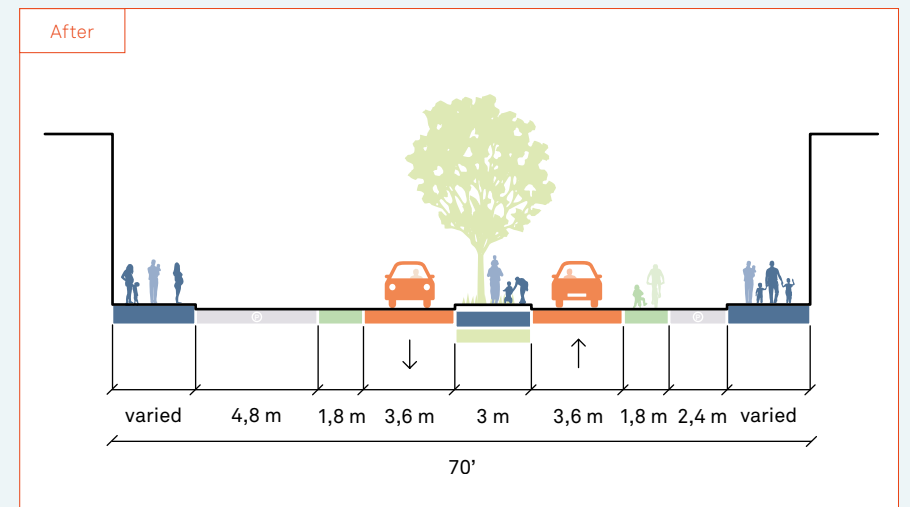
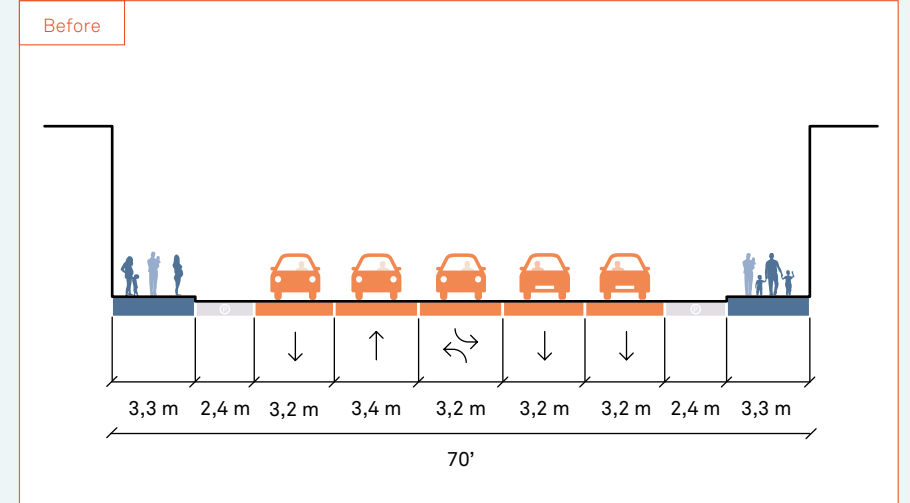
## IMPACT

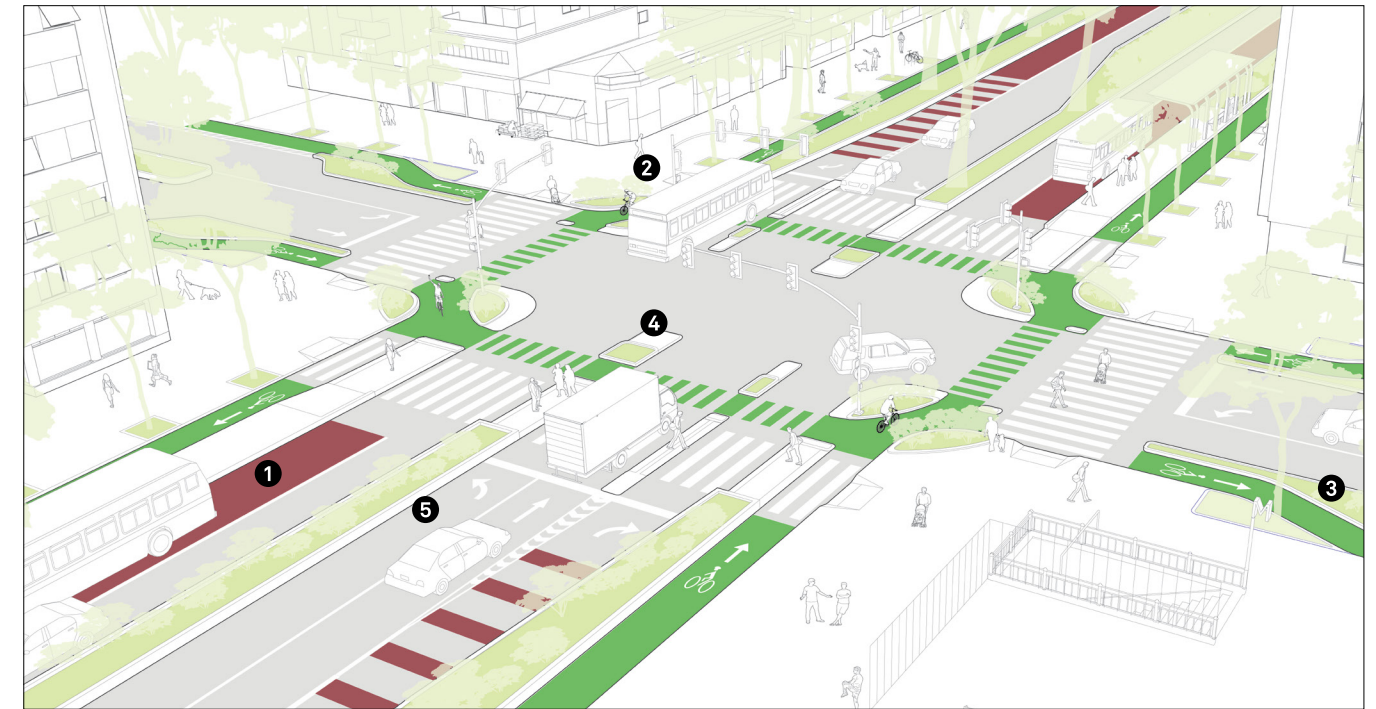
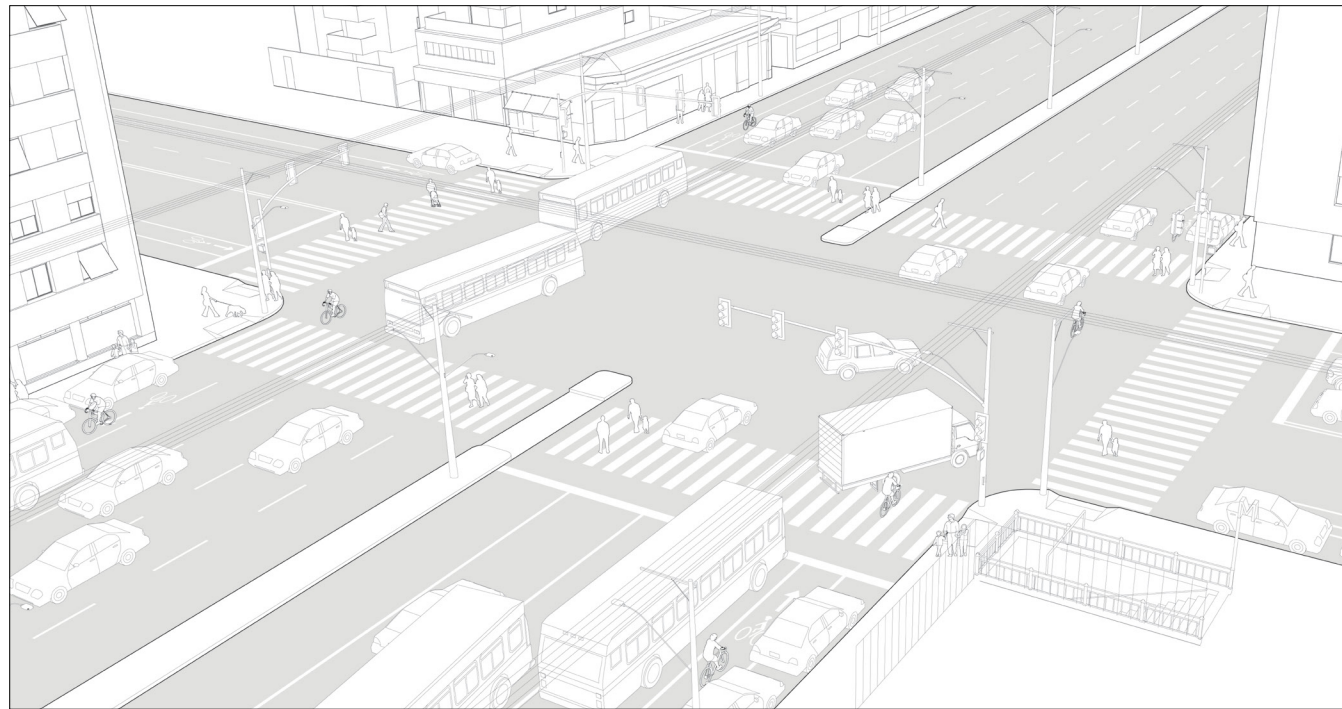
↓ **90%** reduction in traffic crashes, including injuries and fatalities.

↑ **90%** increase in retail sales, supporting local businesses and stimulating economic activity.

🔊 **77%** reduction in noise levels, while landscaped medians enhanced air quality and visual appeal.

Source: Congres for the New Urbanism <sup>7</sup>





High-speed, car-centered arterial corridors can be transformed into multimodal corridors. This change significantly increases the corridor's capacity for moving people by adding dedicated facilities for transit and cycling, which are more space-efficient modes of transportation.

Multimodal corridors often have reduced travel times for transit riders, who often make up the majority of street users.

Additionally, reducing traffic volumes enhances the livability of the street, improves public health in surrounding areas by decreasing air and noise pollution, and boosts local businesses.

### Existing Conditions

This example depicts a high-speed corridor with three wide lanes in each direction. The oversized lanes, road beds and intersections create conditions that lead to unsafe driving speeds. Various transit routes converge on this street, where buses frequently overtake one another. This situation forces them to use two lanes, making it unsafe for transit riders to board and alight from the buses.

With the existing unprotected cycle lane, cyclists feel unsafe as they navigate between fast-moving traffic and parked cars. It's common for them to be at risk of being hit by car doors opening unexpectedly or by vehicles maneuvering while parking or leaving.

Additionally, cars often invade the bike lane, further compromising cyclist safety.

The sidewalks are unable to accommodate the high volume of pedestrians and vendors, leading them to use the road bed and parking lanes.



→ Miami, USA

### Design Guidance

**User Separation**  
Fully Separated



**Crossing Demand**  
Medium



**Speed**  
40 km/h



→ Vancouver, Canada

#### RIGHTSIZE STREETS

1 Right-size travel lanes and dedicate one exclusively for transit in each direction.

Widen sidewalks and maintain 2.4 m deep pedestrian and cycle refuges at crossings.

2 Reallocate reclaimed space to provide a protected cycle track on each side of the street.

3 Alternate parking spaces with street furniture and trees on the intersecting street along a flex zone as protection for the cycle lanes.

#### ADJUST STREET PACE

Set the progression speed for signals at 40 km/h, ensuring that coordination zones include no more than three to four signalized intersections.

#### REDUCE TURN SPEEDS

4 Reduce the radii of corners and ensure that median tips are aligned with the curb. This alignment not only helps lower far-side lane turn speeds but also improves safety of pedestrian crossings.

Additionally, adapt the geometry to include protected corners for cyclists. For more information, see 7.3.2 Rightsized Corner Radius.

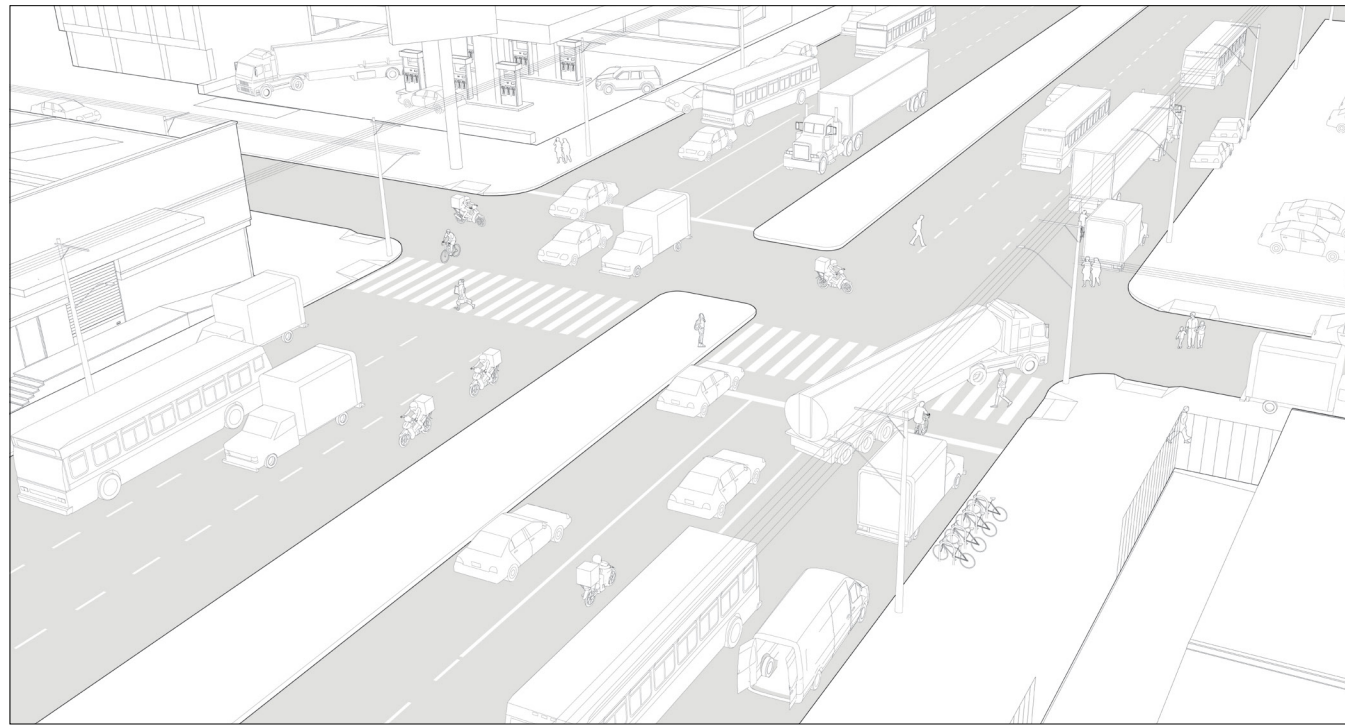
5 At the intersection, designate one travel lane specifically for left turns.

#### DESIGN LIVABLE STREETS

Place trees along sidewalks, sidewalk extensions and medians.

On cross streets, manage the parking demand by reducing the number of parking spots, while implementing metered parking.

Improve accessibility for active transportation to boost local businesses and increase pedestrian activity.



**Existing Conditions**

This example depicts a two-way arterial street in a medium-density area on the city's edge, featuring a mix of low-income, low-rise residential neighborhoods, local businesses, public facilities like schools and healthcare, and industrial sites.

It attracts high volumes of pedestrians, cyclists, and transit riders, especially during peak hours in the morning and evening. A significant portion of the curb space is taken up by driveways leading to garages, auto body shops, and gas stations. The frequent presence of these curb cuts negatively impacts the walking environment.

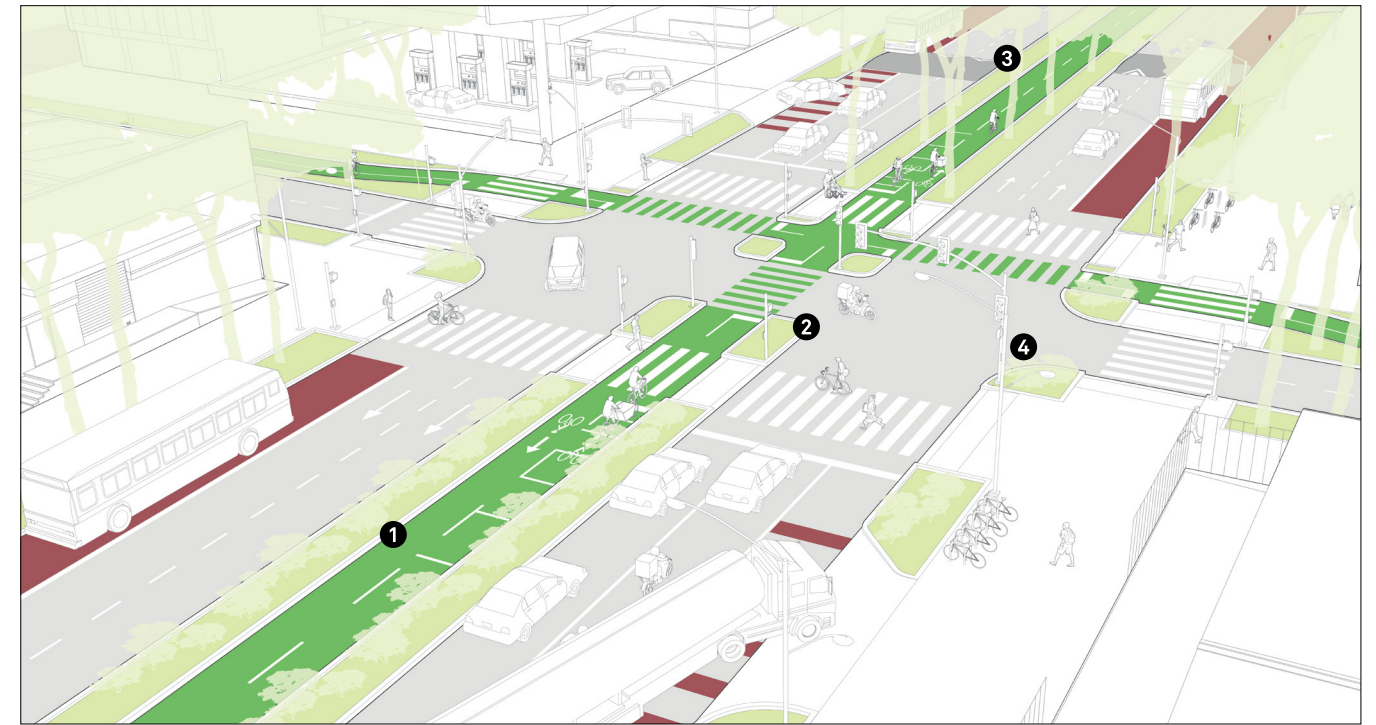
The area has long blocks due to the large land plots, with intersections occurring every 200 meters or more, creating speeding opportunities for vehicles and creating long distances between pedestrian crossings.

The demand for crossings is considerable, particularly during school start and end times.

Pedestrians face extreme danger due to speeding motor vehicles, as the sidewalks are often inaccessible, narrow, and discontinuous, and frequently obstructed by utilities and parked trucks.



→ Ronchin, France



**Design Guidance**

**User Separation**  
Fully Separated



**Crossing Demand**  
Medium



**Speed**  
40 km/h



**RIGHTSIZE STREETS**

Resize travel lanes and dedicate lanes for curbside transit.

1 Allocate a protected center running cycle track in both directions.

2 Use medians that separate cycle tracks from travel lanes to provide pedestrian refuges at crossings.

**ADJUST STREET PACE**

Improve walkability, the corridor's permeability, and transit access with mid-block crossings along the large blocks, aligned to the transit stops.

3 Add speed humps with profiles and spacing aligned with the design speed of 40 km/h. For more information, see 7.2.3 Roadway Humps

**REDUCE TURN SPEEDS**

4 Provide corner islands to protect cyclists waiting to cross the streets.

To reduce corner radii, identify routes, access points, and the frequency of large vehicles in the area. Install mountable corners to prevent small vehicles from speeding while turning.

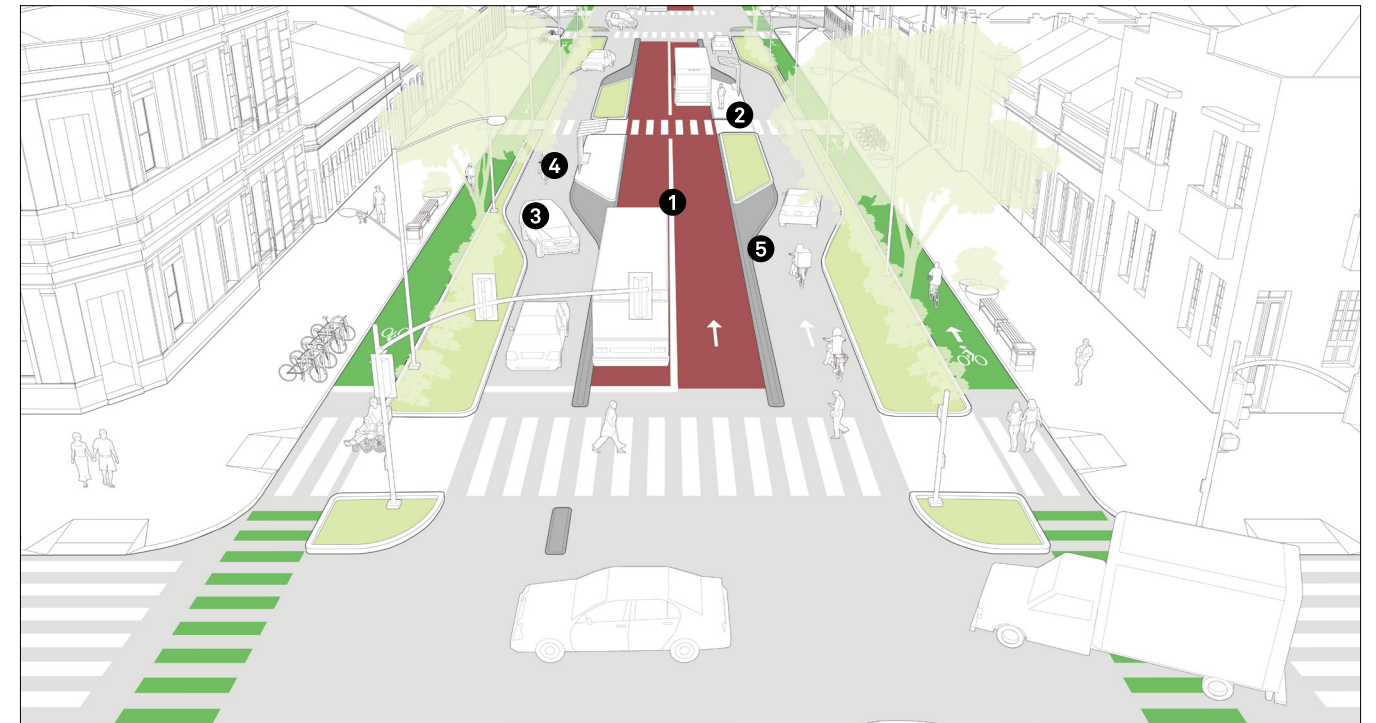
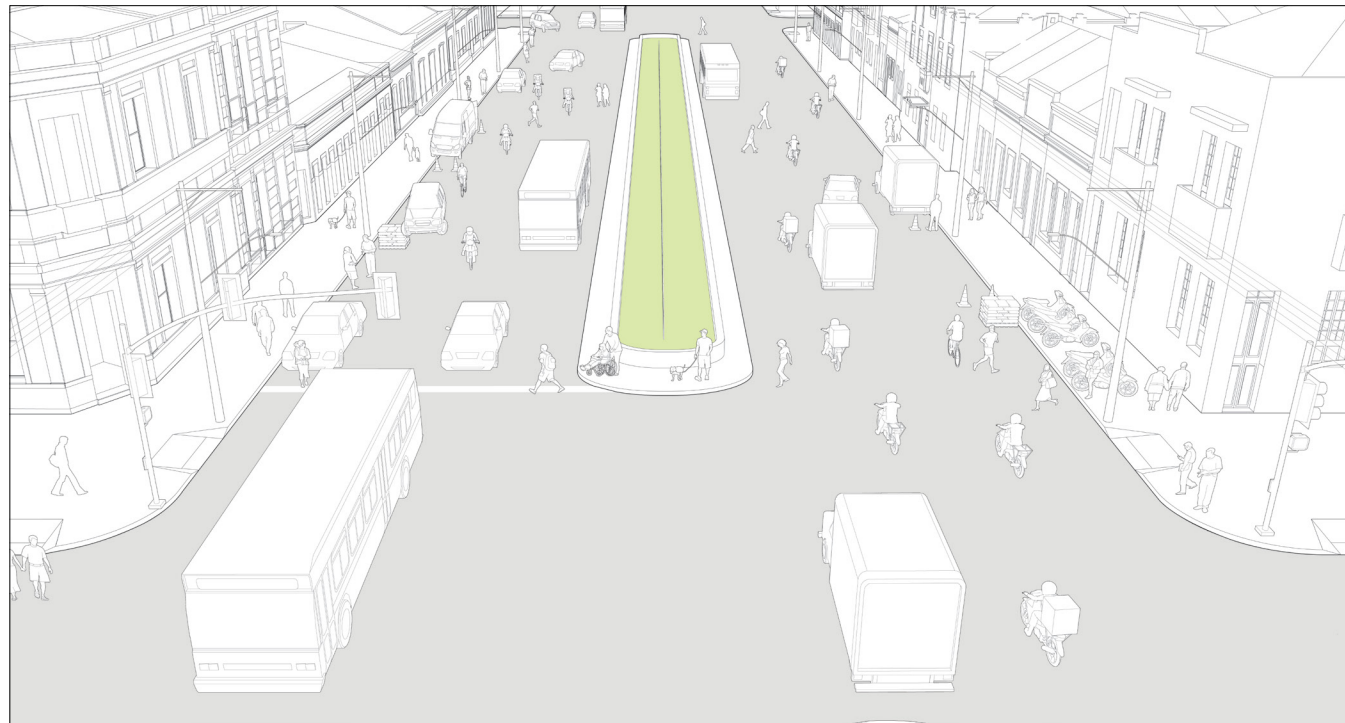
**DESIGN LIVABLE STREETS**

Collaborate with local building owners to reduce the number of curb cuts to a minimum through incentives or law enforcement. This will enhance the walking environment by reducing conflicts with vehicles accessing driveways.

Use the re-organized curb space for tree planting and other streetside elements to improve the overall environment of the street and potentially lower driving speeds.

Plant trees in the median to provide shade and improve cyclists' comfort, which will help promote safer speeds.

Provide bike parking and space for bike share to support cycling as an intermodal connection with transit.



**Existing Conditions**

This example depicts a large, two-way corridor with three wide lanes per direction situated in a medium-density mixed-use area near the city center. This street also serves as a critical corridor for multiple transit routes within the city.

Although traffic levels are lower than in the downtown area, private vehicles dominate the street.

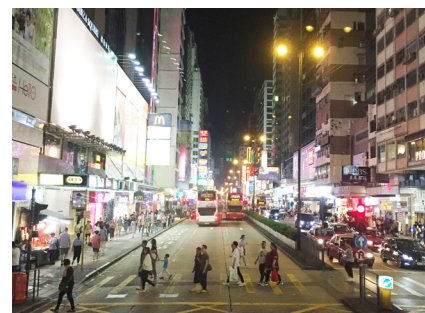
Limited crossing opportunities and central median barriers prevent pedestrians from crossing the street; as a result, they often jump over the barriers at mid-block, putting themselves at risk.

Inaccessible sidewalks push the most vulnerable road users to the road bed and negatively impact nearby businesses.

Additionally, cyclists frequently navigate this street, weaving between cars and buses.



→ Mombasa, Kenya



→ Hong Kong, China

**Design Guidance**

**User Separation**  
Fully Separated



**Crossing Demand**  
High



**Speed**  
30 km/h



→ Kraków, Poland

**RIGHTSIZED LANES**

1 Maintain one **3.3 m** wide lane per direction and dedicate two lanes for center-running transitways.

Allocate one-way curbside cycle tracks on each side of the street.

Planted medians separate cycle tracks from travel lanes, reducing cyclists' and pedestrians' exposure to air pollutants.

2 Provide medians between travel lanes and transit lanes to provide protected waiting areas for transit riders.

Widen sidewalks to improve walkability and promote commercial activity.

**REDUCE TURN SPEEDS**

Reduce corner radii and, if necessary, make the corner partially mountable or implement recessed stop bars to allow larger vehicles to turn while managing the turn speed of smaller vehicles.

Align edge island tips with corners to protect pedestrian crossings and cyclists.

**ADJUST STREET PACE**

3 Shift lane alignment to create chicanes and limit speeding opportunities. Create pedestrian refuges on alternating sides of the roadway, according to the context.

4 Improve walkability and increase the corridor's permeability by adding mid-block crossings, ensuring access to transit stops.

5 Construct mountable curbs on chicanes to accommodate trucks and larger vehicles when necessary. *For more information, see 7.4.4 Chicanes and Lane Shifts.*

**DESIGN LIVABLE STREETS**

Plant trees on edge islands to provide shade for cyclists, narrow sightlines, and encourage lower speeds.

Place bus shelters between travel lanes and transit lanes to reinforce a sense of enclosure.

Improve the overall quality of public spaces with greenery and furniture for pedestrians and cyclists.

## Avenida Leste-Oeste



**Location** Fortaleza, Brazil

**Implementing Organization** City of Fortaleza, Bloomberg Initiative for Global Road Safety (BIGRS), Global Designing Cities Initiative (GDCI)

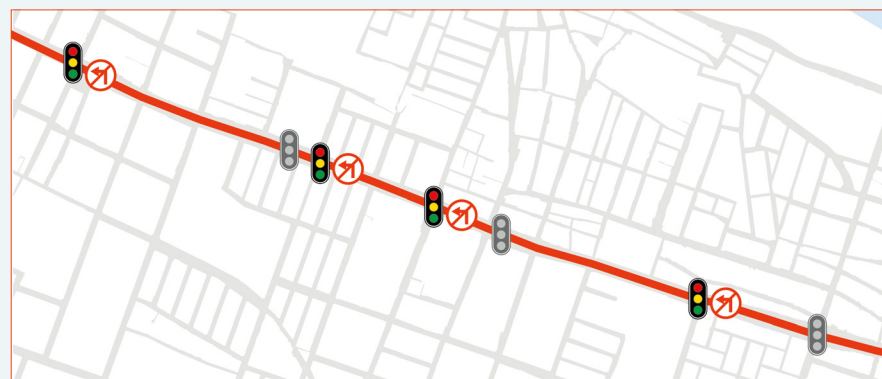
**Implemented in** 2018

### OVERVIEW

The 4.8-km-long Avenida Leste-Oeste was one of the corridors with the highest traffic fatality rate in the city of Fortaleza, especially pedestrian crashes. There were 15 fatal crashes in the two years prior to the implementation, nine of them involving pedestrians.

It is located within a high-density neighborhood in the city, with intense pedestrian activity. The traffic volume was generally high and vehicles were able to reach high speeds, especially outside peak hours. The project changed the speed limit from 60 to 50 km/h, and included design measures focused on speeding, for instance implementing narrower lanes, new signalized crossing opportunities, and the inclusion of dedicated pedestrian phases in many existing traffic signals.

The city shortly observed significant reductions in traffic fatalities, which motivated a rapid expansion of this initiative to more than 170 km.



Existing Traffic Light   New Traffic Light   Disallowed Left-Turn

### STRATEGIES

#### Rightsize Streets

Lanes were rightsized, from typically 3.5 m to 3.0 m.

3.5 km of cycle lanes were included with the reclaimed space.

#### Adjust Street Pace

Dedicated pedestrian phases were added to all existing traffic lights.

Five new traffic lights were added, already featuring dedicated pedestrian phases.

#### Reduce Turn Speeds

Five left-turns over the median were removed.

### IMPACT

↓ **78% reduction in fatal crashes**

↓ **63% reduction in pedestrian crashes**

↓ **54% reduction in injury crashes**

Source: *Diário do Nordeste*<sup>8</sup> and *O Povo*<sup>9</sup>

## Diagonal Sur, Monumento Roca y Perú

**Location** Buenos Aires, Argentina

**Implementing Organizations** Ministry of Transportation of Buenos Aires, World Resources Institute (WRI)

**Implemented in** 2012

### OVERVIEW

As part of Buenos Aires' Sustainable Mobility Plan, this 2012 project transformed the avenue into a pedestrian-friendly corridor by rightsizing vehicle lanes, adding curb extensions, pedestrian islands, and 236 m<sup>2</sup> of space for walking and cycling near the Roca Monument. Dangerous intersections and long crossings were redesigned with shorter distances and tighter turning radii to slow vehicles and improve safety. Greenery and urban furniture like benches enhanced the environment, encouraging community interaction. Impacts include reduced speeds, improved transit connections, better air quality, and increased safety and satisfaction for residents.



## Lancaster Boulevard

**Location** Lancaster, USA

**Implementing Organization** City of Lancaster

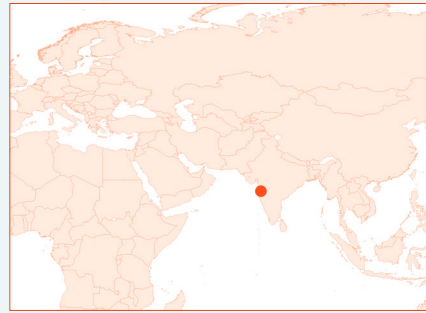
**Implemented in** 2010

### OVERVIEW

Lancaster Boulevard's redesign revitalized the downtown area, transforming it into a pedestrian-friendly corridor. The project reduced five traffic lanes to three, added mid-block crossings, and installed curb extensions and pedestrian islands to enhance safety and accessibility. A central tree-lined promenade (rambla), widened sidewalks, and improved landscaping, lighting, and urban furniture created an inviting environment. Narrow lanes and strategically placed trees enforced a 15 mph (24 km/h) speed limit. These changes reduced pedestrian crashes by 78%, vehicle collisions by 38%, and injuries by 67%, making the area safer and more livable.<sup>10</sup>



## DP Road – Aundh Streets



**Location** Pune, India

**Implementing Organizations** Pune Municipal Corporation, Institute for Transportation and Development Policy (ITDP) India, Prasanna Desai Architects, Pune Smart City Development Corporation Ltd.

**Implemented in** 2017-2018

### OVERVIEW

The transformation of DP Road in Pune, India, was part of the city's "Complete Streets" initiative to create pedestrian-friendly, accessible streetscapes. The project prioritized safe sidewalks, cycling infrastructure, and better integration with urban infrastructure.

By rightsizing travel lanes, changing roadway pavement, and ensuring sidewalk-grade crossings, the transformation reduced private vehicle dominance, ensured a safer environment for pedestrians and cyclists, and enhanced public spaces to foster community cohesion.



### STRATEGIES

#### Rightsize Streets

Travel lanes were narrowed and parking was better demarcated.

#### Adjust Street Pace

Vertical deflection elements, such as raised crossings, were introduced in several locations.

#### Design Livable Streets

The pavement was changed to increase friction, inducing motorists to drive at lower speeds for more comfort.

Sidewalks were improved, ensuring a clearer path to pedestrians.

### IMPACT

Increased pedestrian and cyclist safety through shaded walkways and segregated cycle tracks.

Reduced vehicular speeds, improving overall road safety.

Enhanced urban greenery, contributing to better air quality.

Higher pedestrian volume, supporting local businesses.

Improved accessibility, fostering a more inclusive urban environment.

Source: ITDP <sup>11</sup>

## Károly Boulevard



**Location** Budapest, Hungary

**Implementing Organization** Budapest Capital

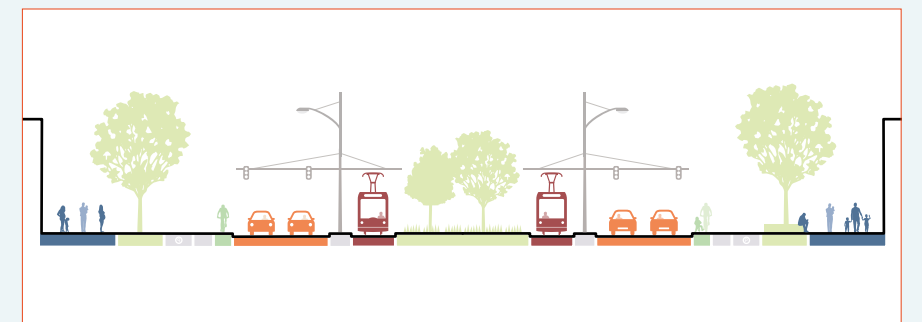
**Implemented in** 2011

### OVERVIEW

The Károly Boulevard regeneration project in Budapest aimed to revitalize an area once dominated by traffic by expanding pedestrian spaces and reducing vehicle presence.

The project reestablished connections between districts that were previously obstructed, highlighted by the creation of an 8-meter-wide central green corridor, between Deák Square and Dohány Street. This corridor is formed by interwoven hornbeam trees and vertical water features, enhancing the local aesthetics and microclimate.

The changes provided more pedestrian areas, restored urban ecology, and transformed the boulevard into a more accessible and pleasant space, promoting social interaction, local commerce, and improving road safety and community well-being.



### STRATEGIES

#### Rightsize Streets

Vehicle lanes were reduced from four to two on each side, reducing car dominance and creating space for pedestrians, cyclists, and public transport.

A parking lane was added on one side to further optimize space.

The central corridor was widened and a tree-lined median introduced.

Traffic lanes were rightsized, inducing safer behaviors from motorists, and creating space for new cycle lanes and parking.

#### Design Livable Streets

Pedestrian areas and green spaces were expanded, including urban furniture, such as benches, trash bins, and fountains.

#### Reduce Turn Speeds

Intersections were reconfigured to reduce turn speeds by tightening corner radii and removing wide slip lanes.



**Existing Conditions**

This example illustrates a four-lane, undivided two-way corridor located within a medium-density area that features local commercial activity. This roadway configuration encourages high speeds and generates long crossing distances for pedestrians.

Vehicles attempting to turn left often block one of the lanes, causing the street to function with only one through lane. Additionally, left turns that cross multiple lanes of traffic increase the likelihood of conflicts. When no cars are parked near the corners, vehicles may slip in and use those spaces as right-turning lanes.

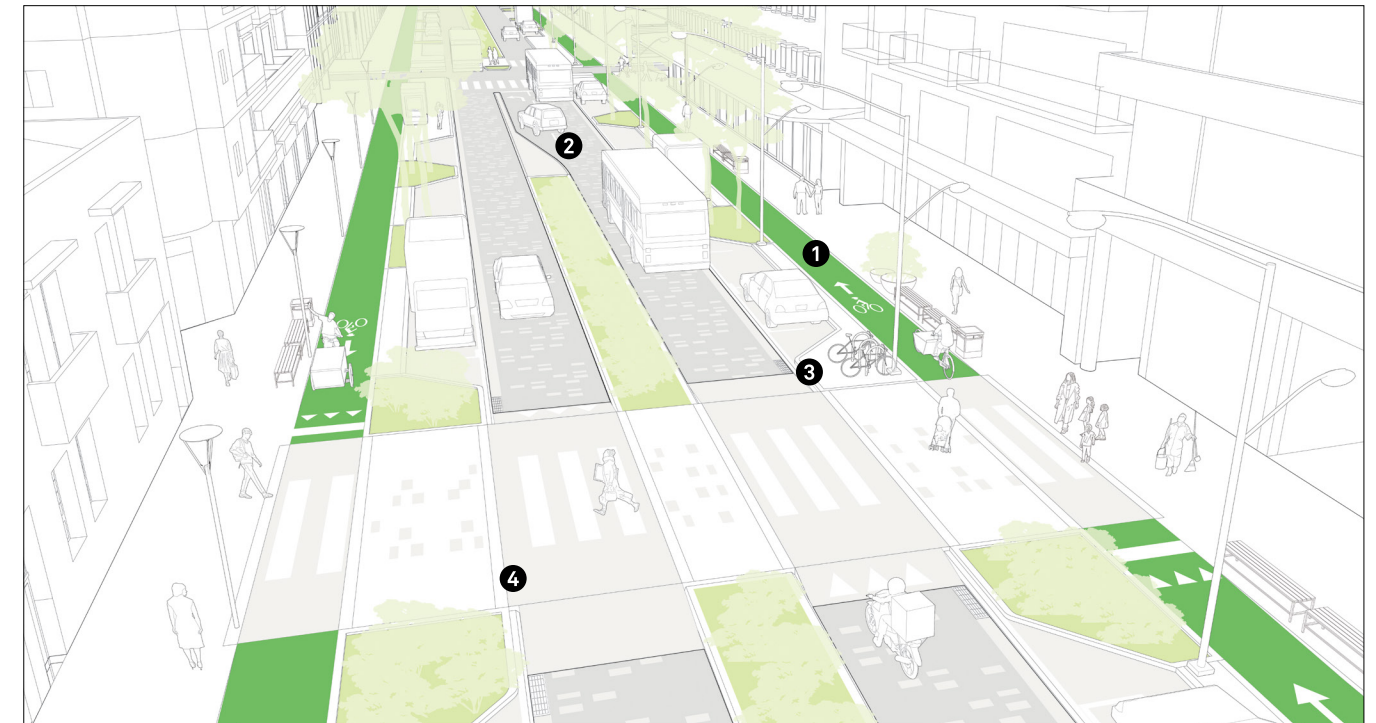
As a corridor with commercial activity, there is a high demand for curb access from different users.

Long blocks cause pedestrian crossings to be spaced too far apart, encouraging unprotected mid-block crossings.

People outside enclosed vehicles face an unsafe and challenging environment due to inaccessible and disconnected sidewalks, fast-moving traffic, a lack of pedestrian crossings, and the absence of landscaping and trees.



→ Hong Kong (SAR), China



**Design Guidance**

**User Separation**  
Fully Separated



**Crossing Demand**  
High



**Speed**  
30 km/h



**RIGHTSIZE STREETS**

**1** Maintain only one travel lane per direction. Adjust the widths of travel lanes to ensure they are properly sized. This adjustment allows for the inclusion of unidirectional cycle tracks on each side of the street.

**2** Optimize the space needed for left turns, creating one central lane that alternates left turn pockets (in both directions, as applicable to each intersection) and a median with pedestrian refuge islands for safe crossings.

**3** Accommodate narrower curbside parking spots and loading zones, as well as curb extensions.

**ADJUST STREET PACE**

**4** Raise mid-block crossings to increase pedestrian permeability and reduce speeding opportunities. Install curb extensions at mid-block crossings to create a pinchpoint effect, reduce crossing distances, and improve mutual visibility between pedestrians and motorists. *For more information, see 7.2.2 Sidewalk-level Crossings*

Implement in-lane bus stops to prioritize transit and increase efficiency. Provide pre-boarded fare collection options or free transit to expedite boarding and alighting and reduce delays for all users. In-lane bus stops also affect travel speeds by occasionally requiring motorists to stop while passengers board and alight.

Adjust signal progression speeds to **20–30 km/h**. *For more information, see 7.4.2 Signal Progression and Coordination.*

**REDUCE TURN SPEEDS**

Provide corner curb extensions and reduce corner radii to manage speeds at turns.

Add a median tip on the pedestrian refuge at the intersection to physically protect the waiting area while reducing far-side lane turn speeds. Adjust the median tip and corner geometry to accommodate turns from vehicles of different sizes.

Where a left turn pocket is provided, use centerline hardening (flexible posts or a traversable raised median) to manage left turns entering and exiting the corridor.

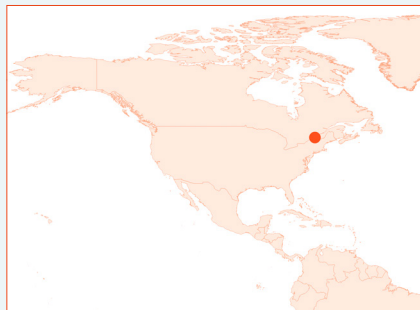
**DESIGN LIVABLE STREETS**

Update roadway pavement material to alter the perception of the space and encourage lower driving speeds.

Replace the parking lane with a flexible zone to create a dynamic streetside design. *For more information, see 7.1.5 Streetside Design.*

The raised crossings' plateau resembles the sidewalk materials to convey pedestrian priority and reduce vehicular speed.

## Rue Saint-Denis



**Location** Montreal, Canada

**Implementing Organization** City of Montreal

**Implemented in** 2020-2024

### OVERVIEW

Prior to the transformation, Rue de Saint Denis was designed for cars, with two wide travel lanes per direction, and poorly demarcated parking spaces. Safe crossing opportunities for pedestrians were present only at intersections, and cyclists shared the roadway with high-speed vehicles.

The corridor underwent a major redesign as part of Montreal's Réseau Express Vélo (REV) initiative, inaugurated in 2020. It was transformed into a safer, more accessible space for pedestrians and cyclists, with works finalized in 2024.

The transformation repurposed space from the travel lanes into dedicated cycling infrastructure, with rightsized lanes for motorized vehicles to navigate. The intersections were made compact with reduced turn radii, curb extensions and islands. And additional mid-block crossing opportunities were created, also adding horizontal deflection for motorized modes.

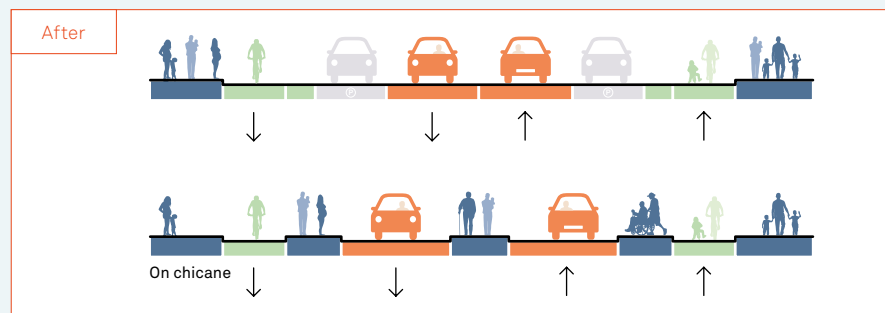
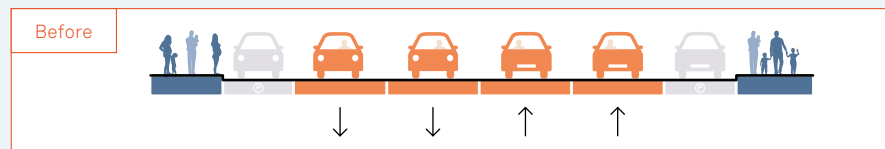
### STRATEGIES

#### Rightsize Streets

Travel lanes were rightsized and parking was better demarcated, and the space was repurposed to cycling infrastructure.

#### Adjust Street Pace

Pedestrian refuge islands were introduced in mid-block locations, creating horizontal deflection for vehicles and safer crossing opportunities for pedestrians.



#### Reduce Turn Speeds

Intersections were redesigned into more compact ones, with the introduction of curb extensions and islands to reduce turn radii.

## Dar es Salaam BRT



**Location** Dar es Salaam, Tanzania

**Implementing Organization** Dar Rapid Transit Agency, Institute for Transportation and Development Policy (ITDP) Africa

**Implemented in** 2012-2016

### OVERVIEW

The Dar Rapid Transit (DART) BRT system in Dar es Salaam, Tanzania, was a catalyst for an encompassing corridor transformation in the city.

The redesign created dedicated center-running bus lanes, repurposing space previously from mixed traffic travel lanes and from an unused median strip. The transformation also addressed sidewalks and lighting along the corridor, helping highlight pedestrians and increase the perception of an urban environment rather than a highway.

### STRATEGIES

#### Rightsize Streets

Mixed traffic travel lanes were rightsized and partially repurposed into center-running BRT lanes.

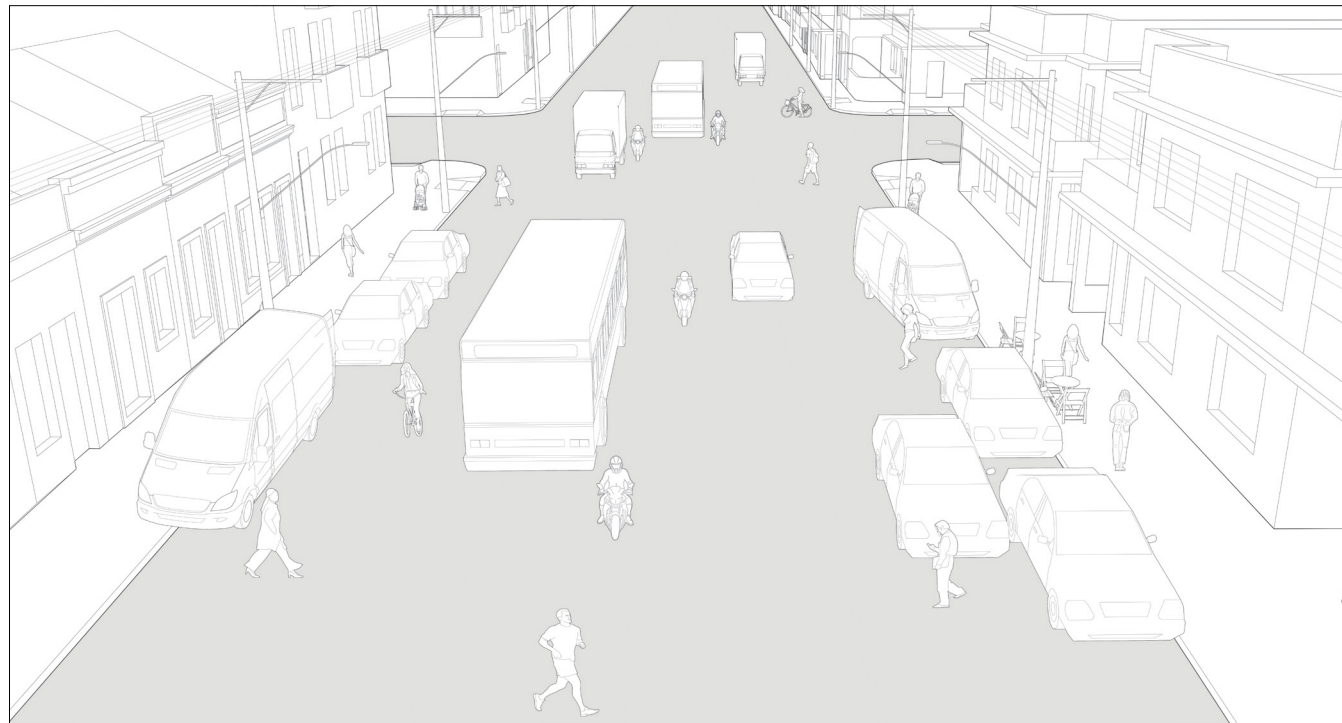
#### Adjust Street Pace

Raised crossings and new traffic signals helped subdivide long roadway segments.

#### Design Livable Streets

Sidewalk and lighting improvements strengthened the sense of an urban environment shared by other users.





Over the past century, numerous cities transformed central two-way streets into one-way corridors to improve traffic flow and minimize conflicts. In some cases, cities were initially designed with one-way street grids following the same logic. Wide one-way corridors offer the possibility of redesigning wide roadways to include cycle tracks and transit lanes, or even converting them back to two-way streets to enhance access, connectivity, and safety.

### Existing Conditions

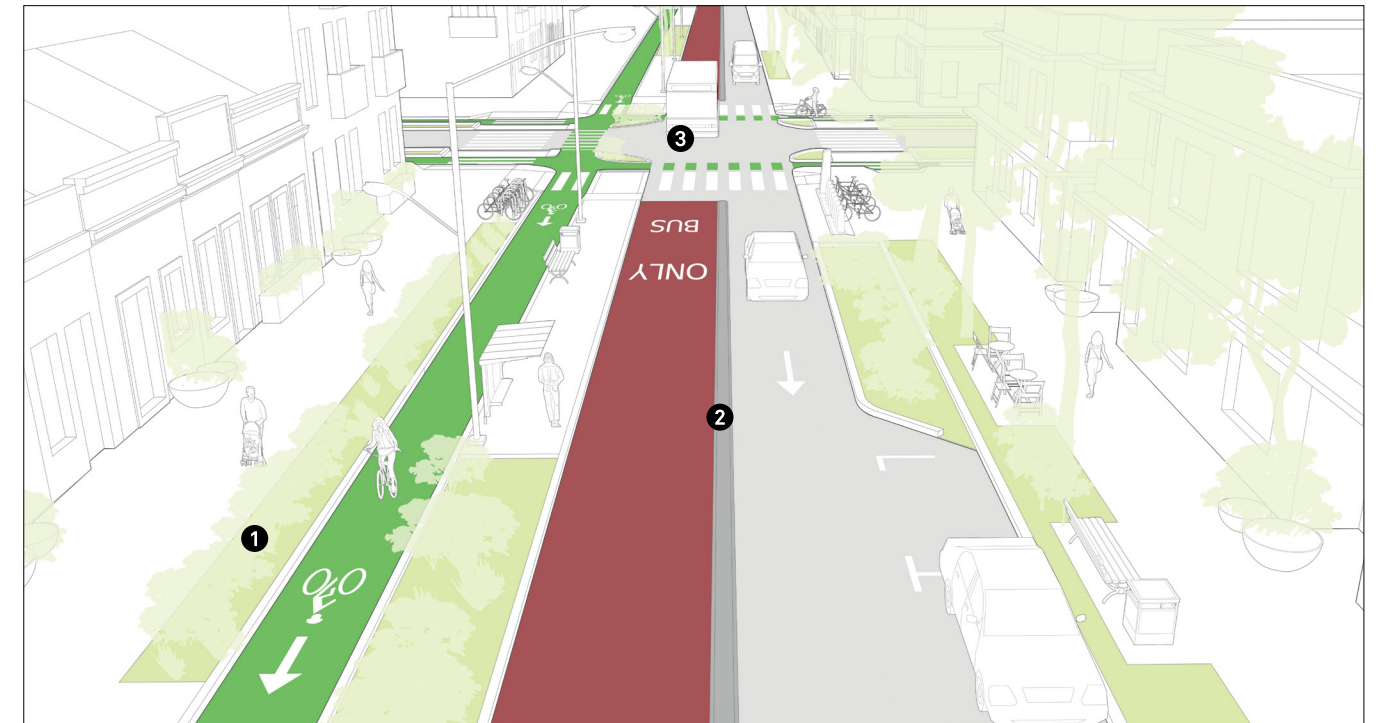
This example highlights one of many city streets that have been converted from original two-way operation to accommodate higher volumes of traffic downtown. However, the wide travel lanes encourage speeding and create unsafe conditions for all road users.

Curbside parking is unregulated; and, the excess space for one-way traffic leads to frequent instances of double parking. Additionally, the absence of road markings contributes to speeding and frequent lane changes.

Due to safety concerns, cyclists are often forced to ride on sidewalks, creating conflicts with pedestrians. When navigating through mixed traffic, they contend with congestion and fast-moving vehicles.



→ Chennai, India



### Design Guidance

**User Separation**  
Fully Separated



**Crossing Demand**  
Medium



**Speed**  
40 km/h



→ New York City, USA

### RIGHTSIZE STREETS

1 Rebalance the street space and use reclaimed lanes as cycle tracks and wider sidewalks.

2 Maintain only one lane for private vehicle travel, occasionally using the transit and parking lanes as turn lanes where applicable.

### ADJUST STREET PACE

Adjust signal progression speeds to 20–30km/h. For more information, see 7.4.2 Signal Progression and Coordination.

To increase pedestrian permeability and reduce speeding opportunities, incorporate mid-block pedestrian crossings on long blocks.

Add speed cushions ahead of crossings to improve safety for pedestrians and reduce approach speeds.

### REDUCE TURN SPEEDS

3 Make intersections compact with smaller turning radii and install curb extensions to reduce turning speeds and create safer pedestrian crossings.

Ban or consolidate right turns onto cross streets to reduce conflicts with cyclists and improve transit operations by avoiding right-turning vehicles' use of the transit lane.

### DESIGN LIVABLE STREETS

Enhance public spaces by adding trees and furniture. Planting trees and greenery creates a visually narrowed roadway while signaling a multi-use environment.

## Bencoolen Street



**Location** Singapore

**Implementing Organization** Land Transport Authority

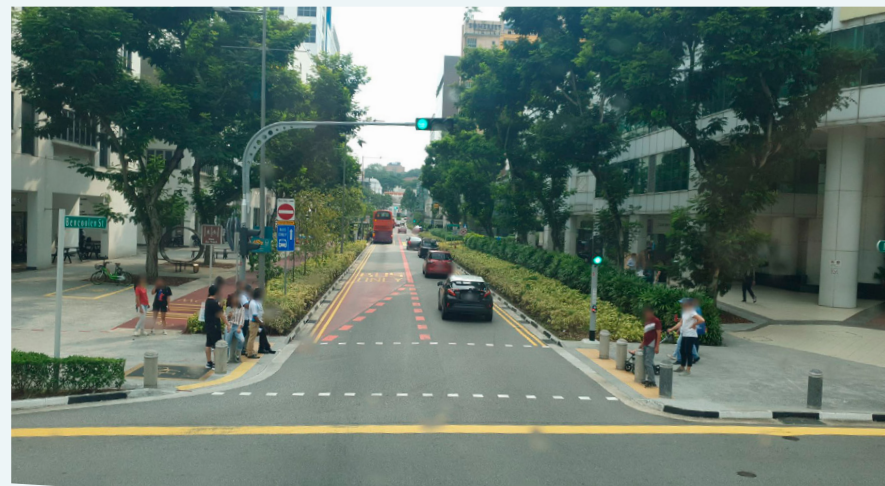
**Implemented in** 2016-2017

### OVERVIEW

Bencoolen Street was redesigned to align with Singapore's vision for reducing car dominance in its center, thus reconfiguring four travel lanes into two, while preserving one as a bus-dedicated facility. The repurposed street space was then reallocated to make it safer, more comfortable, and convenient for pedestrians and cyclists to travel by widening sidewalks and creating a cycle track.

Several midblock crossings were added, both helping people navigate the street and also subdividing the roadway length, which helps prevent motorists from reaching unsafe speeds.

The transformation also added vegetation along the corridor, and included several seating areas, further increasing the sense of enclosure and of an urban corridor, rather than a highway.



### STRATEGIES

#### Rightsize Streets

Travel lanes were rightsized, reconfiguring the corridor from four to two travel lanes.

The reclaimed space was then dedicated towards widening sidewalks and creating a cycle track.

#### Adjust Street Pace

Several mid-block crossings were created with the combination of a pinchpoint and a dedicated traffic signal.

#### Design Livable Streets

The addition of vegetation increased the sense of enclosure for motorists, helping to reduce speeds.

## Avenida Desembargador Moreira

**Location** Fortaleza, Brazil

**Implementing Organizations** City of Fortaleza, Bloomberg Initiative for Global Road Safety (BIGRS), Global Designing Cities Initiative (GDCI)

**Implemented in** 2020-2021

### OVERVIEW

Avenida Desembargador Moreira spans through a dense area of Fortaleza, and is both a connection and also a commercial corridor with high pedestrian volume. In 2020, the city started a redesign process for the whole avenue, with a special focus on adequating conditions at the northernmost segment, a 800 m stretch connecting Avenida Dom Luís to the waterfront. The transformation repurposed two traffic lanes as sidewalk extensions, adjusted turn radii, and added a bidirectional cycle track. Along the corridor, five raised intersections were implemented and dedicated pedestrian phases were added to all traffic signals.



## Street 106

**Location** New Town Kolkata, India

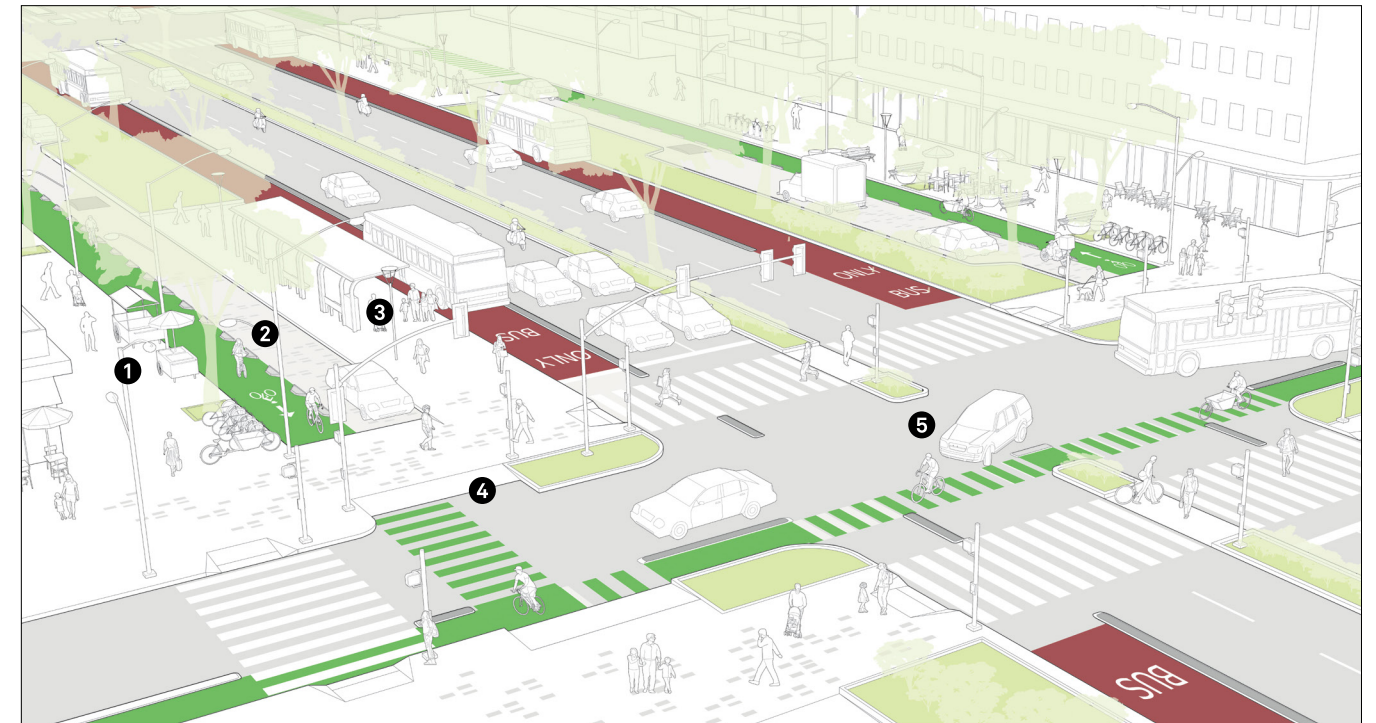
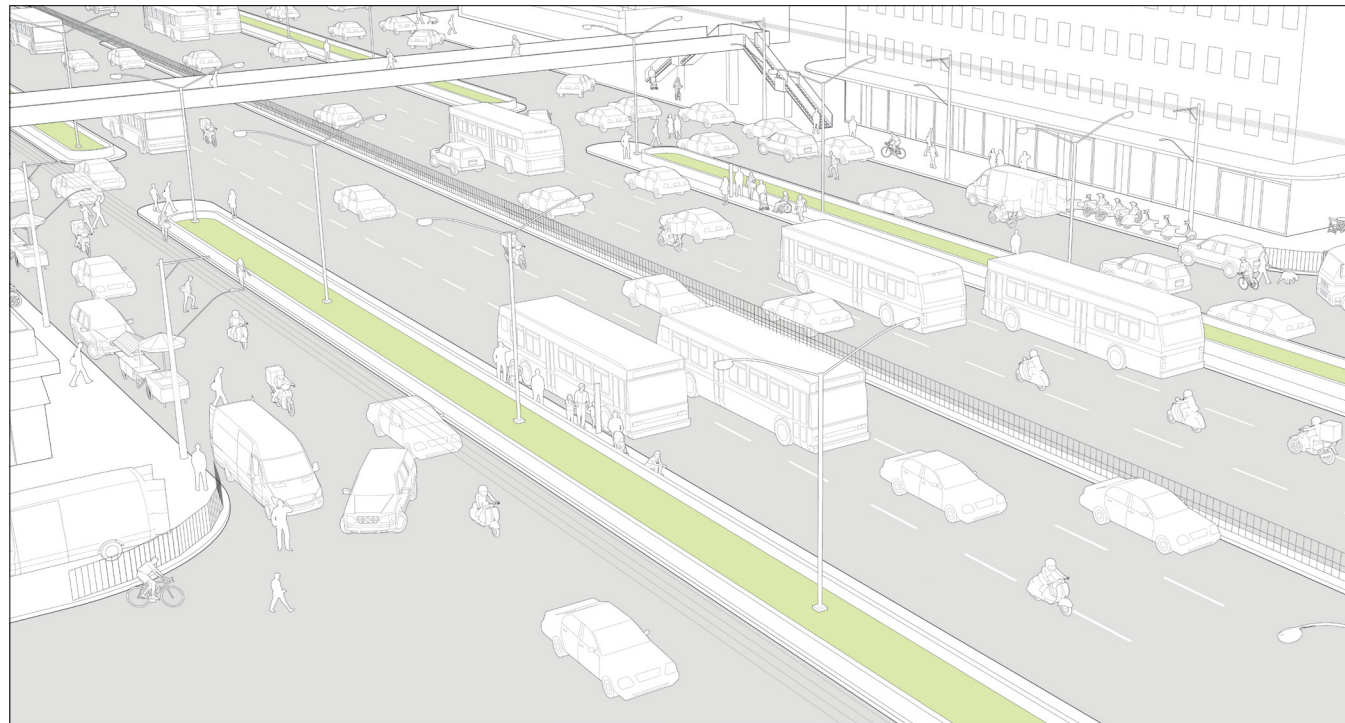
**Implementing Organization** New Town Kolkata Development Authority, Abin Design Studio

**Implemented in** Oct 2021- June 2022

### OVERVIEW

The Street 106 transformation in New Town Kolkata, part of the Smart Cities Mission's Street4People Challenge, aimed to redesign the street to activate it and integrate other uses, especially during evenings. The redesign repurposed two mixed traffic travel lanes, and part of a service roadway, towards pedestrians and cyclists. The new 1,275 m<sup>2</sup> area featured playing areas, seating and included a food truck-dedicated space. The transformation contributed to the 23% reduction in fatal crashes and 25% reduction in non-fatal crashes observed in the street.<sup>12</sup>





Grand streets often hold regional significance but lack good local integration. Despite this, they become the primary corridors in the urban road network, designed to transport large numbers of people across the city. Unfortunately, this design approach often leads to wider streets intended for accommodating more vehicles, under the assumption that this improves urban mobility.

As a result, these streets can present dangerously high speeds yet are prone to congestion due to induced demand. They primarily serve through-traffic, neglect other uses, and create barriers for pedestrians and cross-street traffic, ultimately dividing the city and diminishing the quality of public spaces and overall well-being.

This approach is highly inefficient for the movement and connection of people. To improve efficiency, it is essential to promote higher occupancy modes of transportation through multimodal solutions.

### Existing Conditions

This example shows a wide multilane two-way street in the city center that connects neighborhoods. It is situated in a mixed-use area with significant commercial activity, and it serves both as a through route and a destination.

Wide travel lanes encourage speeding, and the lack of dedicated facilities creates an unsafe walking and cycling environment.

Cross-traffic turns are a frequent source of conflict, resulting in high crash rates.

The long distance between crosswalks limits pedestrian connectivity, forcing people to risk unsafe crossings. The long continuous segments further encourage motorists to speed along the corridor.

A fenced central median is intended to keep pedestrians from crossing. The pedestrian bridge dramatically increases walking distances, which pushes people to avoid using the bridge and cross the street at high risk by jumping over or cutting through the fence.

Transit operates in mixed traffic, which reduces the quality and reliability of service. Transit riders often have to wait on side medians that lack shelters or properly identified stops.



→ Beijing, China

### Design Guidance

#### SERVICE LANES

User Separation  
Fully Separated



Crossing Demand  
High



Speed  
30 km/h



#### THROUGH LANES

User Separation  
Fully Separated



Crossing Demand  
Medium



Speed  
40 km/h



→ Bratislava, Slovakia

#### RIGHTSIZE STREETS

Repurpose roadway space as dedicated facilities for pedestrians, cyclists, and transit on each side. This includes narrowing travel lanes to discourage speeding, adding curbside cycle tracks, and providing dedicated transit lanes.

1 Wider sidewalks allow for a 4.5-m-wide clear path while providing spaces for street furniture and commercial activities.

2 Maintain a service lane on each side, allowing local access for businesses and residents, and right turns.

3 Increase service lane median width to provide space for transit shelters, green infrastructure, and parking.

Widen the central median to 1.8 m to accommodate pedestrian refuge islands and reduce crossing distances.

#### ADJUST STREET PACE

Increase permeability by providing frequent at-grade pedestrian crossings at corners and mid-blocks.

4 Install vertical deflection devices such as speed cushions and raised crossings along the service lanes.

Open medians for cross-street traffic to improve connectivity while ensuring safe conditions for pedestrians, transit riders, and cyclists.

#### REDUCE TURN SPEEDS

5 Extend the median tip at the intersection to manage speeds of left turns onto far-side lanes.

Use mountable curbs at the intersection to enable turns for larger vehicles while restraining effective turning radius for private vehicles.

#### DESIGN LIVABLE STREETS

Raise pedestrian crossings at service lanes to improve pedestrian safety and comfort.

Add trees and landscaping to provide shade and reduce the urban heat island effect.

Differentiate pavement on local lanes to indicate a lower speed area.

# Queens Boulevard



**Location** New York City, USA

**Implementing Organization** New York City's Department of Transportation

**Implemented in** 2015

## OVERVIEW

Queens Boulevard, once called the "Boulevard of Death," spanned vibrant NYC neighborhoods but suffered from dangerous design and high vehicle speeds, causing 20 serious injuries and three fatalities (2012 – 2016). NYC DOT transformed it under the Vision Zero initiative, focusing on safety and accessibility for all users.

Early actions included extending pedestrian crossing times and creating single-stage crossings. The redesign reversed service road space for protected bike lanes and pedestrian paths, widened medians, and reconfigured intersections to reduce crossing distances and slow vehicles.

From 2015, lanes were reduced from 10 to eight over 6 km, adding trees, benches, bike racks, and centralized bus stops. By 2024, Queens Boulevard featured seven miles of protected bike lanes, the city's longest stretch, cutting fatalities by 68%, injuries by 35%, while fostering a safer street environment.<sup>13</sup>



## STRATEGIES

### Rightsize Streets

Vehicle lanes were reduced from 10 to eight, reallocating space for wider medians, bike lanes, and pedestrian paths.

Seven miles of 2.4 m wide protected bike lanes were added, providing safer conditions for multi-speed cycling.

Bus stops were relocated to medians, improving transit accessibility and safety.

### Adjust Street Pace

Crossings were shortened with expanded medians and refuge islands, enhancing pedestrian safety.

Slip lanes were redesigned to slow vehicle turns and reduce conflict risks.

Signal timing was adjusted, incorporating leading pedestrian intervals to allow safer crossings.

Sidewalk extensions and pedestrian paths improved walkability.

### Design Livable Streets

Streetscape improvements included trees, benches, bike racks, and public art, enhancing the urban environment.

Cost-effective materials like paint and bollards were used for rapid, adaptable implementation.

## IMPACT

↓ **35%** decrease in injury crashes

↓ **55%** reduction in pedestrian crashes

↓ **68%** reduction in traffic fatalities

↑ **45%** increase in cycling volumes along the corridor

Source: NYC DOT <sup>14</sup>



# 6.4

## Safe Speed Streets

6.4.1 Applying Strategies for Safe Speed Streets

6.4.2 Residential Streets

6.4.3 Streets Near Schools

6.4.4 Mixed-use Streets

6.4.5 Neighborhood Plazas

6.4.6 Maximize Public Space Use

6.4.6 Historic Streets

6.4.7 Central Streets

6.4.8 Central Plazas

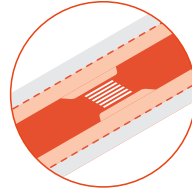
Streets can be transformed into livable spaces that work for people, making speeding uncomfortable. The transformations can be on a case-by-case basis or as part of the redesign of a larger area. In all cases, consider the street's intended role in the network, the desired or possible vulnerable road user separation from motorized traffic, and the projected crossing demand to define facility configurations that are appropriate to the context and compatible with the target speed. Detail users' facilities, safe speed tools, and intersection treatments accordingly.



→ Kuala Lumpur, Malaysia

## Applying Strategies for Safe Speed Streets

Transforming streets requires a detailed approach to create safe, functional, and inviting areas at the street scale. The following explains how the street design and operation strategies from Chapter 4 can be applied at this scale.



### RIGHTSIZE STREETS

#### Rightsize Roadway Widths

On two-way undivided streets, design travel lanes **2.4–3 m**, depending on volumes and presence of buses. Adopt wider lanes only where large vehicles are frequent, yet no more than **3.3 m**.

For single-lane one-way roadways, adopt travel lanes of **3.0–3.3 m** width.

Convert two-lane, one-way streets into two-way or repurpose the extra lane for other modes or uses.

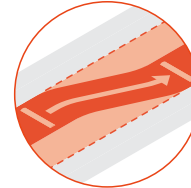
#### Support Sustainable Mobility

Reclaim space for pedestrians and ensure universally accessible sidewalks. Adjust the design speed to **10–15 km/h** if sidewalks are not present or possible.

Select the appropriate cycle facility based on the right-of-way, user volumes, speeds, and network connectivity.

#### Maximize Public Space Use

Repurpose excess roadbed space for pedestrian plazas, enhanced sidewalks, parklets, gardens, bioswales, among other non-mobility uses.



### ADJUST THE STREET PACE

#### Manage the Spacing Between Measures

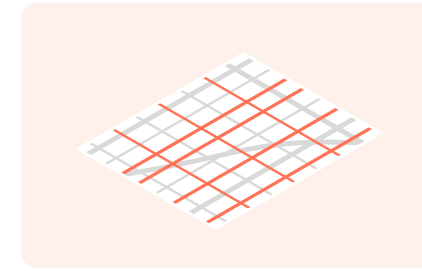
Identify the type of speed reduction measures to use according to the target speed. Space treatments **50–80 m** apart for a target speed of **30 km/h** and **25–50 m** for **20 km/h** or lower.

Use an array of vertical and horizontal deflection tools to reduce speeds and achieve other goals. *For more information, see 7 Safe Speeds Toolbox.*

Consider how different street users navigate each speed reduction measure in the design detailing process. Ensure universal accessibility for pedestrians and permeability for cyclists.

#### Increase Street Permeability

Integrate pedestrian crossings with vertical and horizontal deflection devices.



### REDUCE TURN SPEEDS

#### Design Compact Intersections

Allocate space for active modes and non-mobility activities to configure intersections with compact roadways and short crossing distances.

#### Optimize Turn Geometry

Include speed reduction measures upstream of intersections to support safe turn speeds.

Add curb extensions and reduce corner radii to manage turn speeds.

Select the smallest possible design vehicle to avoid over-dimensioning corner radii. Designate routes for trucks and buses.

Add mountable corners to manage turns of large and small vehicles. Design so that emergency vehicles may utilize the full area of the intersection for making turns.

#### Restrict Critical Movements

Different operational changes can help simplify intersection design and remove high-speed turns from the network.



### DESIGN LIVABLE STREETS

#### Create a Sense of Enclosure

Use pavement materials to convey pedestrian and cyclist priority on raised crossings and intersections and on shared and cycle streets.

Rich and complex pavement patterns can help different users navigate the street and break down the scale of the space.

Plant trees along the roadway to create a sense of enclosure and provide shade for walking or cycling.

Encourage building designs with varied heights and spacing between entrances and windows. Add landscaping with elements of different heights. These changes will break up the scale and rhythm of the block, making speeding feel uncomfortable.

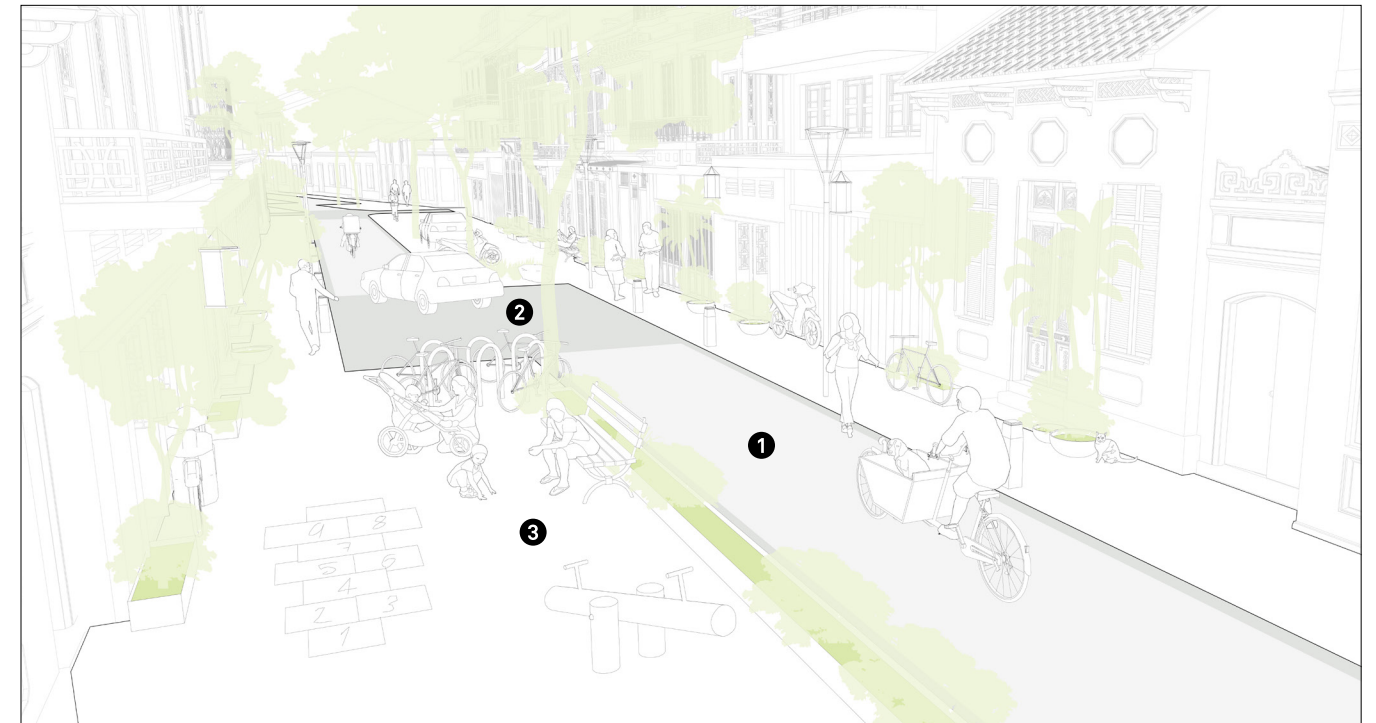
Make well-designed sidewalks with amenities that enhance the walking experience to increase footfall and pedestrian activity.

#### Manage the Roadway Network

Use filtered permeability strategies to remove the through function for private motor vehicles on a street or an area to reduce car dominance.

Filters permeable for cyclists increase network connectivity and promote modal shift.

Lower vehicle volumes are critical in improving first- and last-mile connectivity of transit trips.



Residential streets form the majority of the street network in a city neighborhood. When designed well, these streets serve as people's front yards and extensions of their homes. These streets have a high demand for social activities and gatherings but have been designed for overcapacity, with a disproportionate amount of space dedicated to travel lanes and parking. Hence, over the years, these streets have seen a significant increase in traffic volumes and cut through traffic.

**Existing Conditions**

This example shows a residential street with a narrow right-of-way.

Like many streets in this context, this street lacks markings, signals, pedestrian crossings, or other designated pedestrian spaces.

There is a disproportionate space dedicated to motor vehicles and parking.

Sidewalks are narrow, missing, or poorly maintained, making pedestrian movement difficult and unsafe, especially for caregivers pushing strollers or carrying toddlers and for other people with limited mobility.

Existing utilities such as light and electricity poles, water and sewage channels, trash cans, and other items create frequent obstacles. As a result, conflicts arise as pedestrians, cyclists, and motorists share the roadbed.



→ Kyoto, Japan



→ Havana, Cuba

**Design Guidance**

**User Separation**  
Fully Shared



**Crossing Demand**  
High



**Speed**  
10 km/h



**RIGHTSIZE STREETS**

Reduce from two to one vehicular travel lanes to reallocate dedicated space for pedestrians and cyclists. This street allows contraflow access for cyclists.

**1** Define a **2.7–3.0 m** wide travel lane, yet ensure a **3.5 m** clearance from fixed objects for emergency vehicles to enter the shared space when necessary.

The additional pedestrian space allows for social activities such as children's play and neighborhood gatherings.

**ADJUST STREET PACE**

**2** Slow vehicular speeds through horizontal deflection, such as chicanes. Designate car, motorcycle, and cycle parking spaces along the street edge. Alternate parking placement to act as a horizontal deflection and breaking motorist sight lines.

**DESIGN LIVABLE STREETS**

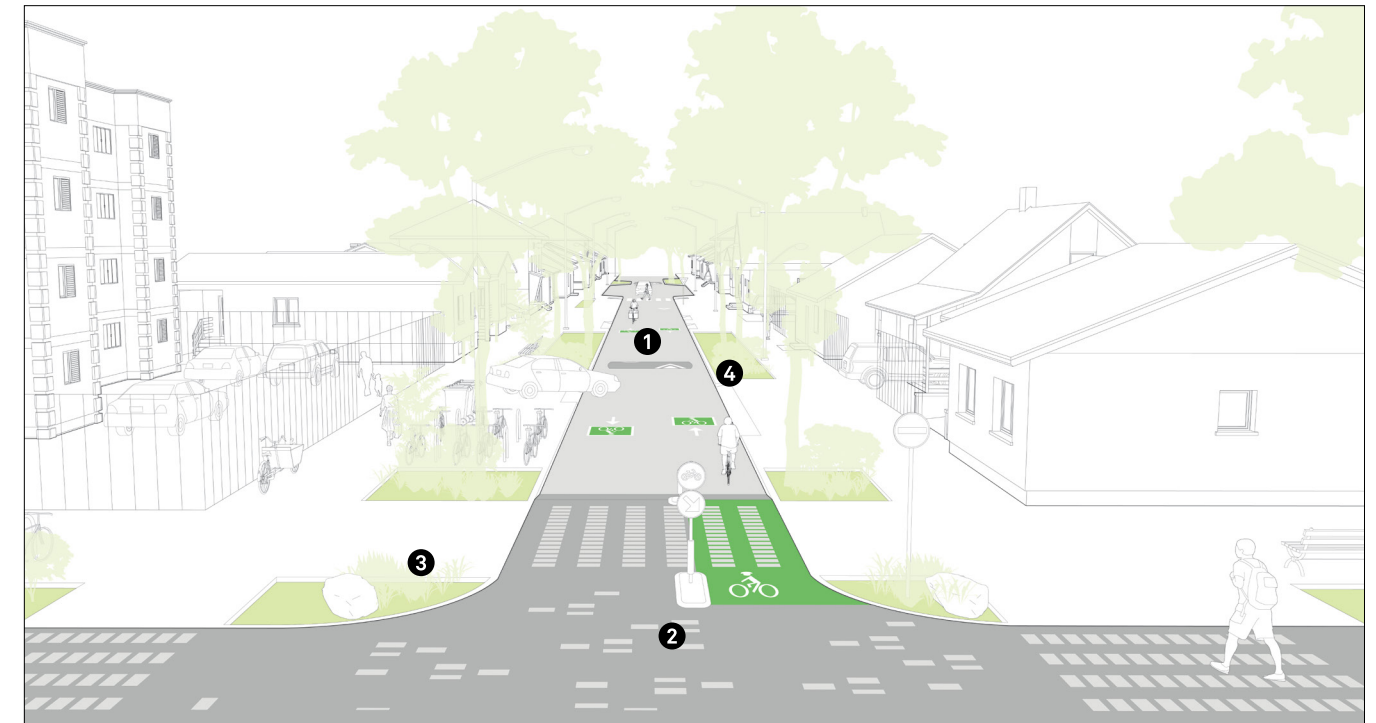
Apply filtered permeability strategies to reduce through-traffic in the neighborhood. The traffic-calmed street serves as a one-way shared street, with contraflow cycling allowed.

Flush the travel lane with the curb and use surface materials other than typical road asphalt to signify a shared space. Street users visually recognize when they are entering or leaving this zone through gateways, changes to grade and paving, tactile surfaces, and vertical elements like bollards.

**3** Improve lighting and street furniture to invite families to walk and stay.



→ Sopot, Poland



Existing Conditions

This example shows a two-way residential street with parking on both sides. The wide travel lanes with priority over cross streets and limited pedestrian crossings create opportunities to speed.

Despite low vehicular traffic, most space is dedicated to motor vehicles and parking.

Sidewalks are narrow, missing, discontinuous, or poorly maintained, making pedestrian movement difficult and unsafe. Cars parked at the intersections obstruct pedestrians' visibility.

Due to a lack of cycling facilities and high vehicular speeds, cyclists are also discouraged from using this street.



→ Quelimane, Mozambique



→ Xi'an, China

Design Guidance

User Separation  
Shared by Cyclists and Motorists



Crossing Demand  
Medium



Speed  
30 km/h



→ Dordrecht, Netherlands

RIGHTSIZE STREETS

1 Redesign the street to a two-way cycle street with mid-block pinchpoints.

Rightsize travel lanes to 4.8–5 m (for two-ways of traffic) to encourage safe vehicular speed.

Provide curb extensions to reduce crossing distances and improve pedestrian visibility.

Limit car parking, but ensure dedicated parking is available for bicycles.

ADJUST STREET PACE

Provide vertical or horizontal deflection devices 50–80 m apart for a target speed of 30 km/h.

Introduce yield pinchpoints to reduce car volumes and speeds. For more information, see 7.3.3 Pinchpoints.

2 Upgrade intersections with pedestrian markings and raised crossings to reduce interval length.

Add mid-block crossings at key destinations or in blocks longer than 100 m.

REDUCE TURN SPEEDS

3 Introduce curb extensions with rightsized corner radii at intersections to reduce turn speeds.

Raise intersections to slow vehicles and allow for safer pedestrian crossings.

At intersections with major streets, install continuous sidewalks such that they act as gateways, slowing turning speeds and improving pedestrian visibility.

DESIGN LIVABLE STREETS

Depave excess asphalt space and add green and blue infrastructure to fight the heat-island effect and support stormwater management.

4 Convert parking lanes into a flexible zone, which includes curb extensions that are used for adding trees, planters, and landscaping to create a sense of enclosure in the street.

## Planalto Ayrton Senna



**Location** Fortaleza, Brazil

**Implementing Organizations** City of Fortaleza, Botnar Foundation, Van Leer Foundation, FIA Foundation, Global Designing Cities Initiative (GDCI)

**Implemented in** 2021

### OVERVIEW

The transformation is part of the "Pathways to School" municipal program, aimed at improving road safety and accessibility near schools. The intervention prioritized reducing vehicle speeds and creating safer, more engaging spaces for children and caregivers.

The redesign rebalanced street space in a mixed-use area with a school and healthcare facility. Narrowed lanes, extended sidewalks, and protected crossings enhanced safety and walkability.

After the transformation, some surveys and metrics collection were conducted, including with kids. Over 90% of children surveyed feel safer walking and find the street better for playing, while 90% of parents reported feeling more connected to their children and the community. More than 80% of parents now visit the redesigned space with their kids.



### STRATEGIES

#### Rightsize Streets

The two-way street was reduced to a one-way shared street, rightsizing lanes from 7.5 m to 3.5 m, widening sidewalks and reclaiming 1,900 m<sup>2</sup> of public space.

A side street was partially pedestrianized with a 120m<sup>2</sup> play area.

#### Reduce Turn Speeds

Corner radii were readjusted, also reducing conflicts with pedestrians.

#### Design Livable Streets

Colorful markings and artistic elements revitalized the space.

The addition of 22 seating areas, including benches and planters, encouraged social interaction.

## Barrios Vitales - San Felipe



**Location** Bogotá, Colombia

**Implementing Organization** City of Bogotá, World Bank, World Resources Institute (WRI), Global Designing Cities Initiative (GDCI)

**Implemented in** 2022

### OVERVIEW

San Felipe's transformation is part of Bogotá's Barrios Vitales program, which revitalizes public spaces into community-centered areas. Once dominated by vehicle traffic, this mixed-use neighborhood known for its art and culinary scene was redesigned in 2022 to prioritize pedestrians and cyclists. Interventions reduced speeds, improved road safety, and fostered active mobility, cultural vibrancy, and economic activity. As part of Bogotá's 15-minute city model, San Felipe exemplifies people-centered urban design.

### STRATEGIES

#### Rightsize Streets

Traffic lanes were rightsized and narrowed, and space reallocated towards sidewalk expansions, cycling infrastructure, and loading areas for local businesses.

About 5,200 m<sup>2</sup> of space was reclaimed for pedestrians and cyclists.

#### Reduce Turn Speeds

30 intersections were redesigned with tighter turning radii to slow vehicles and improve safety at crossings.



#### Design Livable Streets

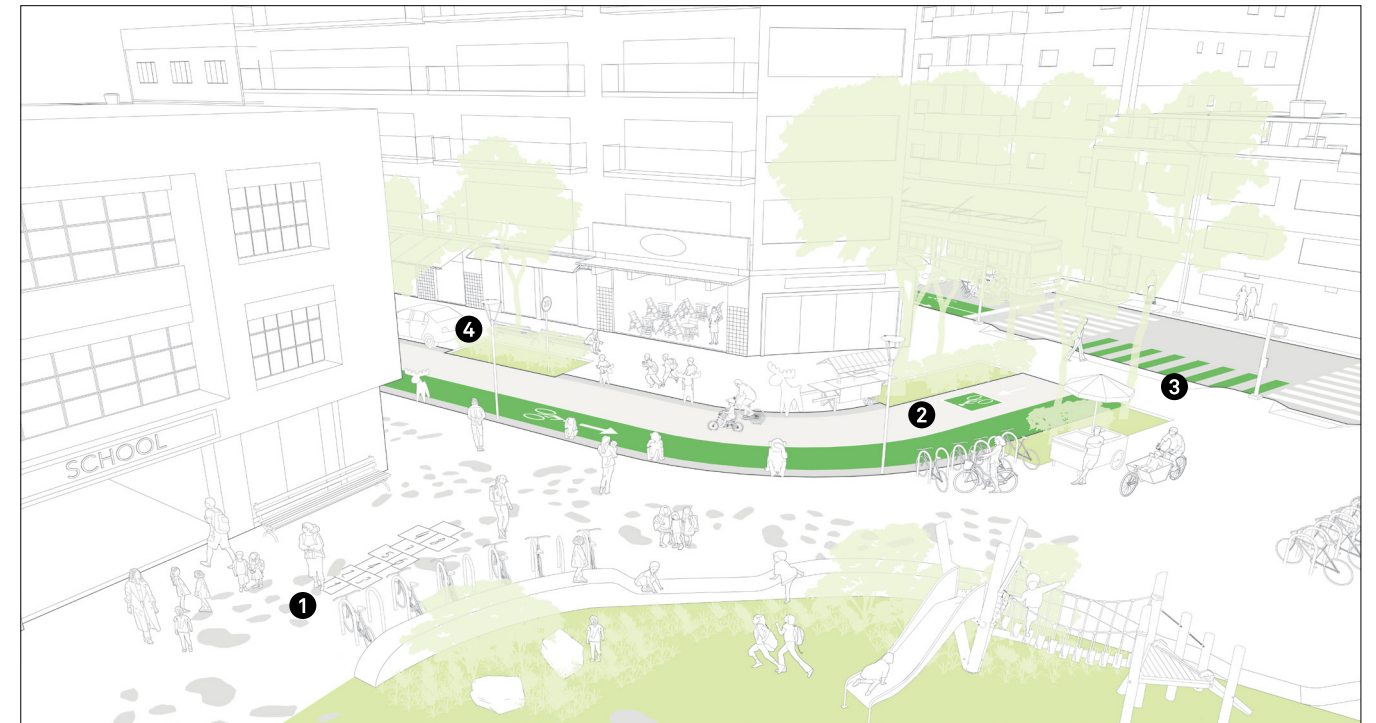
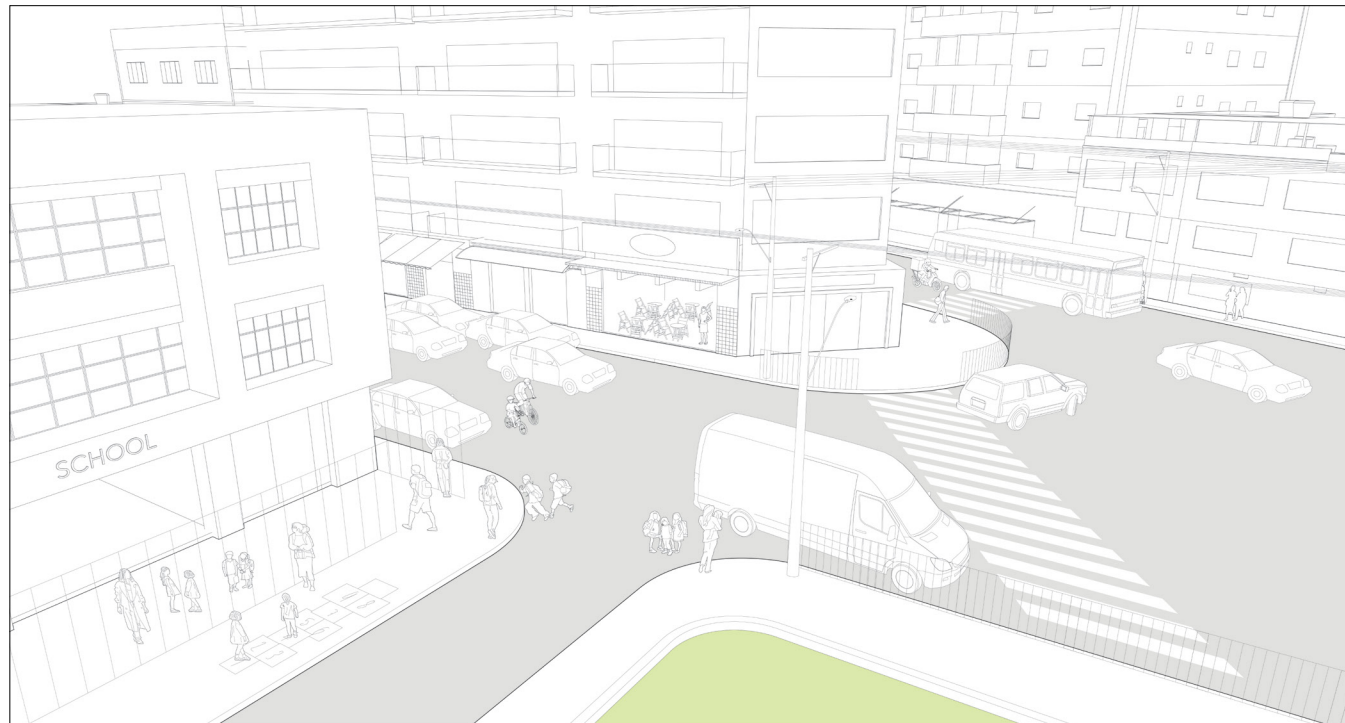
Modal filters were implemented at the core of the neighborhood, disincentivizing through traffic.

Colorful plazas markings, planters, and street furniture reinforced a pedestrian-priority environment.

The changes rehabilitated 11,700 m<sup>2</sup> of sidewalks.

### IMPACT

- ↓ 46% reduction in crashes
- ↑ 5% increase in cycling trips



Streets near schools face challenges due to the diverse yet specific mix of users concentrated during peak times, including students, caregivers, staff, and school bus drivers. These streets should be seen as extensions of the facilities they support, therefore designed as safe speed environments, emphasizing safety, playability, and education.

School commutes provide important opportunities for children and families to interact. Creating comfortable spaces on their routes promotes meaningful connection, vital for children's cognitive development and overall well-being.

A single project can encompass multiple facilities which are normally clustered together and are central for families with children of various ages, such as clinics, daycares, and community centers. These locations are ideal starting points for transforming streets and effectively addressing the mobility challenges faced by families and should be prioritized for network-scale street transformations that reduce car dominance.

### Existing Conditions

This example depicts three streets that intersect near a school.

During drop-off and pick-up hours students walk, gather, play, and wait for their caregivers on the sidewalks while vehicles compete for drop-off space at the curb. This creates complex curb-use patterns in front of schools and affects the surrounding area.

Sidewalks are narrow with frequent obstructions. Unable to accommodate the high volume of pedestrian activity during peak periods, children and caregivers are forced to walk on the roadbed. This has a greater impact on those who walk from home or wait at a transit stop.

The high volume of vehicles in the area leads to an increase in air and noise pollution around the school, which increases the health vulnerability of children and caregivers.

The large width of intersections and misaligned pedestrian crossings with school entrances result in unsafe turning speeds and high car dominance. Students and caregivers navigate long crossing distances without traffic lights through moving traffic and unsafe conditions.

This street lacks dedicated cycle infrastructure or parking for caregivers who drop children off at school by bicycle.

This situation influences caregivers' decisions to look for motorized options.



→ Istanbul, Turkey

### Design Guidance

#### CYCLE STREET

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
High



**Speed**  
20 km/h



#### MAIN STREET

**User Separation**  
Fully Separated



**Crossing Demand**  
High



**Speed**  
30 km/h



→ Istanbul, Turkey

#### RIGHTSIZE STREETS

**1** Pedestrianize the street directly in front of the school to maximize safety and encourage the use of sustainable modes.

**2** Filter through-traffic from the intersecting street and reconfigure it as a contraflow cycle street. The reduced vehicular volumes increases the number of people walking and cycling, positively impacting driver behavior and speeds.

Provide protected cycle facilities on the main street to ensure safe and comfortable access for cyclists of all ages, abilities, and genders.

#### ADJUST STREET PACE

Provide frequent speed reduction measures to ensure safe speeds at peak and off-peak times.

#### REDUCE TURN SPEEDS

**3** Normalize the intersection with the main street to reduce speeds, shorten crossing distances, and improve visibility of crossing pedestrians.

#### DESIGN LIVABLE STREETS

Reverse traffic direction at the school block to break the roadway continuity at the network level and prevent through-traffic.

Configure a gateway at the intersection with the main street to signal to motorists the transition into a lower-speed environment. Raise the road bed to the sidewalk level to highlight pedestrian priority while ensuring pedestrian comfort and accessibility.

Offer multiple play options, including active and passive play, visual learning, etc.

Provide diverse types of seating and furniture to attract functional and social use.

**4** Provide dedicated drop-off spaces near the school, away from the pedestrianized area.

## Danau Kota School Street



**Location** Kuala Lumpur, Malaysia

**Implementing Organizations** City of Kuala Lumpur, Bloomberg Initiative for Global Road Safety (BIGRS), Global Designing Cities Initiative (GDCI), Bike Commute Malaysia

**Implemented in** 2024

### OVERVIEW

School streets in Danau Kota were redesigned to create a safer environment for the over 2,000 students who attend the neighborhood's primary and secondary schools. The final design was developed through several iterations, including a pop-up trial and interim measures to demonstrate the safety and community benefits. As a result, the city reclaimed street space for people, creating 1365 m<sup>2</sup> of waiting areas and improving sidewalks, while rightsizing lanes and deploying speed management tools, such as raised crossings. As a result, 88.2% of surveyed residents, students, and caregivers indicated that the school street was much safer than before the redesign.

### STRATEGIES

#### Rightsized Lanes

Converted a two-way to a one-way street with removal of parking spaces.

Lanes were rightsized, improving pedestrian facilities and reducing crossing distances, in some points from 10.5 to 3.3 m.

The dropoff area was clearly marked with adequate turn deflections and rightsized lanes.



### IMPACT



**88%** of respondents felt that the street outside the school is safer

#### Street Pace

Speed humps and raised crossings were added with adequate spacing.

#### Turn Speeds

Corner radii were reduced.

#### Livable Streets

Colorful markings helped highlight pedestrian spaces.

## Tove Ditlevsens Plads

**Location** Copenhagen, Denmark

**Implementing Organizations** City of Copenhagen, Supertanker, Tove Ditlevsens School

**Implemented in** 2012-2015

### OVERVIEW

Tove Ditlevsens Plads, a small plaza in front of Tove Ditlevsens School, was transformed as part of the Regional Renewal Central Vesterbro plan. The street's typical cross section, previously two parking lanes and a travel lane, was transformed to one travel lane featuring a chicane that incorporates green infrastructure and cycle parking. Rightsizing the street enabled the city to expand the schoolyard, removing its fence and integrating it with the street. The pavement change from asphalt to cobblestone also helps communicate to motorists that they are entering an environment where lower speeds are more adequate.



## Lomas de La Trinidad

**Location** León, México

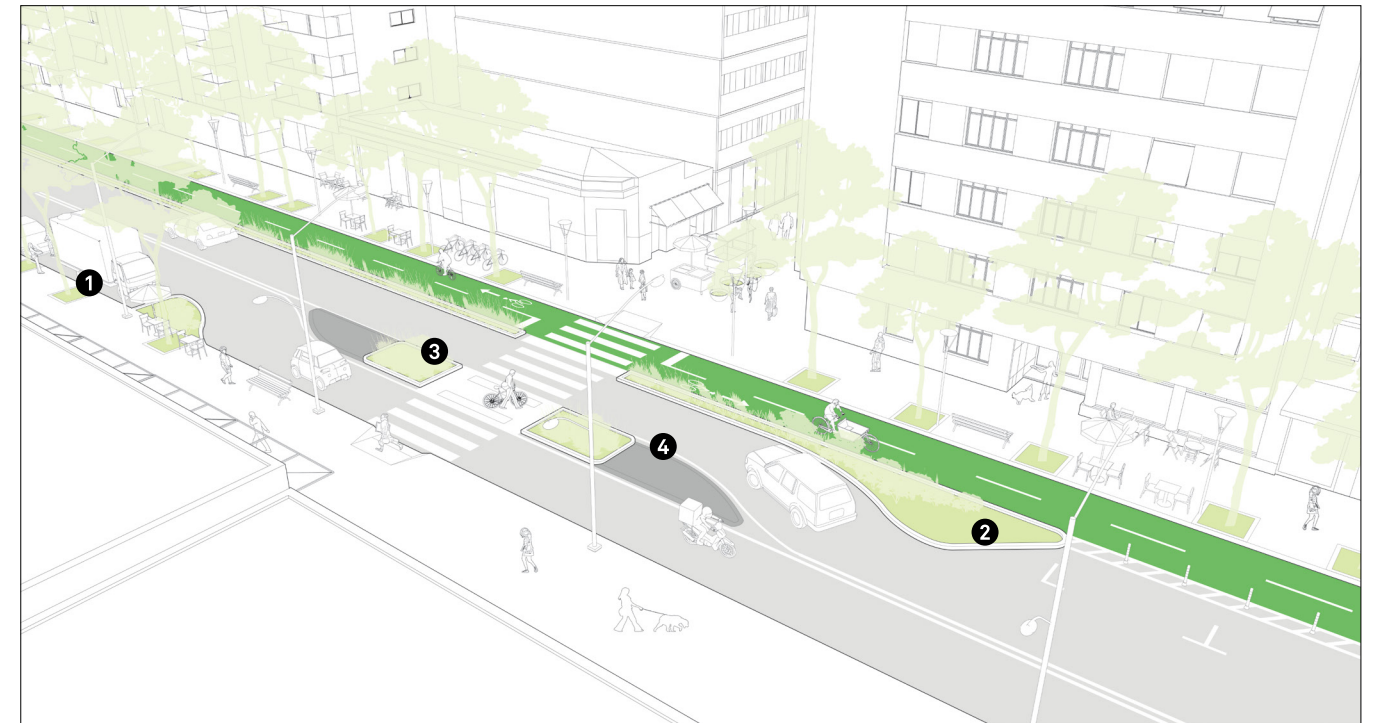
**Implementing Organization** City of León, Sistema Nacional para el Desarrollo Integral de la Familia (DIF), Global Designing Cities Initiative (GDCI), Colectivo Tomate

**Implemented in** 2023

### OVERVIEW

Lomas de la Trinidad project created safe and engaging routes for nearly 1,000 children by connecting a before-and after-school children's center and two middle schools in the area. The transformation improved road safety by redesigning a 90-meter block with three intersections on Efrén Hernández Street, extending sidewalks, adding protected crossings and accessibility ramps, and introduced playful furniture and vegetation. Data collected before and after the transformation revealed a one-third reduction in vehicle volume on weekdays, with top speeds decreased by 10 km/h during peak hours.





Mixed-use streets are essential for everyday life, offering accessible destinations such as restaurants, shops, and services. These streets encourage high levels of pedestrian and cycling activity, which requires well-designed infrastructure, including sidewalks and cycle lanes. Managing traffic speeds and controlling vehicular access is crucial for maintaining a safe environment and effectively meeting the needs of all users.

### Existing Conditions

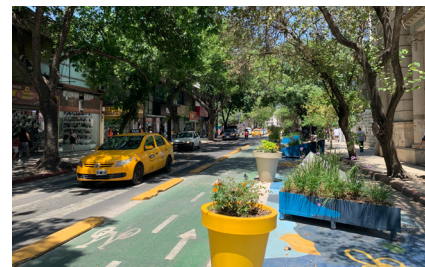
This example shows a mixed-use street situated within a dense residential neighborhood.

It is two-way, with moderate-to-high traffic volume, and has curbside parking. While this street has high use during peak hours, wide travel lanes allow for high traffic speeds at off-peak hours.

Because of retail activity on the ground floor, the curbside is in high demand for loading and unloading, transit access, cycle parking, and vehicular parking.

Parked vehicles often block sidewalks and travel lanes, hindering vehicular movement, pedestrian access, and visibility.

Infrequent pedestrian crossings prevent pedestrians from safely accessing the many destinations on both sides of the street, further increasing conflicts with motor vehicles.



→ Tirana, Albania

### Design Guidance

**User Separation**  
Fully Separated



**Crossing Demand**  
High



**Speed**  
30 km/h



→ New York City, USA

### RIGHTSIZE STREETS

Narrow travel lanes and reallocate space for pedestrian and cycle facilities.

Provide a two-way cycle track to reduce conflicts with motorized traffic.

1 Designate loading zones on the opposite side of the cycle track to avoid conflicts with cyclists.

2 Manage parking demand by keeping some parking spots and providing parking on surrounding streets. Metered parking can increase turnaround and free up space for other uses.

### DESIGN LIVABLE STREETS

Incorporate trees, benches, rain gardens and other elements to foster a sense of enclosure and discourage speeding.

3 Add green infrastructure to pedestrian islands and buffers for the cycle track.

### ADJUST STREET PACE

Space vertical or horizontal deflection devices 50-80 m apart for a target speed of 30 km/h.

4 Integrate mid-block crossings with a chicane to reduce speeds and help pedestrians safely cross the street to access destinations. For more information, see 7.3.4 Chicanes and Lane Shifts.

Adopt intersection treatments that require motorists to slow down, including miniroundabouts, raised intersections and crossings, and signalization when volumes are high. For more information, see 7 Safe Speeds Toolbox.

Add leading pedestrian intervals and provide longer pedestrian clearance times at signalized crossings. For more information, see Global Street Design Guide, Chapter 8.8.



**Existing Conditions**

This example is a narrow one-way street with parking on both sides that supports a mix of uses. Travel lanes are narrow and often shared between cars, motorcycles, cycles, and loading vehicles.

Due to the limited space, these streets may have no or inaccessible sidewalks, with utility boxes and light poles obstructing the pedestrian clear path.

In some contexts, sidewalks are occupied by street vendors and illegal parking, forcing pedestrians onto the roadbed.

These conditions are typical of streets in historic city centers with narrow right-of-way and function as de facto shared streets.



→ Ho Chi Minh, Vietnam



→ Cusco, Peru

**Design Guidance**

**User Separation**  
Fully Shared



**Crossing Demand**  
High



**Speed**  
10 km/h



→ Gdansk, Poland

**RIGHTSIZE STREETS**

Redesign the street using shared space principles and prioritizing vulnerable users.

**1** Reduce the space dedicated to motorized vehicles to a minimum. Maintain a shared lane for emergency access and authorized vehicles. Pedestrians and cyclists outnumber motor vehicles and hence can safely share the space.

**2** Provide 1.8 m or wider pedestrian clearpaths protected from traffic to ensure universal accessibility.

**ADJUST STREET PACE**

**3** Use street furniture and parking to create chicanes and reduce speeds. Intentionally breaking motorists' sight lines makes speeding uncomfortable.

**DESIGN LIVABLE STREETS**

Use volume and access management strategies to minimize vehicle volumes and enable a shared space. Reduce cut-through traffic, which often moves at higher speeds.

Remove the level distinction between the sidewalk and the roadbed, making speeding uncomfortable.

Change the paving pattern or type to designate areas for vehicular movement.

Incorporate street furniture—such as benches, planters, trees, bollards, cycle parking, and others—to define the shared space and distinguish the shared lane from pedestrian-only areas.

**4** Designate spaces for street vendors aligned with street furniture, preventing obstruction of pedestrian pathways.

Integrate permeable pavers and rain gardens in green infrastructure and water management strategies.

## Albert Sabin Hospital Zone



**Location** Fortaleza, Brazil

**Implementing Organizations** City of Fortaleza, Bloomberg Initiative for Global Road Safety (BIGRS), Global Designing Cities Initiative (GDCI), World Resources Institute (WRI)

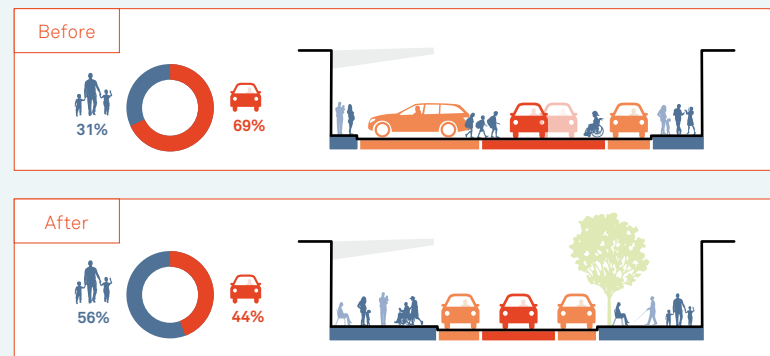
**Implemented in** 2017

### OVERVIEW

Albert Sabin Children's Hospital serves hundreds of young patients daily, most arriving on foot from a nearby bus stop.

Tertuliano Sales, the street accessing the hospital, was oversized for motorized vehicles, with narrow sidewalks in poor conditions forcing many children, including those with disabilities, to walk on the roadbed—an unsafe condition. The hospital flagged this issue, leading to strategies to improve safety and prioritize pedestrians.

Over 1,000 m<sup>2</sup> of road space was repurposed into accessible sidewalks, and several speed management measures like raised crosswalks, curb extensions, and narrower lanes were implemented. Speed limits, previously unmarked, are now clearly set at 30 km/h with visible signage.



### STRATEGIES

#### Rightsize Streets

After rightsizing traffic lanes, 1,175 m<sup>2</sup> of street space was reclaimed as sidewalks.

#### Adjust Street Pace

Curb extensions, raised crosswalks, and speed bumps were implemented.

#### Reduce Turn Speeds

Tighter turning radii were introduced at both ends of the block.

#### Design Livable Streets

Benches and trees were added, and space for street vendors was improved and reorganized.

### IMPACT

**86%** reduction in pedestrians walking on the roadbed near the hospital

**67%** shorter pedestrian crossings

**100%** of children used safe pedestrian facilities post-intervention, compared to 50% walking on the roadbed before

Reduction from **16%** to **2%** of motorists driving over 30 km/h after the redesign.

## Waltham Forest Mini-Holland



**Location** London, United Kingdom

**Implementing Organizations** Waltham Forest Borough Council, Transport for London

**Implemented in** 2013

### OVERVIEW

The Waltham Forest Mini-Holland program is a large-scale urban transformation aimed at creating a sustainable, healthy, and accessible environment by prioritizing walking and cycling.

Spanning the borough, the initiative redefined public space and mobility with Dutch-style cycling infrastructure, traffic-calming measures, and low-traffic neighborhoods. These changes were implemented across key corridors, residential areas, and town centers, reshaping the urban fabric.

The program extends from major streets like Lea Bridge Road to quieter ones and local shopping areas, forming a cohesive cycling and walking network.



### STRATEGIES

#### Rightsized Lanes

Reduced road space for dedicated cycle lanes and widened sidewalks.

#### Street Pace

Shortened road segments with alternating green spaces to curb speeding.

#### Turn Speeds

Tighter turning radii slow vehicle movement.

#### Livable Streets

Created low-traffic zones with improved crossings and cycle hubs.

### IMPACT

**18%** increase in cycling

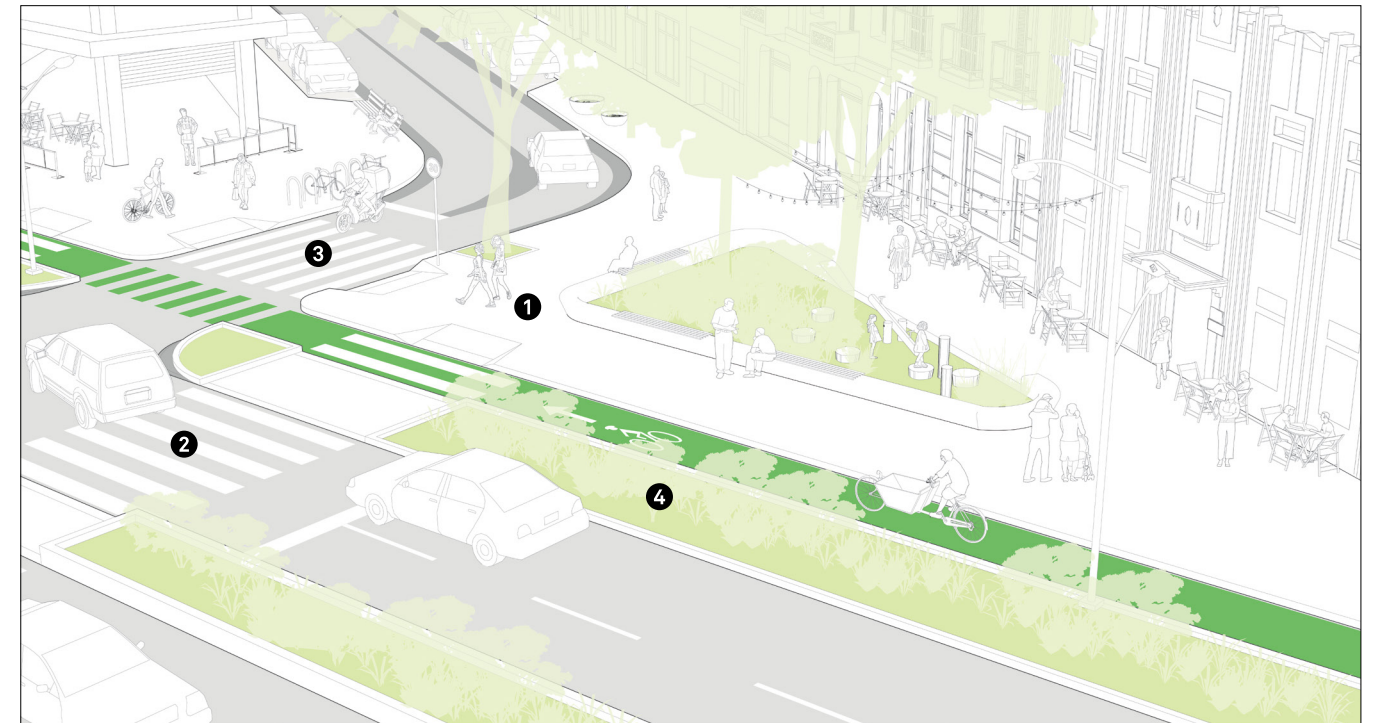
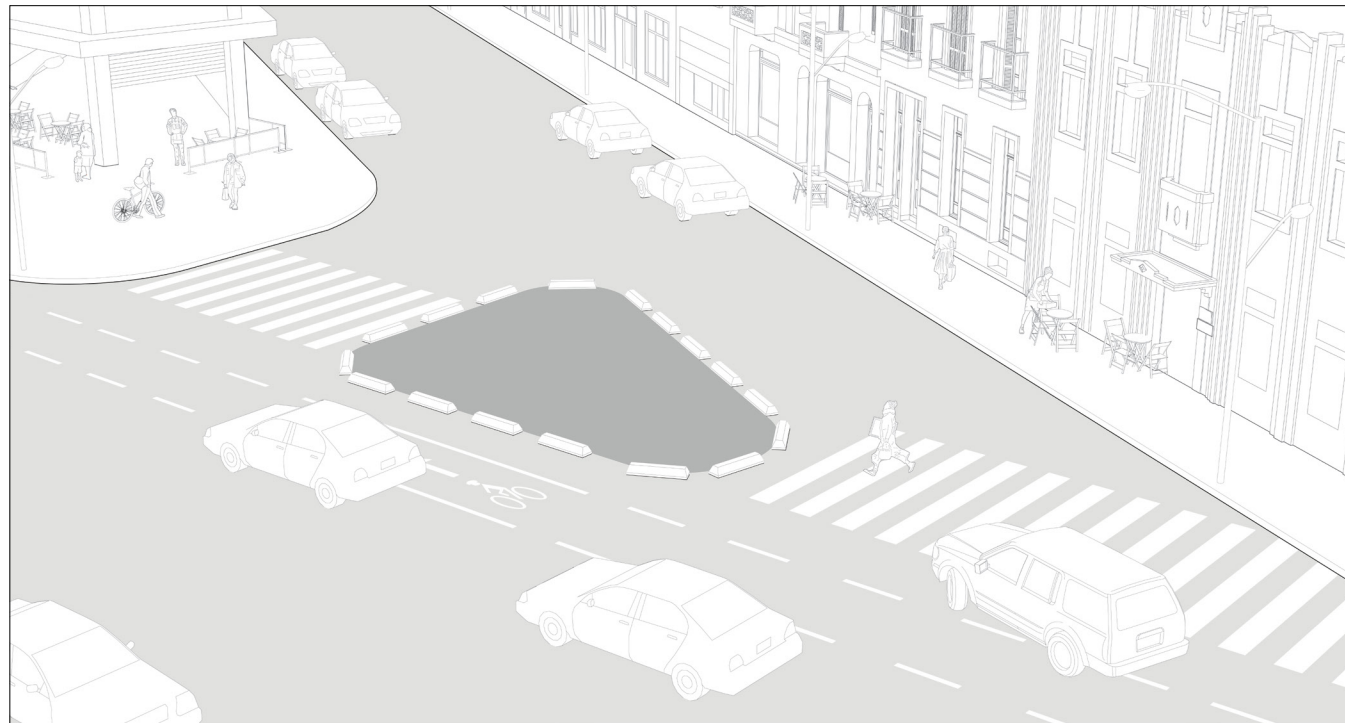
**13%** rise in walking across the borough

**34 miles** of cycleways improvement

**22** school streets safety improvements

**25%** decrease in nitrous oxide levels

Source: London Borough of Waltham Forest<sup>15</sup>



Neighborhood plazas can transform underutilized spaces into vibrant public areas that benefit vulnerable users while encouraging safer speeds. These plazas provide convenient, active, and accessible public spaces close to homes, businesses, schools, and daily routes. They are often incorporated into area-wide traffic-calming strategies aimed at promoting walking, cycling, and social interaction while reducing the dominance of vehicles.

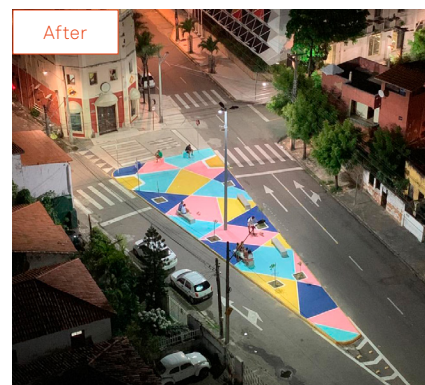
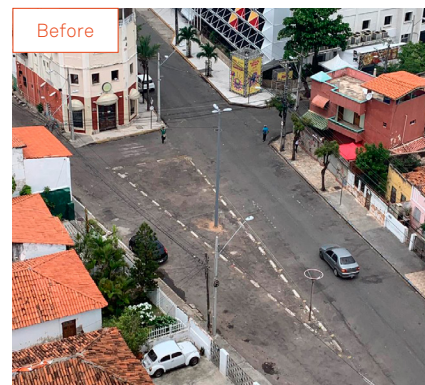
Plazas also offer an opportunity to introduce more green and permeable areas into the neighborhood. They energize surrounding streets and public spaces by fostering a safe speed environment, creating foot traffic that can boost local businesses and invigorate street life.

### Existing Conditions

This example illustrates an angled T-intersection. It is a confusing and uninviting environment for pedestrians.

The geometry results in large areas of underutilized pavement and extremely large turn radii that enable turns at unsafe speeds.

The prioritization of vehicular movements leads to long crossing distances, increasing the exposure time of pedestrians and cyclists.



→ Fortaleza, Brazil

### Design Guidance

#### MINOR STREET

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
Medium



**Speed**  
30 km/h



#### MAJOR STREET

**User Separation**  
Fully Separated



**Crossing Demand**  
Medium



**Speed**  
40 km/h



→ Paris, France

#### RIGHTSIZE STREETS

**1** Reconfigure the intersection space to better balance the needs of all users. Adjust travel lane widths and curb radii, and use reclaimed areas for pedestrian use and public space.

Break larger intersections into more compact ones, reducing vehicle speeds and creating more opportunities for pedestrians to cross.

Upgrade cycle facilities and integrate those in the plaza and intersection design.

#### ADJUST STREET PACE

The reconfigured intersection makes the roadway less continuous, forcing turning motorists to slow down and reducing opportunities for speeding on the cross street.

**2** Add pedestrian crossings to the main street to meet existing desire lines and reduce speeds.

#### REDUCE TURN SPEEDS

**3** Reconfigure the minor street to meet the major street at a **90-degree angle**. This facilitates a smaller curb radius that reduces turn speeds, improves visibility, and shortens crossing distances.

Given the low vehicular volume on the two-way minor street, assume larger turning vehicles entering will use both lanes to turn, thereby keep the intersection compact and ensure safe turn speeds.

#### DESIGN LIVABLE STREETS

**4** Incorporate different textures, colors, and greenery to enhance the visual narrowing of the roadway. Visual narrowing allows drivers to perceive the area as more pedestrian-friendly, encouraging them to intuitively slow down to adjust to the changing environment.

Integrate drainage channels and permeable surfaces into the design of the plaza. Sites should have minimal cross slope and use edge treatments that mitigate the overall slope.



**Existing Conditions**

This example illustrates a neighborhood intersection that serves both as a destination and a route for cut-through traffic.

This street experiences a high volume of pedestrians and cyclists as it provides access to neighborhood amenities such as schools, parks, and community centers.

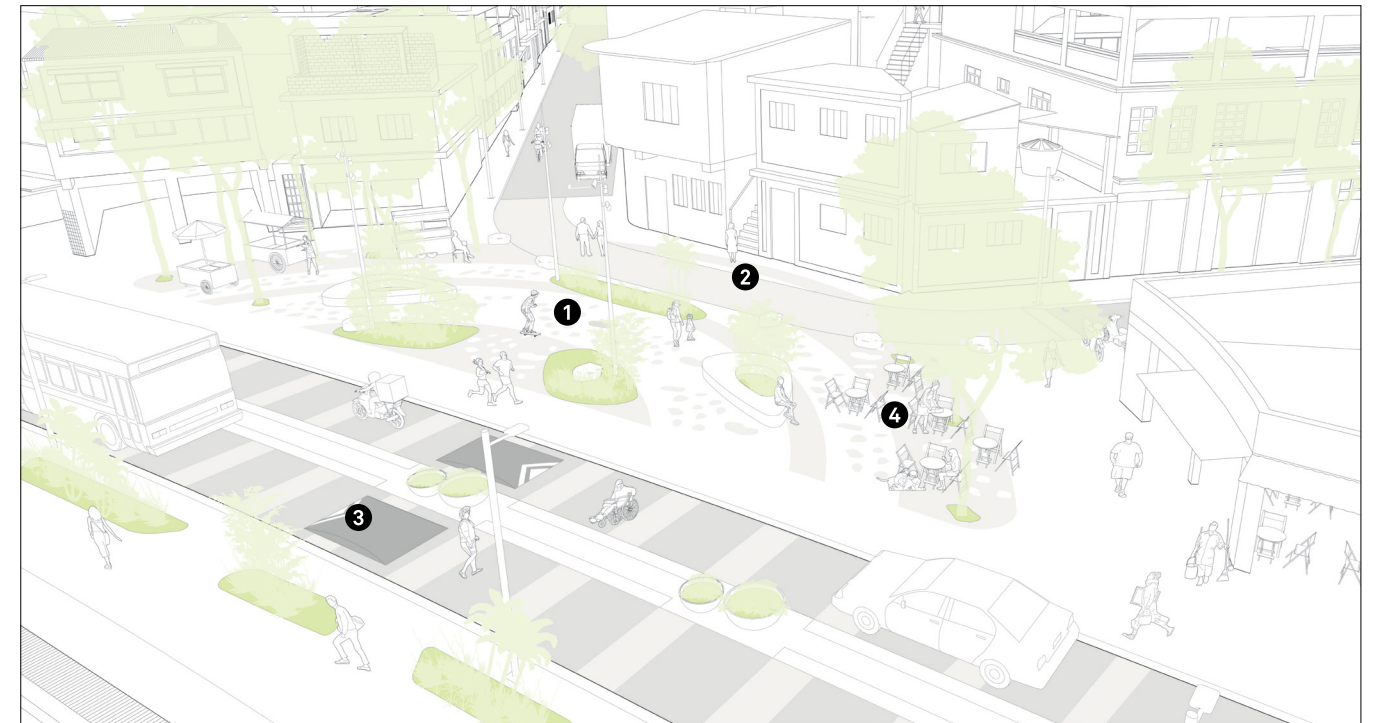
This intersection is the main meeting point for neighborhood residents. Different activities coexist in an undefined spatial configuration, creating an improvised plaza. This configuration creates conflicts between street users and an unsafe environment for pedestrians.



→ Recife, Brazil



→ Mexico City, Mexico



**Design Guidance**

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
High



**Speed**  
20 km/h



→ Istanbul, Türkiye

**RIGHTSIZE STREETS**

**1** Prevent through traffic by installing physical barriers such as planters, bollards, or street furniture. These barriers should filter out private cars while allowing pedestrians and cyclists access.

Position the barriers carefully near intersections or mid-block, taking into account where the addition of public space would be more beneficial, and considering garage entrances and accessibility requirements.

**ADJUST STREET PACE**

**2** Create shorter road segments by interrupting direct pathways.

Raise the road bed at the plaza to convey pedestrian priority while creating vertical deflection to reduce speeds.

**3** Incorporate speed cushions to reduce the speeds of smaller vehicles while prioritizing the comfort of bus passengers. Integrate greenery at these locations to avoid trip hazards for pedestrians.

**REDUCE TURN SPEEDS**

Ensure there is enough space for vehicles to maneuver and exit the dead-end formed by application of modal filters.

**DESIGN LIVABLE STREETS**

**4** Use greenery, seating areas, public art, and other street furniture to divert traffic in the plaza, allowing pedestrians and cyclists to use it and increasing social interaction.

Plant trees that provide shade as they grow.



**Existing Conditions**

This is an example of a wide intersection with confusing traffic patterns and multiple lanes merging from different angles.

Wide travel lanes, large turning radii, and undefined vehicle movements encourage speeding, which creates unsafe conditions for pedestrians and other road users.

The dispersed pedestrian desire lines and the lack of dedicated crosswalks force pedestrians to navigate indirect and unsafe paths to cross the intersection.

Vehicles are parked irregularly around the intersection, obstructing pedestrian visibility and movement. This not only complicates crossing the street but also increases the risks for pedestrians.

The intersection is frequently used as a shortcut by drivers trying to avoid congestion on main streets, leading to higher traffic volumes. This increase negatively impacts the local environment, resulting in more noise and pollution.

Although it is part of a local street network, the intersection accommodates through traffic, prioritizing vehicular movement over the safety and comfort of pedestrians and cyclists.



→ Ljubljana, Slovenia

**Design Guidance**

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
Medium



**Speed**  
30 km/h



→ Copenhagen, Denmark

**RIGHTSIZE STREETS**

Combine network-level efforts to reduce cut-through traffic in the neighborhood with the need for public spaces to reconfigure the intersection as a pedestrian plaza.

1 Use a combination of barriers, landscaping, and seating to configure a modal filter that doubles as a pedestrian plaza. Motorized vehicles access the street only through the opposite side, while permeability is retained for pedestrians and cyclists.

**ADJUST STREET PACE**

2 Raise the intersection to sidewalk level to create vertical deflection and reduce speeds.

**REDUCE TURN SPEEDS**

3 Reduce corner radius to lower turn speeds.

The raised intersection configuration helps to reduce approach speeds from all directions.

**DESIGN LIVABLE STREETS**

Configure a modal filter as part of a wider filtered permeability strategy to reduce car usage and increase walking and cycling in the neighborhood. Traffic cutting through neighborhoods is reportedly faster than local traffic.

This configuration results in a quieter, yet more vibrant and active intersection. The modal filter doubles as a plaza connecting the community center to local businesses across the street. The increase in pedestrian activity leads to lower vehicular speeds.

Raise the intersection and adopt pavement surface that resembles sidewalk materials to convey pedestrian priority.

## Glorieta El Inglés



**Location** Bogotá, Colombia

**Implementing Organizations** City of Bogotá, Bloomberg Initiative for Global Road Safety (BIGRS), Global Designing Cities Initiative (GDCI)

**Implemented in** 2019

### OVERVIEW

The Glorieta El Inglés project transformed an underutilized and chaotic roundabout and its surrounding streets into a vibrant public plaza by implementing a traffic diverter and prioritizing pedestrians, cyclists, and vulnerable road users.

Residents helped shape the design through seven engagement events and a three-day pop-up intervention in 2019.

The intervention addressed safety issues like informal crossings and chaotic freight movements. By redesigning the eight-legged intersection into a six-legged layout, it eliminated highspeed through-traffic while enhancing pedestrian infrastructure. Previously, the area experienced heavy vehicle volumes at unsafe speeds. The transformation reduced deaths and serious injuries through traffic calming, pedestrian facilities, and safer crossings, fostering a more livable neighborhood.



### STRATEGIES

#### Rightsize Streets

Crossing distances were reduced from 20 m to 6 m.

Integrated cycle lanes connected the plaza to nearby streets.

#### Reduce Turn Speeds

Speed limits were set at 20 km/h in the roundabout and 30 km/h on surrounding streets, with turn radii adjusted to match those design speeds.

#### Design Livable Streets

Thirty-two pedestrian crossings were introduced at 19 intersections.

Modal filter plazas with planters, bollards, and furniture blocked through-traffic while maintaining pedestrian and cyclist access.

### IMPACT



**52%** reduction in pedestrian-vehicle conflicts during peak hours



**88%** of surveyed residents reported improved road safety



Reduction from **68%** to **11%** of motorists driving over 30 km/h when entering the neighborhood after the redesign.

## Rua das Crianças, Jordão

**Location** Recife, Brazil

**Implementing Organizations** City of Recife, Global Designing Cities Initiative (GDCI)

**Implemented in** 2023-2024

### OVERVIEW

The Streets for Kids project in Recife transformed the previously unpaved Silva Jardim and 22 de Agosto streets into a safer, pedestrian-friendly environment near three schools. By reclaiming 7,000 m<sup>2</sup>, it created a plaza with play elements, greenery, and seating, while implementing traffic-calming measures like raised crossings, narrower lanes, and a 20 km/h speed limit. The redesign prioritized children's safety, decreasing the number of pedestrians walking outside protected infrastructure by 87%.



## Piazza Spoleto-Venini

**Location** Milan, Italy

**Implementing Organization** City of Milan, Mobility, Environment, and Territory Agency (AMAT), Global Designing Cities Initiative (GDCI), Bloomberg Associates

**Implemented in** 2019

### OVERVIEW

The intersection in front of Ciresola elementary school, in Milan, allowed and invited motorists to navigate at high, unsafe speeds. In response, the City of Milan redesigned the area as a part of the Piazze Aperte program. By rightsizing lanes, adding a parking-protected cycle lane, and implementing a modal filter, the transformation discouraged through traffic and inappropriate speeds in the area, while creating a safe play space for residents.



## Bonfim

**Location** Salvador, Brazil

**Implementing Organizations** City of Salvador, Bloomberg Initiative for Global Road Safety (BIGRS), Global Designing Cities Initiative (GDCI)

**Implemented in** 2021

### OVERVIEW

The Bonfim Slow Zone reduced the speed limit from 50 km/h to 30 km/h, improving safety in a historic neighborhood with high pedestrian volumes. The intervention reclaimed 400 m<sup>2</sup> of public space to create a plaza with bollards, benches, and play elements. Pedestrian visibility and crossing safety improved, with 89% fewer people walking on the roadbed. After the intervention, 91% of the motorists observed were driving at 30 km/h.



## Maximize Public Space Use

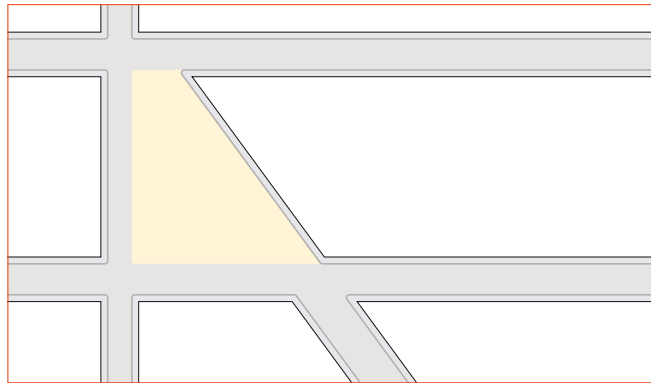
Streets are the largest continuous network of public spaces in cities. They are the stage where public life unfolds, and are crucial for cultivating vibrant public life and activating communal spaces, thus fostering a more livable urban environment. A comprehensive street design approach includes the creation of new spaces for people to linger, play, and engage in social and economic activity.

Safe speeds can both enable and be a result of repurposing the space dedicated for private motor vehicles as new public spaces. Strive for a virtuous cycle in which spaces like new pedestrian plazas help to reduce vehicular speeds, becoming more attractive for people to use and, in turn, generating an even greater speed management effect due to increased pedestrian activity.

### Reclaimed Pedestrian Spaces

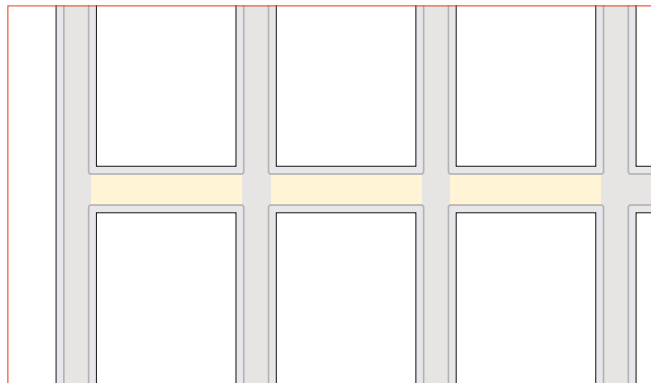
#### INTERSECTION PLAZAS

These plazas provide additional pedestrian space by redesigning intersections to be more compact. Using residual space between intersecting streets, on street corners and traffic islands, these spaces provide a safer and more active pedestrian environment. Operational changes like banning redundant or undesired vehicular movements permits connecting public spaces to adjacent land uses and reduces conflicts, reduces pedestrian crossing distances and slows down traffic.



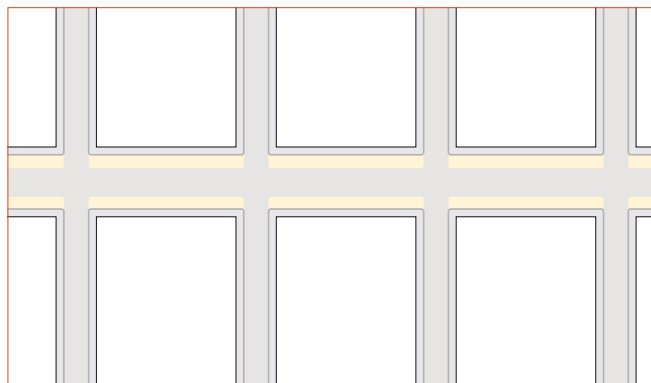
#### THROUGH-BLOCK PLAZAS

Through-block public plazas are developed either by pedestrianizing streets for one or more blocks or by allocating public space through super-blocks. These are located in areas of heavy pedestrian volumes such as urban centers, around waterfronts, key attractions, and shopping areas. A constant clear path must allow for universal accessibility and emergency vehicle access. These paths may be lined with trees, planters, lighting, benches, and other furniture.



#### SIDEWALK EXTENSIONS

Sidewalk extensions create a larger pedestrian realm through widening the sidewalks along the length of one or multiple blocks. It is important to maintain linear clear paths in such cases to allow for unobstructed pedestrian movement. Landscaping and other fixed or movable elements can be used to demarcate public space, commercial activity, and walking paths.



#### Example: Pedestrian Plaza

Public plazas transform underutilized street areas into vibrant social spaces for residents and businesses. These plazas result from partnerships where the city provides the land, and neighborhood groups or business associations maintain and program the space. Plazas boost pedestrian traffic, energize surrounding streets, and invigorate street life, benefiting local businesses.

Reevaluating street dimensions to balance all users' needs reveals excess spaces that can be reallocated for pedestrian use, enhancing neighborhood open spaces.



→ Fortaleza, Brazil

#### Example: Open Street

Temporary street closures for street fairs, markets, block parties, play streets, and open streets provide an opportunity to rethink the space by allowing people to experience a range of different activities. Temporary closures open streets to people, activate streets, and showcase businesses and communities.



→ Hanoi, Vietnam

#### Example: Bulb-outs

Bulb-outs are sidewalk extensions into the parking lane that should be installed where on-street parking is present to increase visibility, reduce crossing distance, provide extra waiting space, and allow for seating or landscaping. Before full reconstruction, gateways can be marked with striping or signage to indicate a slow zone entrance. The bulb-out length should match the pedestrian crossing width and preferably extend to the stop bar.

Bulb-outs serve as traffic calming measures: pinchpoints when mid-block, gateways at slow zone entrances, and chicanes to create S-shaped paths that reduce vehicle speed. When aligning bus stops with the parking lane, they are called bus bulbs.



→ Mexico City, Mexico



Many historic city centers were developed long before the automobile era. They often consist of narrow streets and lanes that connect with a diverse array of buildings. This limited space prevents segregating infrastructure for each user. Designing shared streets can help restore the original balance and multiple functions of these streets. Closing or restricting motorized traffic in these areas, limiting access and loading according to the context, and transforming them into pedestrian priority spaces can add significant quality to the neighborhood and the citywide network.

Transforming these areas may require special attention given historic significance can restrict construction and reconstruction permissions.

**Existing Conditions**

This example shows a narrow one-way street in a city's historic district.

The street is perceived as dangerous or dirty due to limited maintenance and investment.

The street network supports active ground floors, stores, and businesses; however, due to limited space and maintenance, there are frequent conflicts between loading activity, pedestrians, cyclists, and vehicular movements.



→ Marrakesh, Morocco

**Design Guidance**

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
High



**Speed**  
20 km/h



→ Quito, Ecuador

**RIGHTSIZE STREETS**

**1** Redesign the street using shared street design principles. Level the curb and the roadbed while maintaining clear paths to guarantee accessibility and safety.

Delineate a narrow travel lane with limited flexible parking for loading and accessibility.

**ADJUST STREET PACE**

**2** Utilize the historic network of short blocks to provide frequent stopping intervals and break long segment lengths.

Use horizontal deflection as an option to limit vehicular speed while limiting vertical deflection to maintain leveled surfaces and eliminate tripping hazards.

**REDUCE TURN SPEEDS**

Define the curb radius based on the smallest possible design vehicle, keeping in mind that in narrow streets the effective radius is the same as the curb radius.

**DESIGN LIVABLE STREETS**

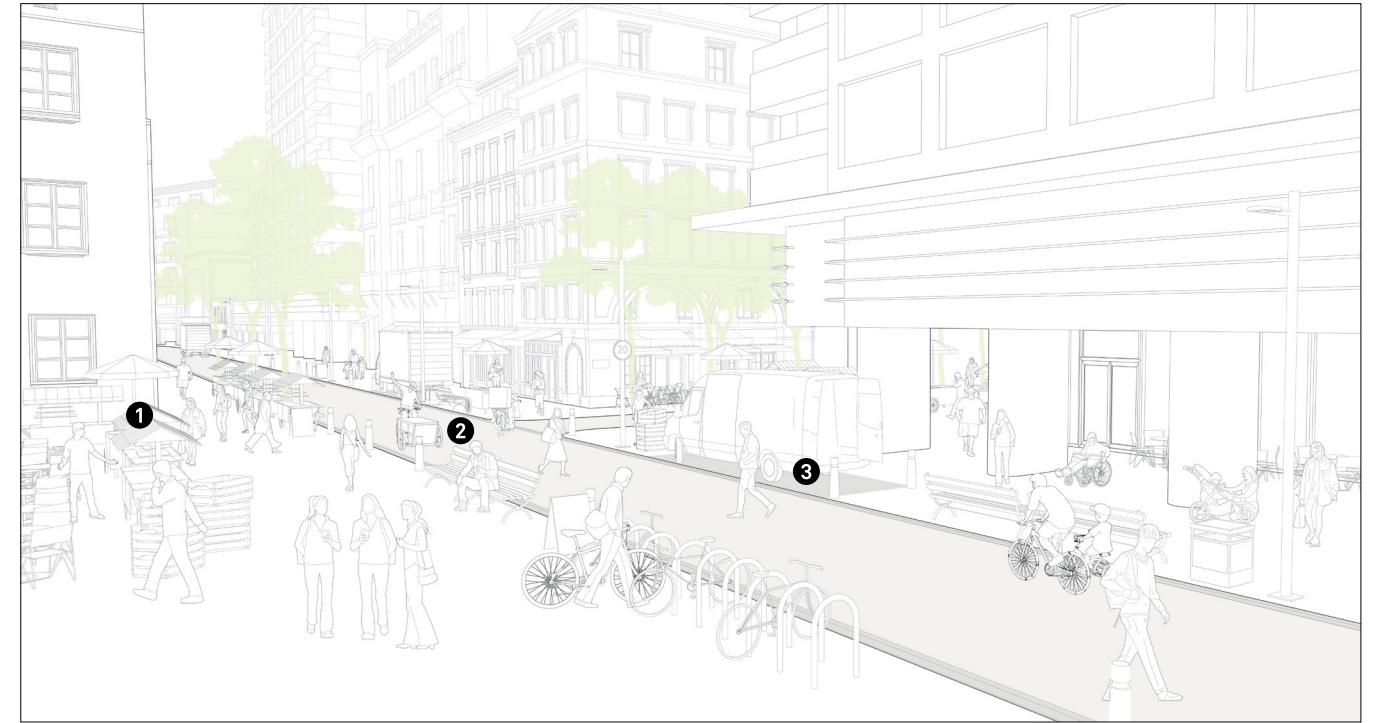
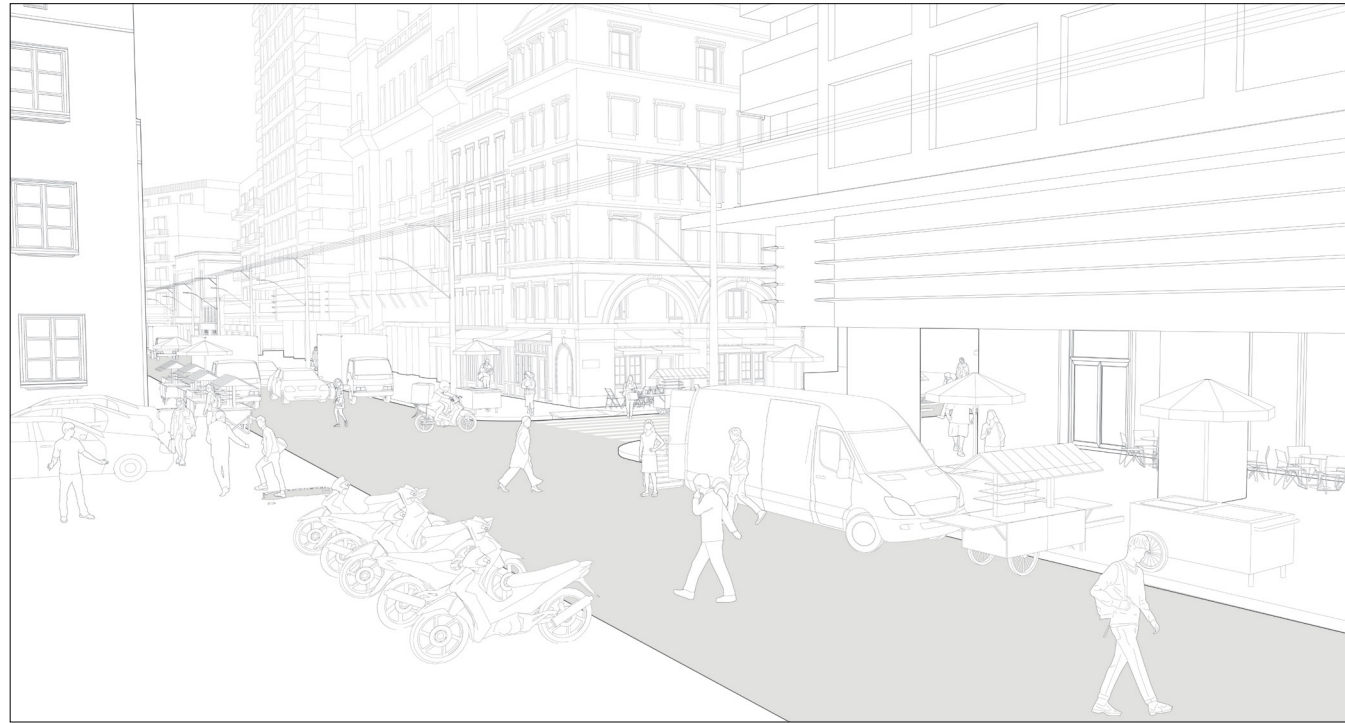
Work with local stakeholders to identify areas to remove or limit through-traffic and parking, and prioritize pedestrians, cycling, and transit use.

Add distinctive paving, street furniture, signage, and lighting to reinforce the neighborhood's character.

Implement wayfinding and signage that reflect historical and cultural context and landmarks.

**3** Consider adding narrow paver strips that allow smoother cycle riding in areas with cobblestones or other uneven surfaces.

Allow loading and delivery during off-peak times.



Commercial streets within the city are popular destinations and busy vibrant streets that attract people from various neighborhoods. They serve as important economic hubs and tend to have a concentration of specific types of shops and services.

Due to the high volume of shoppers, there is significant interest from street vendors, who often occupy the sidewalks. While the high pedestrian traffic could warrant a complete pedestrianization of the street, there is also a need for local vehicular access and high freight demand that must be considered.

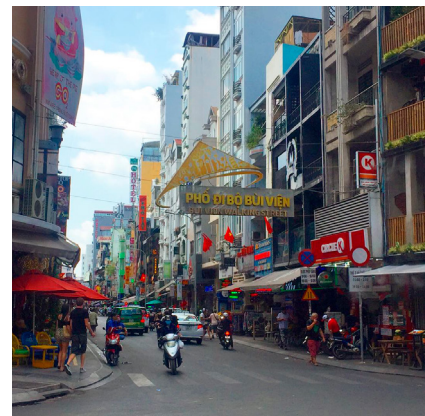
### Existing Conditions

This example describes a busy commercial street with a high volume of pedestrians during peak hours. Due to limited space on the sidewalk, many pedestrians are forced to walk unsafely on the roadway.

Street vendors frequently obstruct the narrow sidewalks, which also forces pedestrians to walk on the road bed.

During off-peak hours, when pedestrians and street vendors are no longer present, the wide travel lanes enable high speeds.

Conflicts at curbside are common due to multiple demands, including vehicular and bike parking, freight loading and unloading, and vendor use.



→ Ho Chi Minh City, Vietnam

### Design Guidance

**User Separation**  
Fully Shared



**Crossing Demand**  
High



**Speed**  
10 km/h



→ Budapest, Hungary

### RIGHTSIZE STREETS

Reallocate roadbed space to create a narrow central shared lane and wide pedestrian-only clear paths on each side of the street.

1 Designate space for street vendors. Ensure pedestrian clear paths are unobstructed.

### ADJUST STREET PACE

While speeds are limited during peak hours due to high pedestrian use, ensure consistent speed management measures are provided to limit vehicular speeds during peak and off-peak times.

Prioritize using horizontal deflection to limit motorists' speed while limiting vertical deflection to maintain leveled surfaces and eliminate tripping hazards.

Consider using vegetation and street furniture to create chicanes or lane shifts that break drivers' sight lines, helping to reduce speeds.

### REDUCE TURN SPEEDS

Consider providing a wider turning radius to accommodate larger freight vehicles that support commercial use.

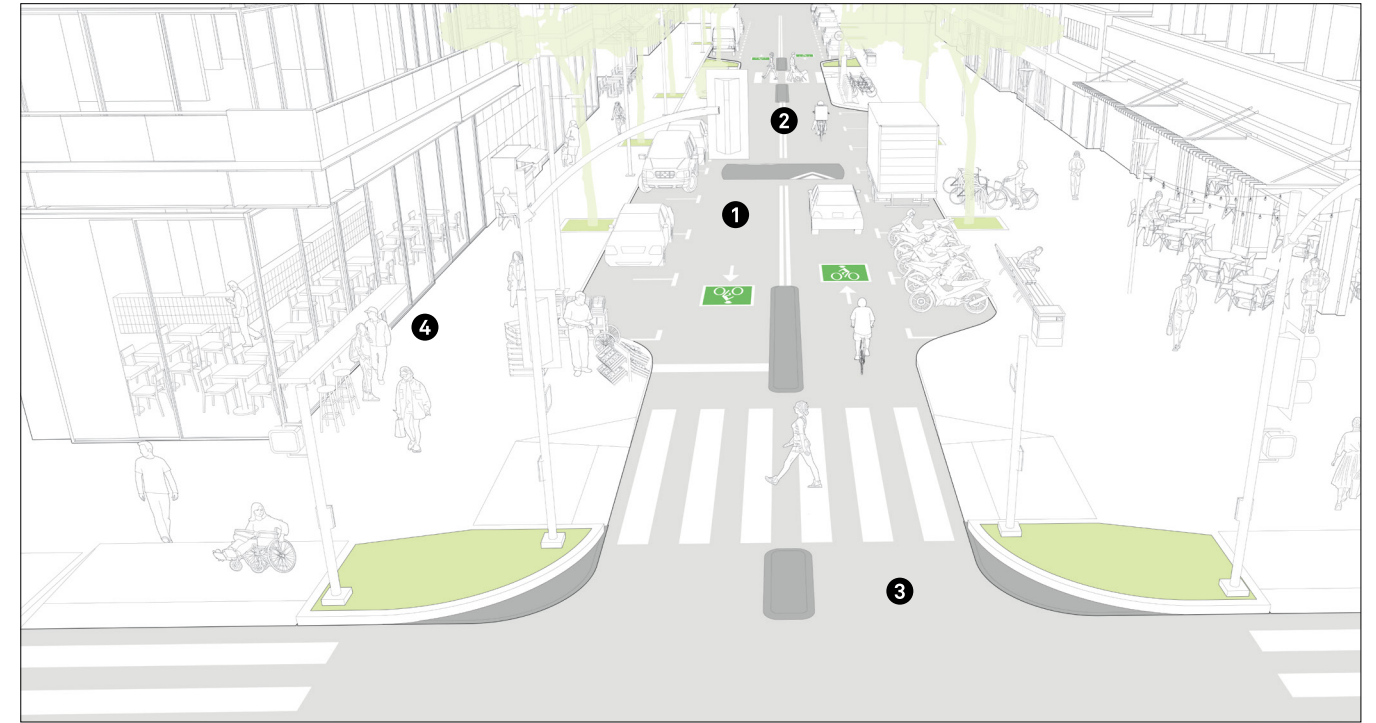
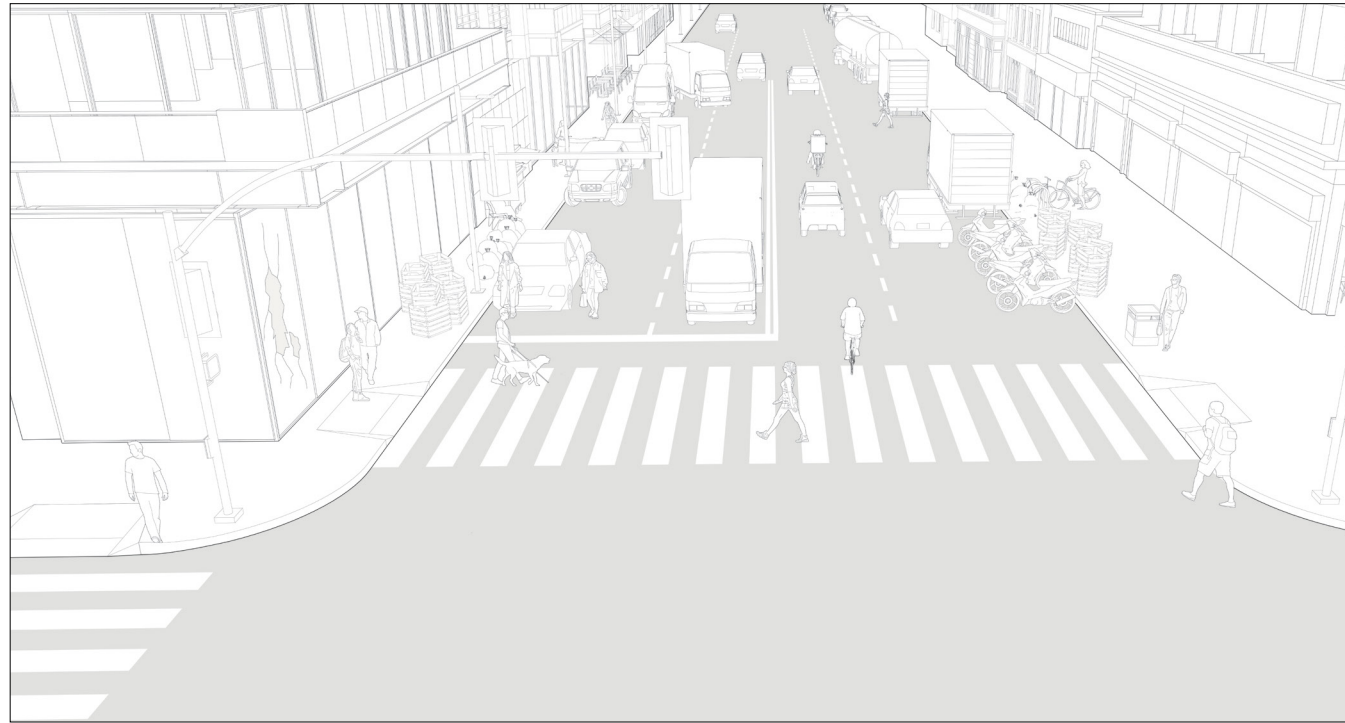
2 Use differentiated paving at intersections and crossing points in this shared environment to signal caution. Difference in paving patterns encourages slower turns and enhances driver awareness of pedestrians and cyclists.

### DESIGN LIVABLE STREETS

Implement measures to restrict and discourage through-traffic by managing access and volume.

3 Limit the hours and types of delivery vehicles allowed, and clearly designate loading zones.

Install clear signage to indicate pedestrian and cyclist priorities.



Existing Conditions

This street is heavily congested, with a high concentration of businesses, shops, restaurants, and services.

Instead of fulfilling its purpose as a commercial street, the entire right-of-way is dedicated to the movement and parking of vehicles.

Due to the absence of designated pedestrian spaces and the conflicts with vendors and other users, pedestrians are forced to walk in the roadway, putting them in unsafe conditions as they navigate through fast-moving traffic and parked cars.

Additionally, motorcyclists, particularly those making deliveries, weave at high speeds and park along sidewalks.



→ Budapest, Hungary



→ Tokyo, Japan

Design Guidance

**User Separation**  
Shared by Cyclists and Motorists



**Crossing Demand**  
High



**Speed**  
30 km/h



→ Mexico City, Mexico

**RIGHTSIZE STREETS**

Widen sidewalks to better accommodate high pedestrian volumes and support commercial activity and social interaction.

**1** Define a compact, 6.0 m wide roadway for both directions of traffic.

Upgrade the parking lanes into flexible zones by adding curb extensions performing multiple functions.

**ADJUST STREET PACE**

**2** Ensure there are frequent pedestrian crossing opportunities, including mid-block crossings, recognizing that both sides of the street may be appealing and people might want to explore freely.

Install curb extensions to increase public space and create pinchpoints at crossings.

Use speed bumps and raised crossings to encourage drivers to maintain appropriate speeds.

**REDUCE TURN SPEEDS**

**3** Adopt rightsized corner radii to manage turn speeds. Use corner wedges and hardened centerlines to address speeds from frequent smaller vehicles, while allowing larger vehicles to turn.

Narrow down travel lanes near the intersection to manage the approach speed and encourage yielding.

**DESIGN LIVABLE STREETS**

Plant trees to provide shade and character. Place them where they do not obstruct visibility for pedestrians or block clear pathways.

Incorporate a variety of seating options, street furniture, and suitable lighting to create an inviting atmosphere for all users.

**4** Provide opportunities for businesses to collaborate and propose attractive designs that contribute to the street's character. This may include specific furniture designs, sidewalk materials, and color schemes that transform the street into a destination.






Existing Conditions

Similar to the previous example, this commercial street has a significant number of street vendors occupying narrow sidewalks, which forces pedestrians to walk on the road bed. Additionally, the high number of cyclists using the street for commuting and local deliveries creates a significant demand for cycling infrastructure.



→ Mombasa, Kenya

Design Guidance

- User Separation**  
Shared by Cyclists and Motorists 
- Crossing Demand**  
High 
- Speed**  
20 km/h 



→ London, UK

RIGHTSIZE STREETS

**1** Maintain one narrow travel lane that is shared with cyclists, while providing a cycle lane in the opposite direction to ensure connectivity and safety for cyclists.

Limit parking to one side of the street. Use reclaimed space on alternate sides to provide sidewalks extensions, green infrastructure, intermittent parking spaces, and areas for street vendors.

Restrict the width of the travel lane and cycle lane to a total of **4.3 m**, to prevent illegal (double) parking.

**2** Extend sidewalks to create a pedestrian clear path. Designate space for local vendors and street commerce on the sidewalk.

REDUCE TURN SPEEDS

The elements used to protect the cycle lane and to define the parking areas can double as delineators to limit turning movements.

ADJUST STREET PACE

Increase the number of pedestrian crossing opportunities, including mid-block crossings, to encourage exploration of destinations on both sides of the street.

**3** Implement chicanes with a bypass for the contraflow cycle lane.

Install curb extensions to provide additional public space and establish pinchpoints at crossings.

Use speed humps and raised crossings to promote safer driving speeds.

DESIGN LIVABLE STREETS

Add street trees to the curb extensions to create a sense of enclosure for all users and enhance the street's character.

Incorporate a variety of seating options, street furniture, and suitable lighting to create an inviting atmosphere for all users.

## Jalan Masjid India



**Location** Kuala Lumpur, Malaysia

**Implementing Organization** City of Kuala Lumpur

**Implemented in** 2019

### OVERVIEW

Jalan Masjid India is located at a popular shopping district of Kuala Lumpur, in a densely populated, mixed-use area with several ground-level stores. Prior to the transformation, the space was mostly dedicated towards motorized modes. With wide lanes and angled parking throughout most of its length, sidewalks were narrow and often wouldn't have a clear path for pedestrians, forcing them to walk on the road bed, exposed to vehicles at significant speeds.

The comprehensive transformation repurposed space from travel lanes and parking towards widening sidewalks. It also addressed broader street design aspects to highlight pedestrians, including sidewalk and roadway materials and human-scale lighting posts.

After the transformation, the street design became more aligned with the existing context and created a safer, more inclusive, and vibrant street for both residents and visitors, and supported local businesses.



### STRATEGIES

#### Rightsize Streets

Typical cross-sections were reconfigured from two to one travel lane, disincentivizing traffic in the area.

Space was reallocated from travel lanes and several angled parking spaces towards wider sidewalks.

#### Adjust Street Pace

Although the road bed was narrowed, a certain degree of horizontal deflection was kept, helping induce motorists to drive at safer speeds.

One raised intersection was implemented, adding vertical deflection for motorists and creating a more comfortable crossing for pedestrians.

#### Design Livable Streets

Added trees and planters in combination with the pavement change help to reduce speeds.

## Waterkant Street



**Location** Cape Town, South Africa

**Implementing Organization** City of Cape Town

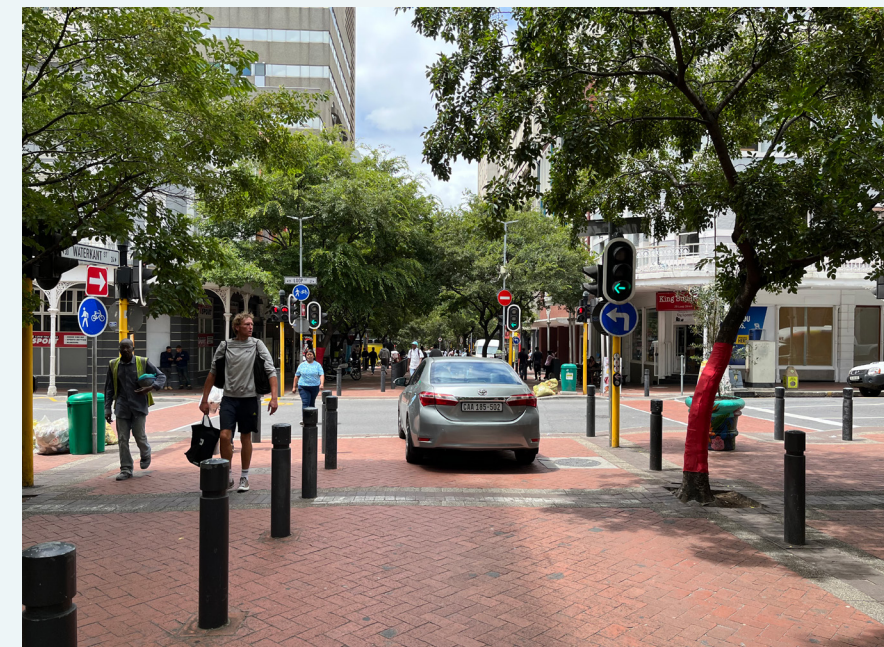
**Implemented in** 2009-2010

### OVERVIEW

Waterkant Street in Cape Town was redesigned as part of the "Fan Walk" initiative for the 2010 FIFA World Cup in South Africa, with the main goal to facilitate access to the city stadium, creating a safe and inviting route for pedestrians.

As part of that goal, the transformation reallocated street space that was previously dedicated for motor vehicles towards sidewalks and shared paths for cyclists and pedestrians. Along the street, the transformation also included a few horizontal deflection points to further induce motorists to navigate at safer speeds.

The redesign changed the pavement from asphalt to tiles, helping to communicate to motorists they are driving in a lower speed environment. It also added landscaping elements, including planters and trees, helping to create visual friction for motorists and improving thermal comfort for people walking and cycling.



### STRATEGIES

#### Rightsize Streets

Travel lanes were rightsized, with one lane removed, and the space repurposed for wider sidewalks.

#### Adjust Street Pace

Traffic signals were implemented at certain intersections, subdividing roadway segments.

#### Design Livable Streets

The inclusion of planters and trees and the pavement change helps motorists self-enforce and comply with a safer speed limit.



Denser areas in cities such as central neighborhoods often lack adequate public spaces. Redesigning wide, busy intersections in these locations presents a valuable opportunity to transform them into plazas and public spaces.

Conducting a network analysis can help identify heavy traffic flows that can be interrupted or redirected in order to reduce car dominance. This, in turn, can create spaces where the local community can thrive.

### Existing Conditions

This example illustrates an irregular network of narrow streets in a dense area. The streets meet at wide angles and create undefined open spaces that are predominantly occupied by cars.

Although this intersection is not designed to accommodate heavy vehicle volumes, its position within the network encourages motorists to use it as a more direct route to avoid larger roads.



→ Fortaleza, Brazil

### Design Guidance

**User Separation**  
Fully Shared



**Crossing Demand**  
High



**Speed**  
10 km/h



→ Lille, France

### RIGHTSIZE STREETS

Pedestrianize streets within the network that facilitate through-traffic. This will reduce vehicle access points to the intersection and reduce car dominance.

Transform underused roadbed areas into public plazas to encourage and attract more activities and uses.

1 Provide a single travel lane with a width of 3.0 m around the plaza to allow for internal vehicle connections.

### ADJUST STREET PACE

Use the plaza to change travel movement for one or more unwanted through-traffic connections.

### REDUCE TURN SPEEDS

2 Limit turning opportunities for vehicles to reduce and reclaim the space required for turning.

### DESIGN LIVABLE STREETS

3 Incorporate furniture and activities for multiple uses like social gatherings, active play, dining, etc. Encourage active use and programs for different users and at all times of the day.

Change the pavement materials to alter the character of the space, emphasizing the priority of pedestrian and public space usage.

# 6.5

## Safe Speed Zones

6.5.1 Overview

6.5.2 Safe Speed Zone Planning

6.5.3 Identify and Address Speeding Opportunities

6.5.4 Reconfigure Street Operations And Design

Smaller, inner-neighborhood streets form the majority of a city's street network. In lieu of transforming each street at a time, there are advantages in taking a comprehensive, area-wide approach to a zone, neighborhood, or district.

This section presents how reducing speed limits on multiple streets at once creates opportunities for cities to combine additional physical and operational measures to self-enforce the new speed while achieving additional goals.



## 6.5.1

### Overview

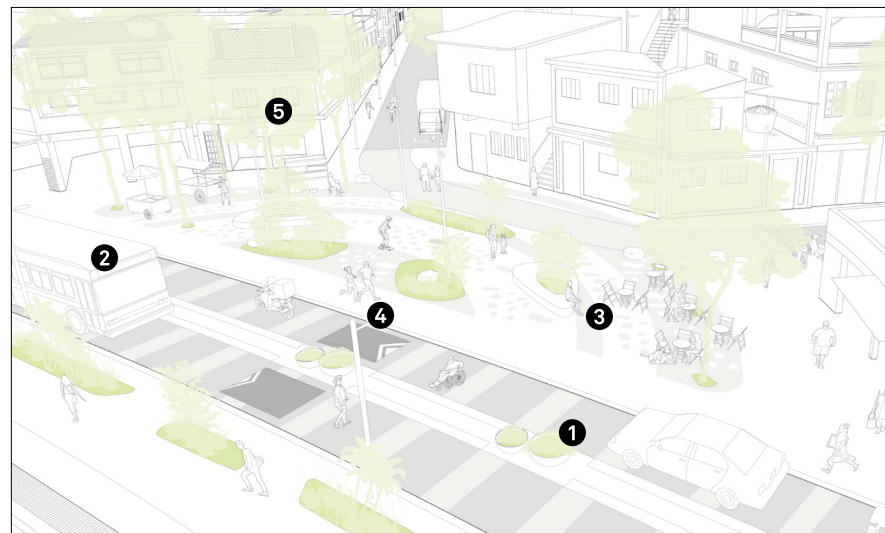
Safe Speed Zones – also known as slow zones, low-speed zones, and zones/ areas 30/20 – are a consolidated approach to addressing speeds and road safety throughout an entire area, neighborhood, or district. Frequently, an updated speed limit is applied to all streets within the perimeter, paired with traffic calming measures to ensure motorists' compliance.

Innovative cities have been seizing opportunities brought by an area-wide approach to street design to address multiple crises and achieve several additional goals.

A Safe Speed Zone can be the starting point and a model for scaling up a renewed approach to street design citywide.

#### SAFE SPEED ZONE OPPORTUNITIES

- 1 Reduce speeds and improve road safety
- 2 Promote safe and sustainable mobility
- 3 Reclaim and enhance the public realm
- 4 Reduce motor vehicles dependency for short travels
- 5 Improve air quality, reduce noise pollution, and promote physical activity.



### Examples of Area-wide Interventions

Safe speeds and road safety can be the central motivation for an area-wide intervention or can enable interventions with different starting points.

Speed reductions can be combined with additional physical and operational measures to reduce traffic emissions; make streets walkable and cyclable for people of all ages, abilities, and genders; make neighborhoods more livable; elevate historic buildings; enhance local businesses; and protect the environment and enhance contact with nature.

The objectives and narrative supporting the area-wide intervention should be relevant to the local context and needs of its users. Safe speeds are foundational to the intervention examples shown below.

#### Low-speed zones



Streets near schools and other key destinations



Livable neighborhoods



Streets near transit hubs and stations



Historic centers



Business districts



## 6.5.2

### Safe Speed Zone Planning

Select the area for implementing a Safe Speed Zone based on the local context, community needs, and equitable public investment distribution, among other factors. Through-traffic and crash data analysis may be relevant for zone identification. Use data to prioritize and justify the site selection.

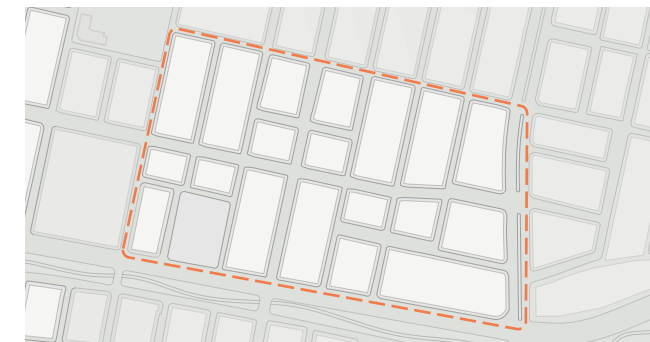
Once the project area is identified, conduct further analysis. This phase should be followed by the design development and detailing phases. Follow the approach below but note that the order of the steps can change, and they can happen simultaneously.

#### 1. DEFINE THE BOUNDARIES

The limits of the Safe Speed Zone should be logical, clear and legible to street users (once implemented), and also to multiple stakeholders during the planning stage.

The area could be generally bounded by streets with higher vehicular capacity and speed limits, natural barriers or other infrastructure like rail lines.

Make sure the boundaries of the Safe Speed Zone are permeable (especially for pedestrians and cyclists) and that its speeds are safe. Also, identify the links to surrounding zones.

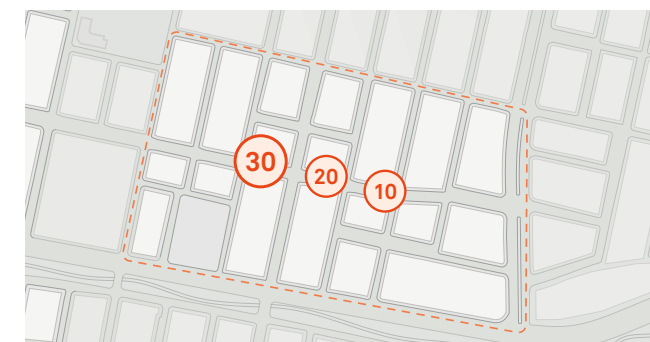


#### 2. REDUCE SPEED LIMITS

The base speed limit of a Safe Speed Zone is typically 30 km/h or lower.

Lower speeds can be adopted on specific streets depending on the context (shared streets or school streets, for example).

Install vertical signs and road markings displaying the new posted speed at entry points and throughout the perimeter.

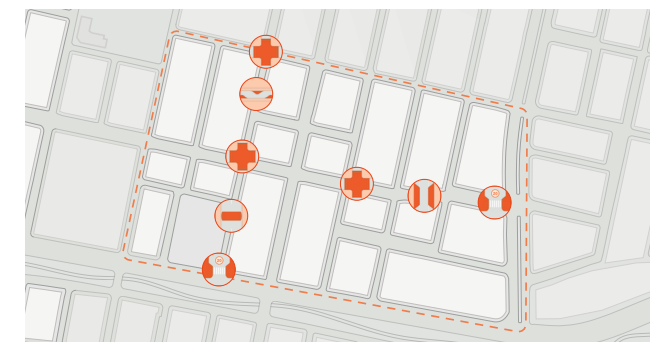


#### 3. IDENTIFY AND ADDRESS SPEEDING OPPORTUNITIES

Analyze the street network to identify long unimpeded and wide-lane roadway segments that create speeding opportunities within the area.

For a 30 km/h target speed, the spacing between speed reduction measures should be typically 60 m or lower. Those can include both mid-block and intersection treatments. *For more information, see 4 Strategies.*

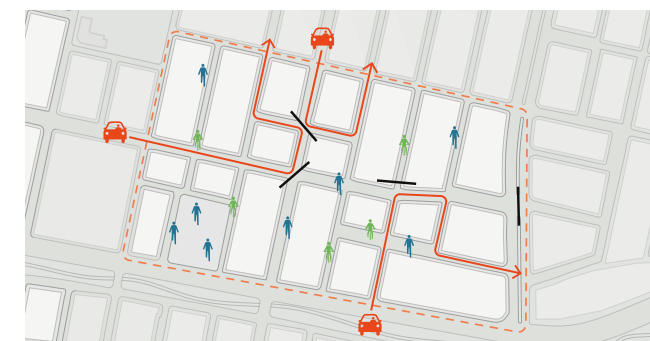
In tandem with potential circulation changes, identify the location for such measures, which will be further detailed in the design phase.



#### 4. RECONFIGURE STREET OPERATIONS AND DESIGN

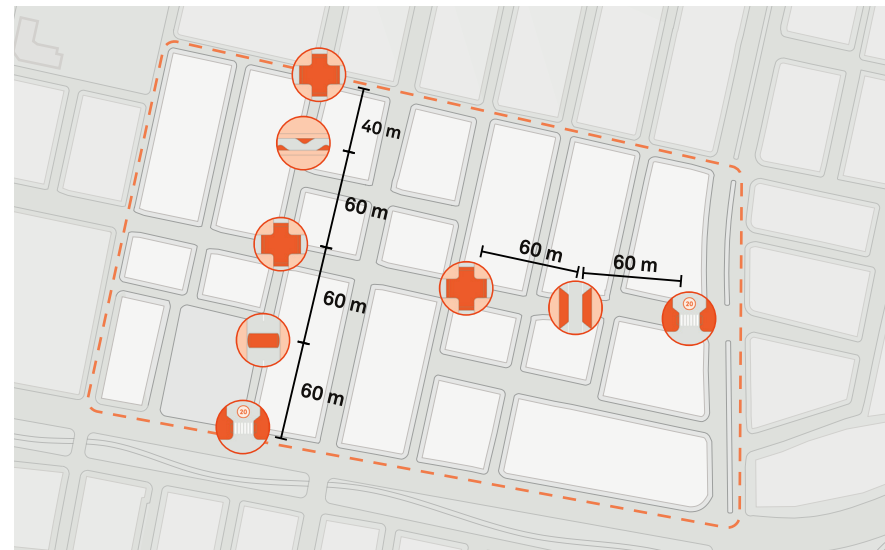
Safe Speed Zones do not depend on circulation changes to be effective. However, managing motor vehicle volumes and access while retaining permeability for active modes can dramatically change the design possibilities and overall livability of a street and area.

Analyze modal networks to define the right profile for each street. Circulation changes can aim at removing cut-through traffic from neighborhood streets. The speeds for this travel type are reportedly higher than that of local access trips.



## Identify and Address Speeding Opportunities

At the planning stage, cities can use an area map to identify portions of the network more prone to traveling at unsafe speeds. This includes configurations like wide roadways and intersections, and long unimpeded street segments. These assumptions can be verified on-site by conducting speed measurements. Note on the map the locations that need some sort of speed reduction measure.



The following guidance outlines how cities can address speeding opportunities in Safe Speed Zones based on the characteristics of their road network and urban layout. These should be considered alongside any changes to circulation and the integration of walking, cycling, and public transport facilities to support a safer and more coherent transport network within the zone. *For more information, see 6.5.4 Reconfigure Transport Networks and Street Profiles.*

### LONG BLOCKS

Add vertical or horizontal deflection tools midblock to remove speeding opportunities. Complement those with pedestrian crossings as applicable.

### BOUNDARY STREETS

Boundary streets often carry higher traffic volumes and speeds, creating physical and psychological barriers that disconnect communities. Improving the permeability of these streets can help reduce speeds, enhance safety for pedestrians and cyclists, and support more inclusive and connected neighborhoods by reducing the risk of transport-related social exclusion.

### PREFERENTIAL STREETS

If a street is preferential across multiple consecutive intersections, it will operate as a de facto continuous segment, prone to speeding. Mini roundabouts or raised intersections, for example, force motorists in all directions to slow down.

### TRANSITIONS

Identify the locations where motorists will enter the Safe Speed Zone from a higher-speed street. Combine signage and different safe speed tools to create gateway treatments that subconsciously communicate the transition into a lower-speed environment.

### KEY DESTINATIONS

In front of schools, healthcare facilities, markets, transit stations, and other key destinations, or streets with high crossing demand, consider using lower target speeds and adding pedestrian crossings to meet desire lines. Add self-enforcing speed reduction measures to ensure motorists comply with the target speed when approaching the crossing.

### MULTILANE LOCAL ACCESS STREETS

Streets that favor local access and street activity over long-distance motor vehicle connections should have no more than one lane per direction. Two-lane, one-way neighborhood streets encourage speeding. Alternatives include converting back to two-way or repurposing the extra lane for other purposes.

## Summit Condominium Slow Zone

**Location** Addis Ababa, Ethiopia

**Implementing Organization** City of Addis Ababa, Bloomberg Initiative for Global Road Safety (BIGRS), Global Designing Cities Initiative (GDCI)

**Implemented in** 2020

### OVERVIEW

The Summit Condominium Slow Zone project in Addis Ababa transformed a school neighborhood, repurposing space from oversized travel lanes towards pedestrians, and introducing vertical and horizontal deflection elements such as speed bumps and chicanes. The transformation led to up to 69% reductions in crossing distances and 67% reduction in 85th percentile spot speeds.



## Kota Tua Low Emission Zone

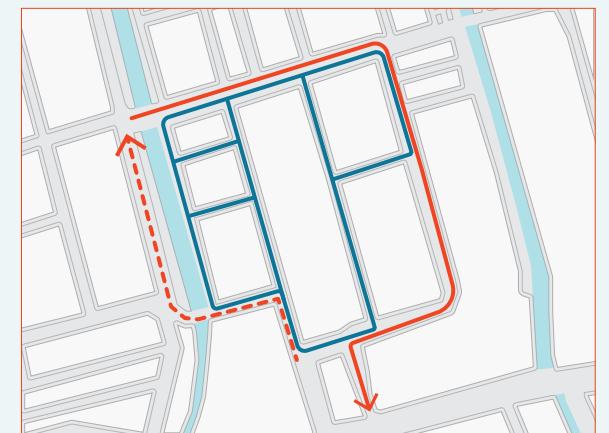
**Location** Jakarta, Indonesia

**Implementing Organization** Jakarta Provincial Government, Institute for Transportation and Development Policy, UK PACT

**Implemented in** 2021

### OVERVIEW

The Kota Tua Low Emission Zone, with the main goal of improving air quality in Jakarta's historic district, pedestrianized five streets and restricted motor vehicle access to several others. The city also repurposed space from oversized travel lanes towards sidewalks and cycling infrastructure.



- Motorized Vehicle Access
- - - Restricted for Motorized Vehicle
- Pedestrianization

## Microcentro

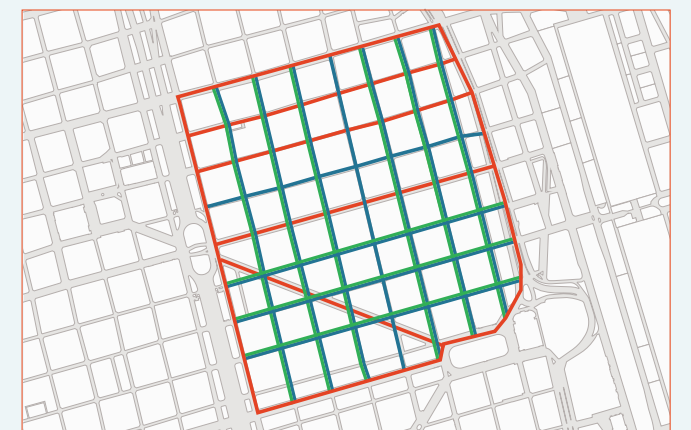
**Location** Buenos Aires, Argentina

**Implementing Organization** City of Buenos Aires

**Implemented in** 2012

### OVERVIEW

Buenos Aires' project transformed 71 blocks of the city center, prioritizing pedestrians with widened sidewalks, shared streets, and bike lanes. Vehicle speeds were capped at 10 km/h, and access was restricted during peak hours. The project reclaimed 9,792 m<sup>2</sup> of pedestrian space, reduced traffic and pollution, and enhanced safety. Features like bollards, planters, LED lighting, and subterranean waste bins improved aesthetics and comfort.



- Pedestrianized Street
- Through Traffic
- Shared Street

## Reconfigure Street Operations And Design

### Sustainable Modes and Essential Services

Managing street users' demand, volumes, access, and parking can be critical to prioritizing the safety of vulnerable users and promoting sustainable transportation modes. For more information, see *Global Street Design Guide Chapter 8*.

#### WALKING

Ensure streets prioritize the most vulnerable users, particularly older adults, children, and people with disabilities.

Allocate enough space for pedestrian facilities with accessible sidewalks with clear paths of at least 1.8 m.

If that is not possible, pedestrianize the street or reduce vehicular volumes to a minimum (generally, local access only), and reduce speeds to 10-15 km/h to create the conditions for a shared street.

Include frequent crossing opportunities for pedestrians, including every leg of intersections and midblock crossings.

#### CYCLING

Provide protected cycling facilities on streets with speeds of 30 km/h or higher and a moderate to high volume of traffic.

If cyclists and motorists need to share the roadway, reduce vehicular volumes to a minimum (generally, local access only), and reduce speeds to 30 km/h or lower to ensure a safe environment for cyclists.

Allow contraflow cycling to increase connectivity and create a safer and more comprehensive cycle network.

Cycle facilities that are attractive to people of all ages, abilities, and genders are critical to make cycling a viable transport mode.

#### TRANSIT

Improving walking and cycling conditions is critical for improved first- and last-mile connectivity for transit riders.

Boundary streets or corridors often carry high-capacity transit lines. Make sure pedestrians and cyclists can conveniently cross them to access transit stations.

Local transit lines should be retained within the Safe Speed Zone. For such streets, adopt a 12 m city bus as the design vehicle. Consider adding bus gates that prevent private vehicles from using the street as a through route and prioritize transit, reducing passenger delays.

Depending on the local context, first- and last-mile connections within a zone can be provided by small collective transport services.

#### FREIGHT, SERVICES AND EMERGENCY ACCESS

Designated truck routes should be directed to higher-capacity streets. On smaller local routes where freight access is needed, use smaller vehicles as the control vehicle.

Designate loading zones in commercial streets and other locations that require frequent delivery and pick-up points.

Emergency vehicles can access dedicated transit lanes in congested areas and perform turning radii that include multiple travel lanes. Allow emergency vehicles access to limited traffic zones with retractable bollards.

When planning changes to the network, consider the routes and schedules of cleaning vehicles in the zone. Likewise, take school bus routes into account.

### Volume and Access Management

Consider making operational changes to the roadway network to facilitate the inclusion and development of sustainable modes and the provision of essential services. Reduce the density of through routes with restricted movements at the network level to discourage motor vehicles from driving at unsafe speeds, while ensuring local access and accessibility as needed. Use filtered permeability strategies to control motor vehicle access to achieve dense, connected, high-comfort networks for pedestrians and cyclists.



#### RESTRICTED MOVEMENT STRATEGIES

##### 1 Forced Turns

At intersections, use traffic diverters, changes in directionality, and partial or full closures to force motorists to turn, thus limiting through-traffic within the area. Configure a modal filter by adding cut-throughs for cycle or transit traffic.

##### 2 Continuous Raised Median

Block traffic on a minor street from crossing a major street, forcing the minor street traffic to turn right and preventing left turns from the major street. Median openings allow for pedestrian and cyclist crossings while preventing vehicle crossings.

##### 3 Turn Prohibitions

Prohibiting turns from high-volume streets onto lower-volume streets can be implemented through regulatory signage reinforced with through-only arrow markings and by removing any existing turn lane.

##### 4 One-way Streets

Providing multiple one-way exiting segments and few entry streets for motorists can help reduce through-traffic in the area.

##### 5 Closures

Modal filters implemented at midblocks or at the approach of an intersection prevent motorists from going through while retaining full access for authorized modes.

#### RESTRICTED ACCESS STRATEGIES

Prevent unauthorized vehicles from accessing a street or zone, or price access accordingly. Restricting access to local vehicle users only can substantially decrease vehicle volumes.

Access restriction strategies require identification and enforcement systems, including vehicle registration, signage, and camera enforcement.

In city centers, where access demand is high, restricted access strategies can be used in conjunction with or replace restricted movement strategies and effectively reduce motorized traffic presence to a minimum.

School streets or play streets can perform operational closures to temporarily pedestrianize the street.

## Examples of Volume and Access Management

### TRAFFIC DIVERSION

Private motor vehicle volume on a street can be reduced by making the street less appealing as a through-route or by completely preventing through-travel.

Traffic diverters and modal filters can be used to break the continuity of vehicular routes within the intervention area. This technique prevents cut-through traffic from motorists avoiding a congested corridor and drastically reduces the vehicle volumes on the impacted street while retaining and facilitating vehicular access to locals.

All streets must keep permeability for pedestrians and cyclists.

Access for emergency services must be ensured.

Low-volume streets can be converted into shared streets. Depending on the intersection configuration, the traffic diverter can double as a pedestrian plaza.

## Barcelona Superblocks

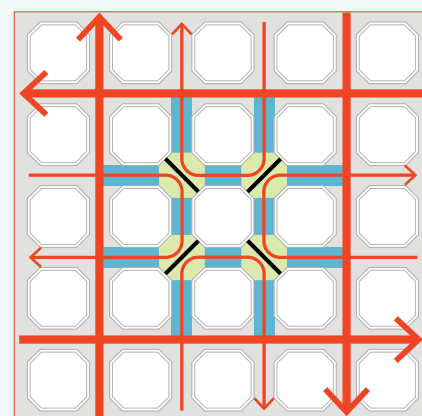
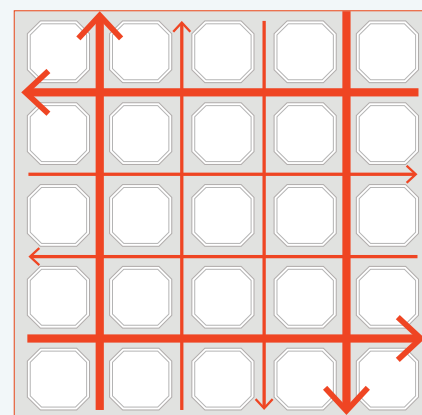
**Location** Barcelona, Spain

**Implementing Organization** Barcelona City Council

**Implemented in** 2016

### OVERVIEW

Barcelona's Superblocks (or Superilles, in Catalan) reorder the street grid forming a polygon, some 400 m by 400 m, where boundary and inner streets have different functions. The boundary streets retain their travel function for all users, while traffic diverters on the inner intersections break vehicular traffic continuity through the inner streets, drastically reducing congestion, emissions, and risk to vulnerable road users. Excess roadway space is repurposed as widened sidewalks, while one motor vehicle access lane is retained to serve local residents and businesses. Intersections with diagonal diverters can be converted into pedestrian plazas that work as new gathering spaces. All streets retain permeability for cyclists and pedestrians.<sup>16</sup>



### ONE-WAY STREETS

An alternative to using modal filters and diverters is to manage street directionality to discourage cut-through vehicular traffic within the area.

Cyclists are allowed to ride contraflow, making all streets bidirectional for them.

Converting streets into single-lane one way streets generates the opportunity to repurpose the remaining space for other uses.

## Utrecht Neighborhoods

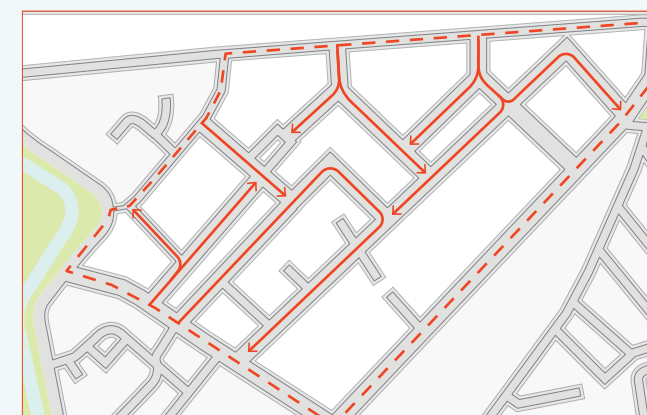
**Location** Utrecht, Netherlands

**Implementing Organization** City of Utrecht

### OVERVIEW

This neighborhood in the city of Utrecht is an example of the use of one-way streets arranged in different directions as a technique to remove through-traffic from the area. Streets are arranged such that there are only a few points to enter the area from, but multiple ways to exit. This makes through traffic movements impossible while retaining access to all destinations and not requiring diagonal diverters or closures.

The result is streets that are pleasant and quiet and safe enough for children to play on, even without any physical barriers on the street.<sup>17</sup>



## Examples of Volume and Access Management

### CIRCULATION PLAN

Central districts are generally very attractive areas, where access demand is very high and space is often limited. Circulation plans use volume and access management techniques to discourage driving into the city center and make walking, cycling, and taking transit the most appealing option.

Examples include subdividing the area into self-contained road traffic quadrants. Traffic can circulate within each quadrant, but not across them. To do so, motorists need to take a longer route using the external perimeter, which discourages those short trips.

Pedestrian, cyclists, and transit vehicles can freely move across the entire area. With much fewer interactions with cars, walking and cycling become much safer and more pleasant.

Additional traffic calming techniques ensure safe speeds across the area.

## Ghent Circulation Plan

**Location** Ghent, Belgium

**Implementing Organization** City of Ghent

**Implemented in** 2015

### OVERVIEW

The Ghent Circulation Plan, launched in 2015 by the City of Ghent, Belgium, is a transformative urban mobility initiative aimed at increasing the sustainability and livability of the historic city center. The plan removed through-traffic from the central areas, introduced a large-scale 30 km/h zone, and prioritized active and public transportation. Strategies included reallocating street space for pedestrians, creating shared streets, implementing modal filters, and redesigning traffic flow by converting some streets to one-way operations.



### LIMITED TRAFFIC ZONE

Alternatively, cities can reduce traffic in central districts by defining limited traffic zones.

Those are areas where motorized traffic is restricted and access is allowed only for specific users or vehicles. This might include local residents, people with accessibility permits, environmentally friendly vehicles, loading vehicles, public utility vehicles, police and emergency vehicles, and at specific hours for loading purposes.

Access to limited traffic zones may be completely restricted, permitted at certain hours, or permitted with an access fee. Traffic is generally physically restricted by using fixed or retractable bollards.

## Florence ZTL

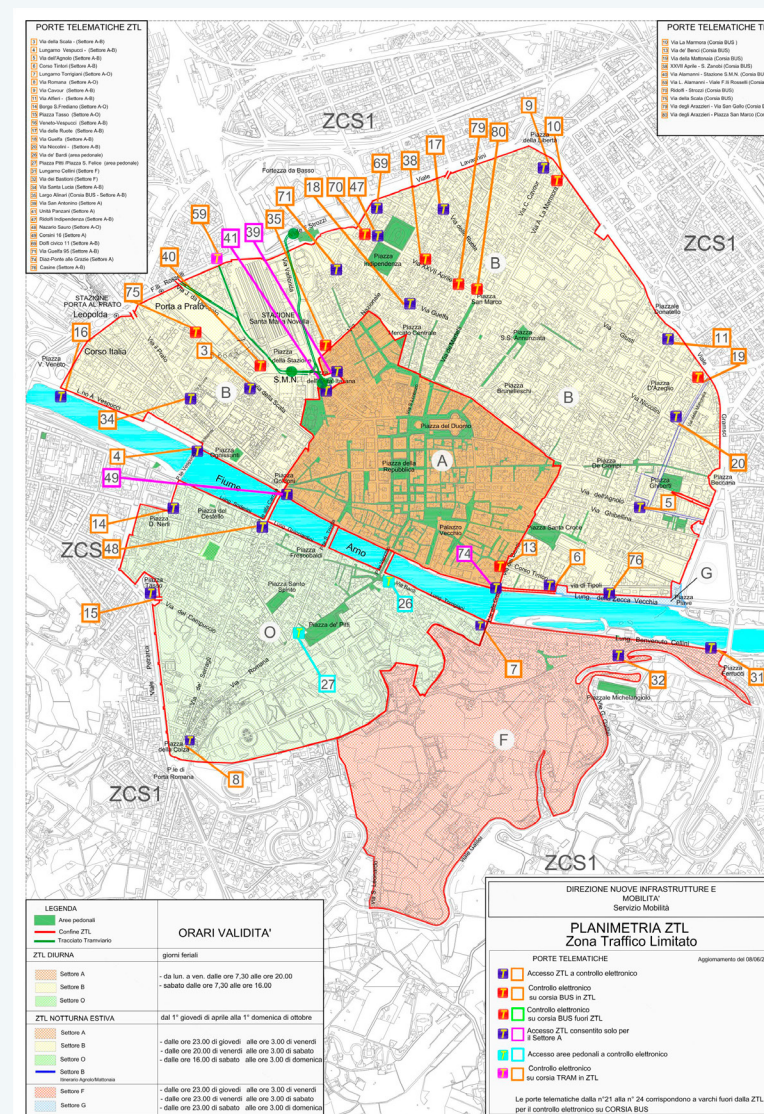
**Location** Florence, Italy

**Implementing Organization** City of Florence

### OVERVIEW

Florence, like other cities in Europe, restricts motorized traffic in its central historic area to vehicles with permits—mainly buses, taxis, and residents. For some sections, these restrictions are time-based and applicable during certain times during weekdays and Saturdays; for the core area, they are applicable at all times, meaning only residents, buses, and taxis can access them.

The rules for the Traffic-Limited Zone (or *Zona a Traffico Limitato*, in Italian) are indicated via traffic signage and enforced by automated cameras. Though there are public and private garages, on-street parking is restricted in these areas, which helps disincentivize motorized traffic.



D

**Toolbox**



# 7

## Safe Speeds Toolbox

A comprehensive street transformation focused on speed management combines the deployment of design and operational tools, like speed bumps, chicanes, and traffic signal coordination techniques. These tools for speed management are varied and so are the multiple variations for the same tool. This chapter presents and offers implementation guidance for many of them.

The recommendations are rooted in the safe speed strategies presented throughout this publication and are grouped based on their speed reduction mechanism, such as vertical deflection, horizontal geometry, and operational tools. Those are complemented by cross-cutting themes that are relevant to all tools.

This global resource offers more than prescriptive guidance. The intent of the toolbox is to provide cities with a solid foundation to start from and adapt to their contexts, considering local existing practices, availability of materials, technology and human resources, local climate and infrastructure, as well as local traditions, history, and character.

## Toolbox Overview

The guidance in this section is organized in four groups. The first one addresses more general design aspects that pertain to all tools and how they are combined.

The following three groups encompass three different types of tools: vertical deflection, horizontal geometry, and operational tools. Each of these feature guidance and considerations for different speed management tools and snapshots, to inform different relevant applications, promoting more robust designs.

### General Guidance

#### Universal Accessibility and Device Permeability

Safe speed tools must be designed so that all users can navigate them properly, with a special focus on pedestrian accessibility and cyclist permeability.

#### Materials

The choice of materials is critical to ensure sturdiness of safe speed tools, to manage drivers' comfort, and to convey user priority and the design speed of the street.

#### Tool Visibility

Tools must be visible to all street users under all lighting and visibility conditions.

#### Streetside Design

The choice and placement of streetside elements can have a positive impact in reducing speeds and to the overall design of cycling and walking facilities.

### Applicability and Considerations of the Guidance

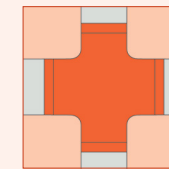
The guidance and key dimensions of traffic calming measures (tools) builds on different street design manuals and technical references from leading organizations internationally, including the United Kingdom, United States, Australia, New Zealand, The Netherlands, Brazil, Colombia, Denmark, Sweden, France, and Italy. All are listed for transparency.

The main goal of this chapter is to provide references as starting points for cities that should be adapted to fit local contexts, rather than prescribe universally applicable design standards, and thus should be interpreted with caution, and ideally tested on-site prior to their implementation. Actual performance of traffic calming measures depends on various factors: the type of traffic calming device applied; its design speed and correct geometric implementation; the design, managed, and control vehicles; as well as contextual conditions such as lane and roadway width, the street typology, pavement materials, land use and street activity, and the composition of the country vehicle fleet.

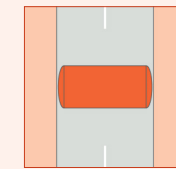
Additional considerations include the presence of motorcyclists and cyclists, emergency vehicle requirements, and local design standards. For these reasons, the figures provided should be understood as indicative ranges rather than prescriptive values, and always adapted to the local context.

### 7.2 | Vertical Deflection Tools

Vertical deflection tools create localized elevation changes to the road bed that require motorists to reduce speeds to navigate them comfortably.



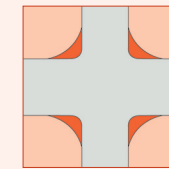
Sidewalk-level crossings



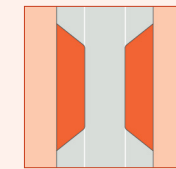
Roadway Humps

### 7.3 | Horizontal Geometry Tools

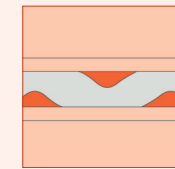
Horizontal geometry tools change the roadway, adjusting turn movements, laterally shifting the vehicle's path, or helping increase the sense of closure. Drivers slow down to comfortably navigate the device or to negotiate right of way with other road users.



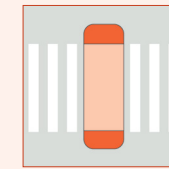
Rightsized Corner Radius



Pinchpoints



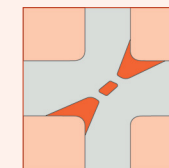
Chicanes and Lane Shifts



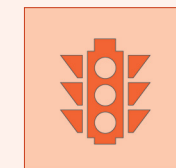
Central Islands

### 7.4 | Operational tools

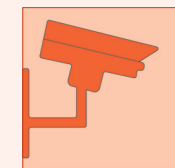
Operational tools alter and enforce rules that affect the movement and right of way of different street users. They can be used to enforce the right of way at conflict points prioritizing the safety of vulnerable users, reduce volumes or restrict access of motor vehicles to certain streets, or enforce motorists' speeds.



Modal Filters



Signals



Automated Speed Enforcement

## Key Principles

Applying safe speed tools requires careful planning, design detailing, and implementation. Tools should be looked at as part of a system and be adapted to the local context as needed. Below, we outline key principles and definitions that frame the tools and recommendations presented in this chapter.

### Consider All Users



Design tools with all users in mind. Ensure tools manage the speeds of motorized vehicles while allowing seamless navigation for pedestrians and cyclists. Universal accessibility must be ensured in every design.

### Strive for Co-Benefits



Besides managing speeds, each tool has the potential to fulfill multiple functions and bring co-benefits to its users, cities, and the environment. For example, raised crossings can slow speeds while providing safe pedestrian crossings, and curb extensions can incorporate green infrastructure, transit stops, or seating.

### Coordinate Tool Placement



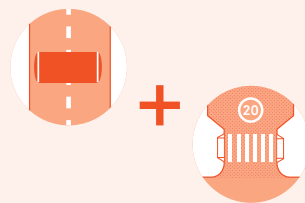
Many safe speed tools reduce speeds at the spot they are placed. However, to reach a certain target speed on a street or corridor, cities should strive for the right spacing between measures. Additionally, explore opportunities to use modal filters and other operational measures to create cohesive, area-wide improvements. *For more information, see 4.1.2 Adjust the Street Pace.*

### Adapt to the Context



Tailor tools to both regional, local, and immediate contexts. Consider factors like climate, infrastructure, and local culture, as well as materials, drainage, and street features to ensure tools are effective and sustainable in each setting. *For more information, see Global Street Design Guide Chapter 5.*

### Combine Tools



Pair different tools to increase impact or to suit specific local needs. For instance, a mini roundabout can also be raised to add the benefits of a raised intersection, while a chicane may also create a yield point, enhancing its speed reduction effect.

## Adapting to Context

### CONSTRUCTION

Construction practices vary widely, and each city or street presents unique factors that influence the suitability and adaptation of a tool.

### Materials

For each tool, consider impact cost, durability, ease of maintenance, sustainability, permeability to stormwater, appearance, and character.

### Technology

Access to different equipment, fabrication, and construction technologies may also impact the cost and/or viability of safe speed tools.

### Implementation Capacity

Local implementation expertise, labor costs, and institutional knowledge may affect the ability to use some tools.

### Infrastructure

Lack or presence of drainage or sewage systems, and the quality of pavement surface and foundation, will determine tool applicability and intervention prioritization.

### Climate and Local Character

Temperature, precipitations, and cultural elements shape material choices and the overall design, preserving a place's unique identity.



→ Lisbon, Portugal

### DESIGN VARIATIONS

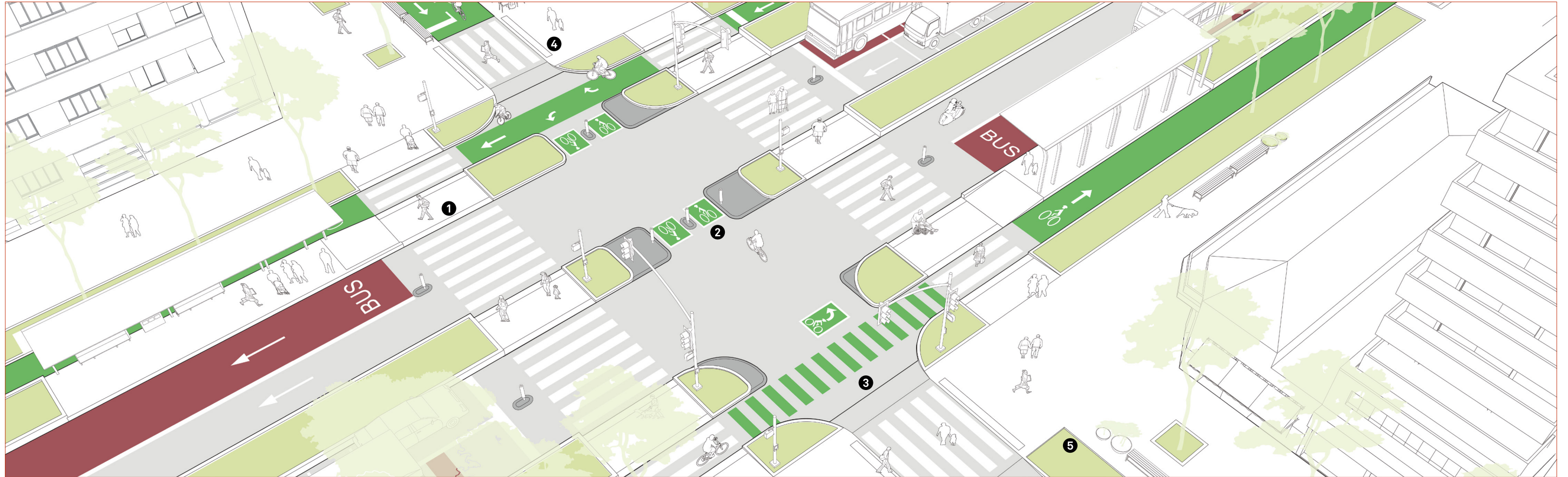
The same tool can be applied in different ways depending on the context. The Safe Speeds Toolbox presents design variations as both technical drawings and snapshots from real projects to inspire and inform locally relevant applications.

When adopting a tool for the first time, cities should conduct thorough post-implementation impact evaluations, preferably using pop-up or interim interventions, to assess its effectiveness locally and to refine future implementations.



→ Córdoba, Argentina

## Universal Accessibility and Device Permeability



Safe speed tools require careful consideration about their use and navigation by different users. Universal accessibility must be a top priority when designing any street. Cyclists benefit from filtered permeability strategies. Place strategic bypasses and filters to achieve a direct, connected, and inclusive cycling network. That generally means restricting access for all or certain types of motorized vehicles, which can be achieved by a combination of design and operational tools. Finally, preserve emergency routes without creating oversized roadways that compromise crash prevention in the first place.

### 1 Universal Accessibility

Ensure universal accessibility needs when designing any tool. Incorporate features such as accessibility ramps between different grade levels.

Consider continuous sidewalks at raised pedestrian crossings or cut-throughs to create seamless walking routes.

Install detectable surfaces like tactile pavers along curbs and conflict points, and add sound alerts at pedestrian crossing.

### 2 Permeability for Cyclists

Consider tool navigation and permeability for pedestrians and cyclists.

Use modal filters to create cycle streets or car-free streets and segments, thereby improving safety, comfort, and network connectivity.

Incorporate cycle bypasses around vertical and horizontal geometry devices to create continuous cycling routes to simplify navigation for cyclists.

### 3 Intersection Navigation

Prioritize pedestrian and cyclist movements at intersections. Make crossings direct by aligning them with pedestrian and cyclist clear paths.

This approach minimizes detours, improve connectivity, and reduces the number of users crossing a street outside of dedicated crossing facilities.

Use pavement materials, markings, and signs to ensure intuitive navigation.

Add protected refuges for cyclists and pedestrians at conflict points or whenever pedestrians have to cross three or more lanes or in narrower streets where speeds and vehicular volumes make single-stage crossings prohibitive or unsafe. *For more information, see Global Street Design Guide 6.3.6.*

### 4 Access Management

Provide access for emergency vehicles or authorized users with devices such as flexible, manual, or pneumatic bollards that can be raised or lowered to control vehicle access as needed.

Implement width or height limitation devices. This can be gateways or overhead structures that restrict the size of vehicles entering certain streets, preventing large vehicles from accessing areas where they are unsuitable.

Consider deploying camera systems to monitor compliance with access restrictions, issuing tickets, or charging fees to unauthorized vehicles entering restricted areas.

Utilize clear signage to indicate forced turns, height limitations, or vehicle type restrictions, informing drivers of access limitations ahead of time.

### 5 Motorcyclist Encroachment

Measures that prevent motorcyclists' encroachment into pedestrian and cycle facilities often affect universal accessibility and permeability for cyclists.

Encroachment from motorcyclists can be addressed by offering more attractive alternatives to such behavior or by using design features that strongly discourage it, along with consistent communication campaigns to shift behavior over time.

Examples include providing legal parking for motorcyclists and using features like benches or planters strategically placed on curb extensions to prevent motorcyclists from weaving in and out of walking and cycling facilities. Implement camera enforcement as a last resort.

In areas with high motorcycle usage, reducing motorcyclists' speeds within pedestrian and cycling facilities is essential, even if the use of these facilities by motorcyclists cannot be entirely prevented.

## Materials

Selecting suitable materials and construction methods is essential for designing and implementing effective speed management tools. Prioritizing sustainability by using recycled, locally sourced, or low-impact materials reduces environmental impact and supports local economies. Durable materials ensure sturdiness and longevity. While they may have higher upfront costs, they often lead to lower long-term expenses due to reduced maintenance needs. Choosing materials that require minimal upkeep also reduces the operational burden on city maintenance services.

### Pavement Surface

#### IMPACT ON SPEEDS

The use of pavement materials can be a key tool in reducing speeds. It can also indicate a change in speed environment and user priority. Pavement materials that produce vibration to motorists are proven to reduce speeds.



Higher speed ← → Lower speed

#### CONTRASTING SURFACES

Material choices in street design communicate user priorities and influence driver behavior. Using highway-like materials such as asphalt, standard markings, and signage often signals priority for motor vehicles.

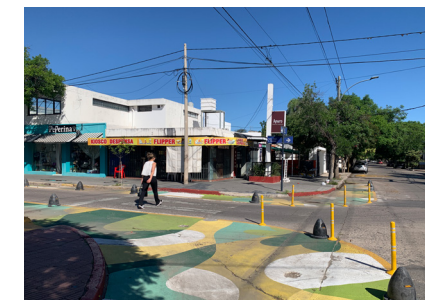
In contrast, a greater presence of green and blue infrastructure and materials that resemble pedestrian spaces like brick or concrete pavers, cobblestones or granite conveys pedestrian priority, and encourages drivers to reduce speed.

Ensure routine maintenance for these surfaces in order to preserve their contrasts, smoother navigability for all users, and thus maintain their functionality.



→ Istanbul, Türkiye

### Interim and Permanent Materials



→ Cordoba, Argentina



→ Istanbul, Türkiye



→ New York City, USA

*When adapting an interim intervention to permanent, revisit the design to maximize the possibilities of a full or partial reconstruction.*

Safe speed tools can be implemented using permanent or interim materials. Interim or pop-up street transformations are powerful tools to demonstrate the benefits of improved street design to local communities, before committing to permanent implementation. *For more information, see How to Implement Street Transformations.*

Though they emulate the final configuration a street may have, the actual design possibilities of a demonstration project are different from the permanent implementation.

#### CURB EXTENSIONS

Curbs generally can't be moved in an interim or a pop-up transformation. Geometric adjustments that are possible in a full reconstruction, like changing the position of a median, may not be feasible in a demonstration project.

Curb extensions narrower than 1.5 m may not make sense on an interim implementation, but can be feasible in a capital construction.

#### HYBRID IMPLEMENTATION

Many cities adopt a hybrid approach and conduct small capital construction changes at critical locations on a project (often using maintenance budgets), while using lower-cost materials for the rest of the project.

Examples include building pedestrian ramps, islands, or median tips in concrete, while using paint, signage, and planters on midblock sidewalk extensions or cycle lanes.

#### PREFABRICATED DEVICES

Some safe speed tools can be emulated using prefabricated devices, usually made of rubber or plastic.

Selected materials should be resistant enough for the type and volume of traffic.

Cost and availability vary widely between different countries and regions, and might not be feasible everywhere.

Examples include modular speed bumps, humps and cushions, refuge islands, bus bulbs, etc.

#### MOUNTABLE ELEMENTS

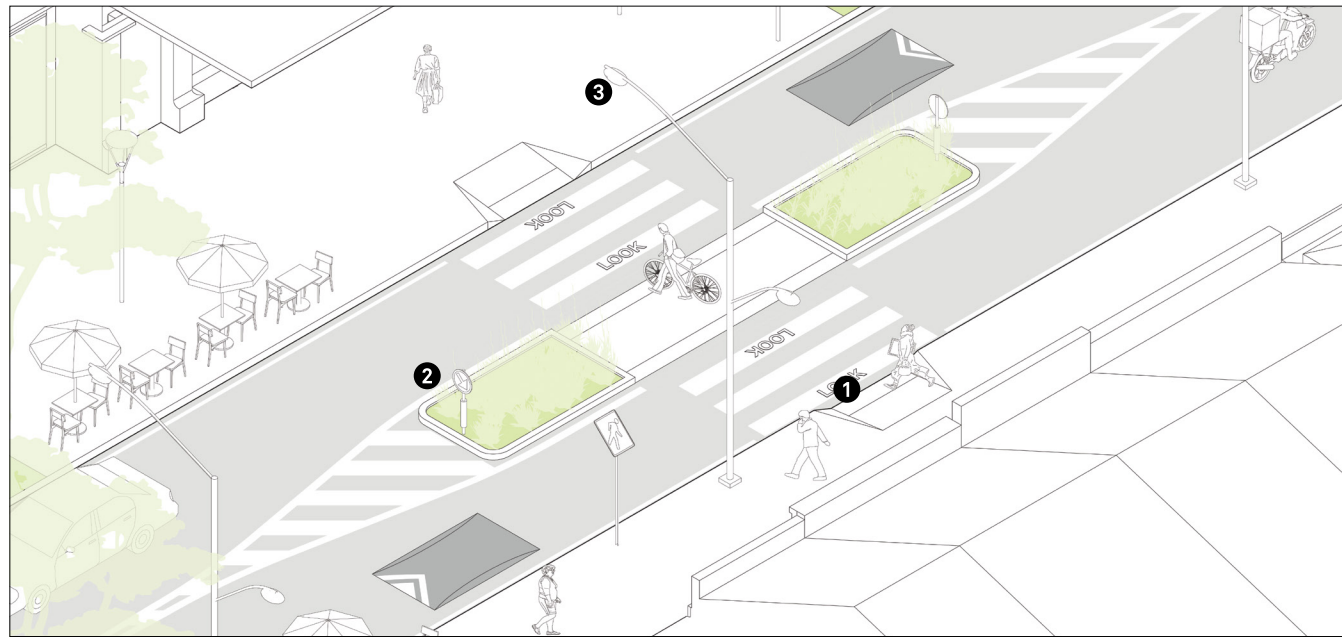
Different elements and materials can be used to create mountable areas for larger vehicles. Examples vary from interim approaches like using speed bumps and signages to create corner wedges, to capital construction elements, like mountable curbs and mountable traffic circles.

## Tool Visibility

Ensuring safe speed tools are clearly visible is important to alert all users of their presence, including under low-visibility conditions such as low light, rain, or fog.

Visibility is also essential when introducing new devices, as routine street users will not expect their presence on familiar routes.

Excessive use of signs and markings can contribute to a car-centric environment and create visual clutter in the streetscape. Signage should be compatible with the target speed and function of the street. Well-planned speed management reduces the need for oversized signs and unnecessary markings.



### Signage and Lighting

#### 1 Markings

Apply road markings upstream and around physical devices to alert motorists of vertical deflection devices or guide them around horizontal geometry ones.

Many cities do not implement lane markings by the curb due to maintenance challenges and redundancy with curbs. Still, those markings can help visually narrow travel lanes and thus reduce speeds.

Consider adding other signage devices such as road studs, rubber curbs, and rumble strips to reinforce markings.

#### 2 Signs

Install appropriate signs to inform and warn drivers about upcoming devices and reinforce visibility.

Use reflective stripes on flexible bollards, planters, and other fixed objects to increase their visibility during low-light conditions.

#### 3 Lighting

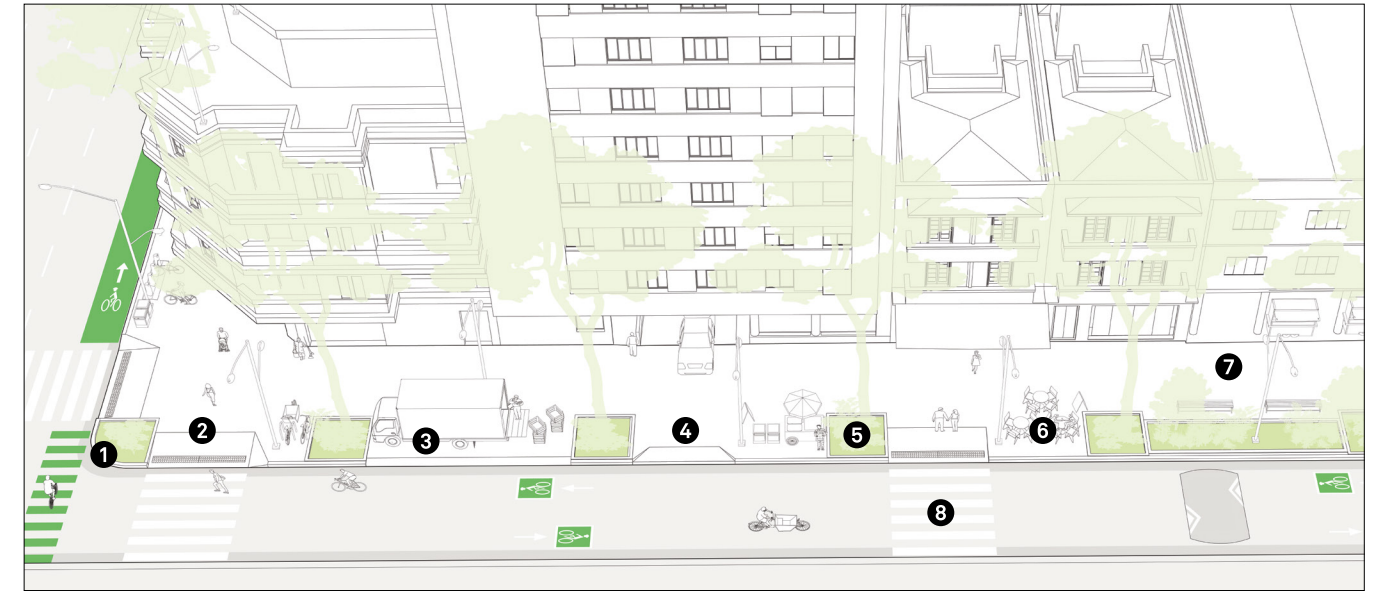
Provide enhanced lighting around tools, particularly at pedestrian crossing points, to improve safety and visibility during nighttime and poor weather conditions.

## Streetside Design

The design of the area adjacent to the roadway can impact driving speeds. A more densely furnished and active streetside highlights other uses, communicating to motorists that they are navigating an environment permeated with other users, and providing perceptual cues that help them self-enforce speeds.

Particular attention should be given to the design of sidewalks—especially the furniture and buffer zones.

Consider repurposing parking lanes to become flexible zones that fulfill multiple functions. That approach leads to a variety of co-benefits and supports streets as people-centered places. *For more information, see Global Street Design Guide 6.3.4.*



### Street Side Elements

#### 1 Corner Radius

Curb extensions reduce corner radii to manage turn speeds.

#### 2 Accessibility Ramps

Curb extensions create enough room to properly accommodate pedestrian ramps.

#### 3 Parking Spots, Loading Zones, and Taxis Stands

Add loading zones and taxis stands to cater to local delivery and service needs.

Ensure there are parking spots reserved for people with disabilities, and metered parking rather than free on-street parking.

#### 4 Driveways

Design driveways with ramps to manage the speeds of vehicles and keep sidewalks continuous.

#### 5 Street Trees and Landscaping

Vegetation can change the character of the street and serve as a buffer between walking and cycle facilities and moving traffic.

Plant trees along travel lanes for safe speeds, ensuring they are placed and maintained so as to not interfere with visibility of pedestrians crossing and signal heads.

Consider aligning trees with parking in constrained rights-of-way.

Choose native trees and prioritize those that provide enough shade for pedestrians and cyclists along the corridor.

#### 6 Street Furniture

Include benches, tables, chairs, light poles, play elements, etc.

### Key Dimensions

#### 7 Pedestrian Clear Path

Sidewalks should provide 1.8–2.4 m wide clear paths for pedestrians in residential settings, and 2.4–4.5 m wide in downtown or commercial areas with heavy pedestrian volume.

#### 8 Crossing Visibility and Daylighting

Remove barriers, including parking, 6–8 m upstream of a pedestrian crossing.

Daylight intersections by removing parking within 6–8 m of the intersection.

# 7.2

## Vertical Deflection Tools

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### 7.2.1 Overview

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### 7.2.2 Sidewalk-level Crossings

---

### 7.2.3 Roadway Humps

---

Vertical deflection tools create level changes to the road bed that require motorists to reduce speeds to navigate them comfortably.

These tools can be tailored to a wide range of target speeds and are applicable for different street types. Design detailing and variations also help address specific requirements for different street users. In particular, vertical deflection tools can support safer crossings for pedestrians and cyclists.

Vertical deflection tools can be combined with other types of speed management tools, such as horizontal geometry tools and signals, for increased efficacy and added co-benefits.

In addition to reducing local speeds, the tools must be intentionally located to achieve benefits in a wider area, for instance, designing the spacing between elements to achieve a comprehensive speed management effect.



## Overview

### Speed Reduction Mechanism

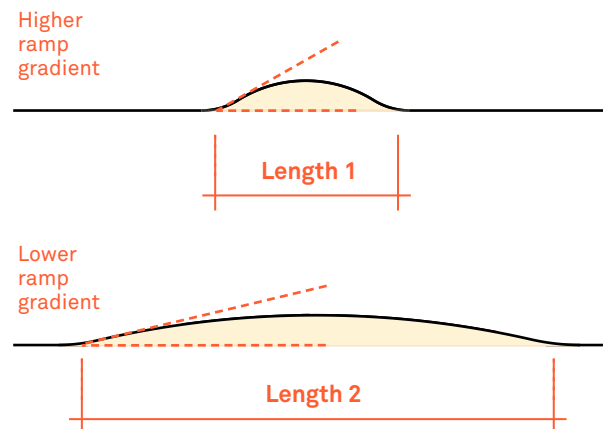
The speed reduction effect from vertical deflection is largely defined by the ramp's profile and its gradient. Steeper gradients are generally associated with lower design speeds.

Ramp profiles also affect speed reduction impact and comfort levels. Consider local resources and the needs of a variety of road users to choose context-appropriate ramp profiles.

#### RAMP GRADIENT

Steeper ramp gradients require motorists to drive at lower speeds to comfortably navigate them. Conversely, ramps with lower inclination allow motorists to navigate at higher speeds.

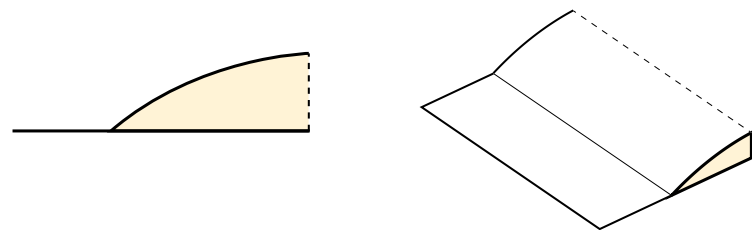
Beyond the target speed, the choice of gradient must consider contextual factors such as fleet characteristics, street grade, and plateau length to work effectively, avoid grounding vehicles, and other safety concerns.



#### RAMP PROFILE

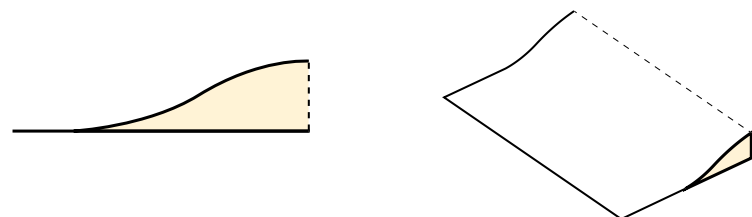
##### Rounded

A rounded profile is the most common form of vertical deflection. It is effective at controlling speed and easy to implement but can create an uncomfortable ride for bus passengers, motorcyclists, and cyclists.



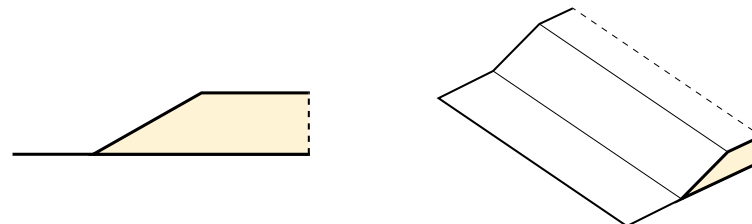
##### Sinusoidal

Sinusoidal is similar to round top but features "feathering" at the leading edges of the ramp, giving a smooth transition between the roadway surface and the hump. This profile is preferred for cyclists, motorcyclists, and bus passengers.



##### Trapezoidal

A trapezoidal profile is commonly used on transit routes as these provide the minimum chance of grounding long vehicles as well as reducing discomfort for passengers.



### Additional Considerations

#### STREET GRADE

Consider the street grade when choosing and designing vertical deflection tools, as it affects element visibility and the risk of vehicle grounding.

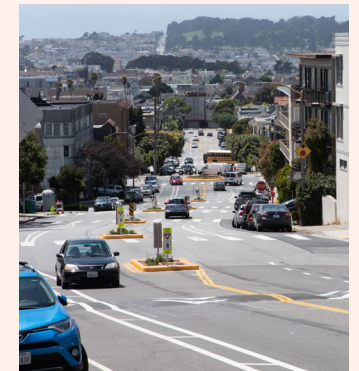
Higher allowable gradients, tailored to the local context, offer practitioners more options when designing streets.

However, allowing vertical deflection elements on streets that are too steep can lead to vehicle grounding, reducing the tool's effectiveness and creating hazardous situations for all users.

#### San Francisco

Even though national-level guidance in the United States sets 8% as the maximum grade in which speed humps can be used<sup>1</sup>, the San Francisco Municipal Transportation Agency (SFMTA) conducted a study to verify less stringent parameters for the city, given its topography and steep streets.

It has found that street steepness up to 12% has little effect on speed humps' effectiveness and comfort levels.<sup>2</sup>



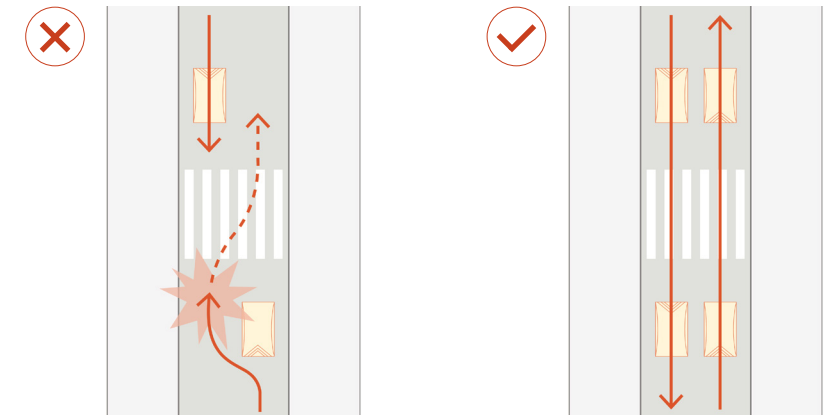
EVIDENCE

#### DIRECTIONALITY

Vertical deflection elements can be used in one- and two-way streets.

When adding vertical deflection elements to undivided two-way streets, ensure the device spans across the road bed and doesn't incentivize motorists to swerve into the other lane to avoid the deflection.

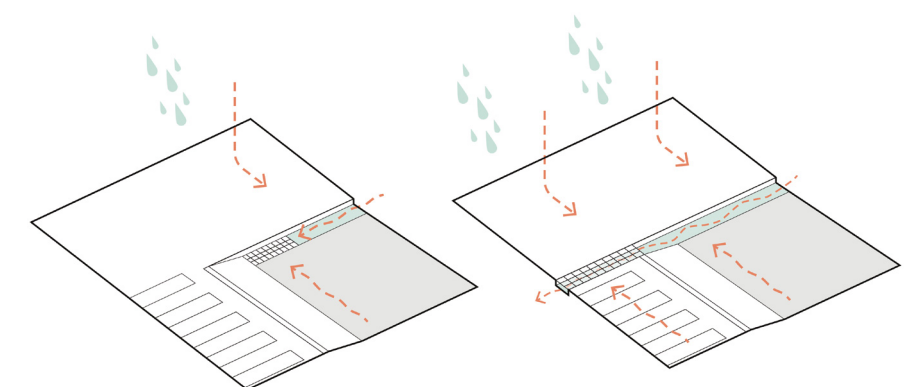
Ensure traffic markings help motorists navigate the tool.



#### STORMWATER MANAGEMENT

Understand the street topography, rain patterns, and the local drainage system to address stormwater management.

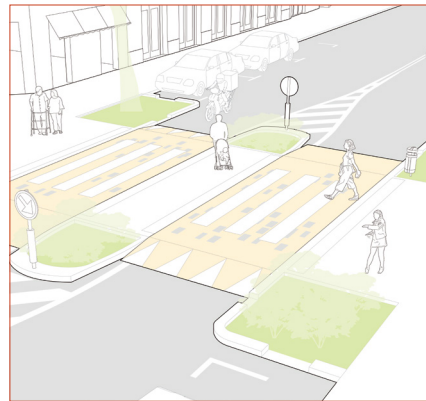
Whenever necessary, add drains upstream of the device to avoid stormwater accumulation. If not possible, add openings to ensure street gutter continuity. Create a continuous surface for pedestrians by adding covers. Those should be removable to allow for cleaning of tree leaves and other debris.



## Vertical Deflection Tools Summary

Vertical deflection tools vary in type and design depending on context, function, and project goals. This spread summarizes the tools covered next in this chapter.

### Sidewalk-level Crossings



#### RAISED CROSSINGS AND PLATEAUS

**Target Speeds** 10–40 km/h

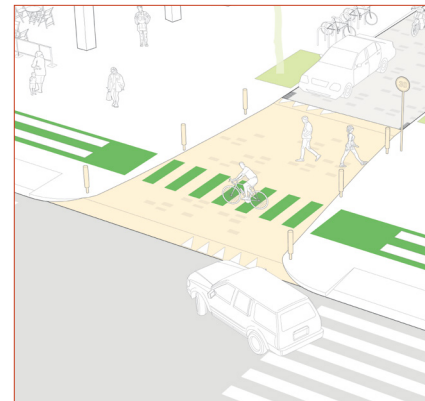
**Traffic Volumes** Low / Mid / High

**Co-benefits** Accessibility, crossing, landscaping

**Placement** Mid-block / Intersection

**Signals** Unsignalized / Signalized

See pages 242–243



#### CONTINUOUS SIDEWALKS

**Target Speeds** Side Street 10–30 km/h, Corridor 10–50 km/h

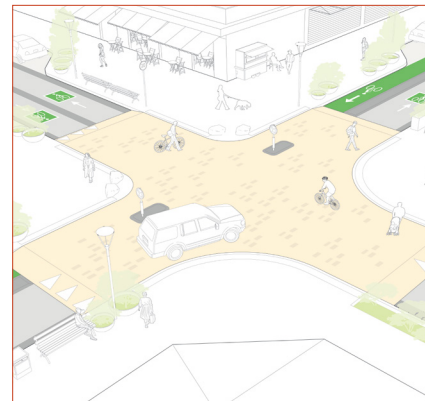
**Traffic Volumes** Low / Mid

**Co-benefits** Accessibility, crossing, landscaping

**Placement** Intersection

**Signals** Unsignalized

See pages 244–245



#### RAISED INTERSECTIONS

**Target Speeds** 10–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Accessibility, crossing, landscaping

**Placement** Intersection

**Signals** Unsignalized / Signalized

See pages 246–247

### Roadway Humps



#### SPEED CUSHIONS

**Target Speeds** 10–40 km/h

**Traffic Volumes** Low / Mid

**Co-benefits** Bus passenger and cyclist comfort

**Placement** Mid-block / Approach

**Signals** Unsignalized

See pages 250–251



#### SPEED HUMPS

**Target Speeds** 10–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** None

**Placement** Mid-block / Approach

**Signals** Unsignalized

See pages 252–253



#### SPEED BUMPS

**Target Speeds** 10–30 km/h

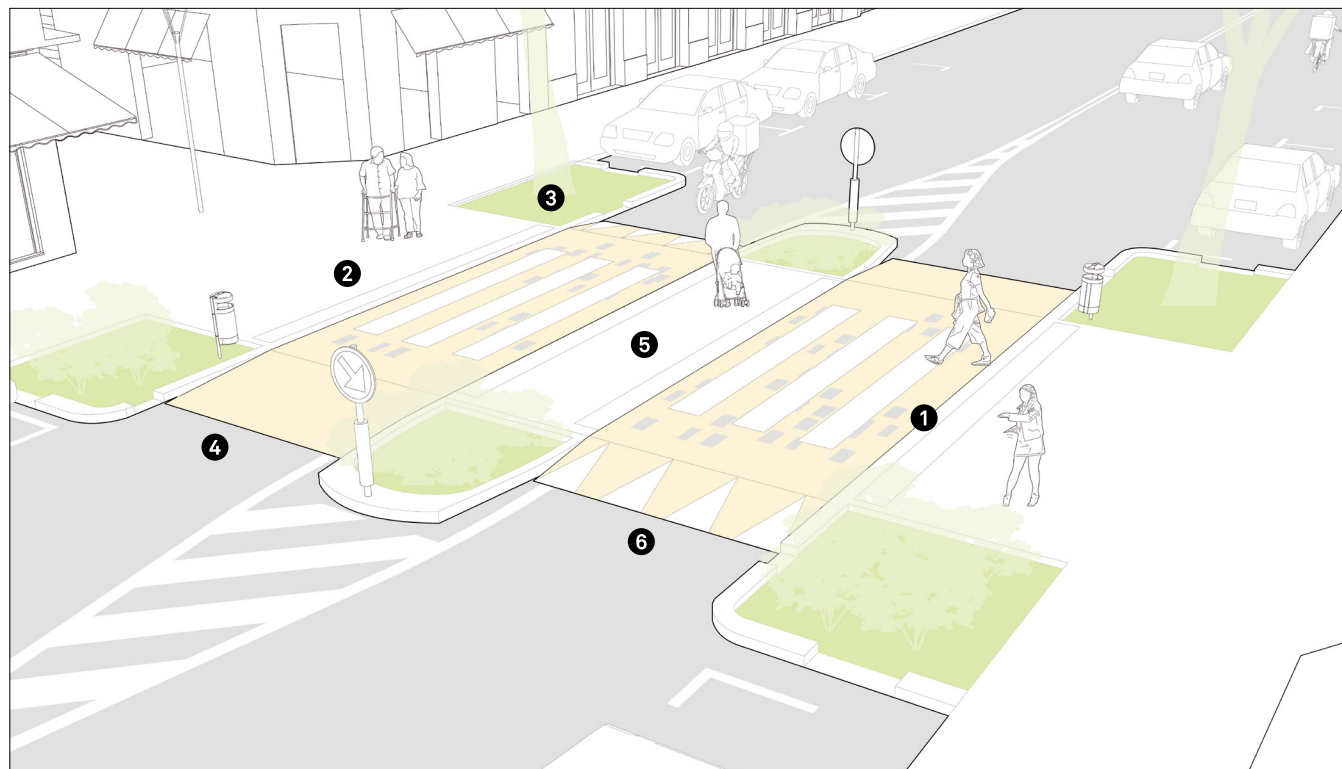
**Traffic Volumes** Low

**Co-benefits** None

**Placement** Mid-block / Approach

**Signals** Unsignalized

See pages 254–255



**Overview**

Raised crossings create safe, comfortable and universally accessible opportunities for pedestrians and cyclists to cross the street, while managing vehicular speeds. It improves safety outcomes and increases yielding rates.

**APPLICABILITY**

**Target Speeds** 10–40 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Accessibility, crossing, landscaping

**Placement** Mid-block / Intersection

**Signals** Unsignalized / Signalized

This tool is applicable where the need for speed reduction overlaps with a crossing desire line.

**Design Guidance**

**CRITICAL**

**1** Ensure level continuity between the flat portion of the tool and the landing areas (sidewalks and medians) to create an universally accessible crossing. Add tactile paving or detectable warning strips to alert visually impaired people.

**2** The flat portion of the raised crossing should be wide enough to accommodate pedestrian and cyclist volumes and all desire lines required.

Ensure the ramp gradient and length are adequate to avoid grounding of larger vehicles. Steeper ramps require a longer length for the flat portion, exceeding the wheelbase length of the design vehicle.

**3** Daylight near the raised crossing to not obstruct the crossing path and to ensure a clear sightline between motorists and pedestrians. Add curb extensions where applicable.

**4** Consider stormwater management needs when adding a new raised crossing.

Add upstream inlets to the raised crossing or create covered channels for continuity of the street gutters.

**5** Add medians or refuge islands where pedestrians have to cross three or more lanes or in narrower streets where speeds and vehicular volumes make single-stage crossings prohibitive or unsafe.

For longer crossings and plateaus, ensure the element is designed so vehicle speeds are never above 30 km/h while motorists navigate it.

**RECOMMENDED**

Prioritize building the raised crossing using the same material as the sidewalks or medians. This will help communicate pedestrian priority to motorists.

**6** Consider sinusoidal ramp profiles to increase cyclists' comfort.

Enhance visibility with dedicated lighting for low-light conditions.

**Key Dimensions**

**Width (w)**

A recommended minimum width of **5 m** should be provided, with an absolute minimum of **4 m**. The width may be increased as required to align with pedestrian volumes and desire lines.

**Length (L)**

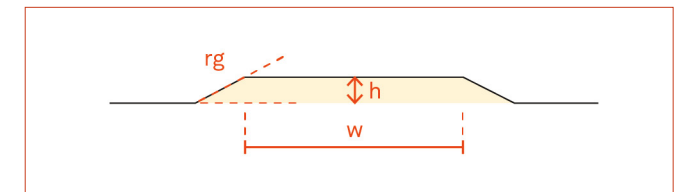
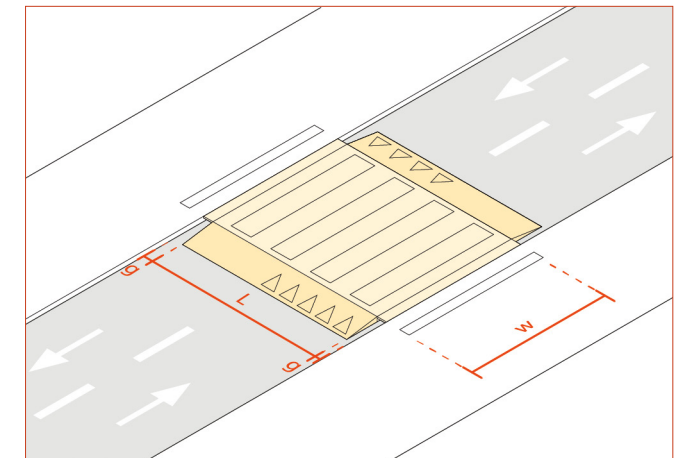
The length should be equal to crossing distance minus the gutter (g), when applicable. The gutter should be covered to provide a continuous, level surface for pedestrians. Implement refuge islands or median in all streets where pedestrians have to cross three or more lanes. For more information, see *Global Street Design Guide Chapters 6.3.6 and 7.3.5*.

**Height (h)**

The raised crossing should be level with the sidewalk at the curb, ensuring a universally accessible, continuous surface for pedestrians.

**Ramp gradient (rg)**

The gradient typically ranges between **1:10–1:25** for target speeds between **20–40 km/h** and suitable for passenger cars. For lower target speeds use gradients close to **1:8**. For high frequency bus routes and target speeds of **30 km/h** or below, use gradients between **1:15–1:20** to reduce passenger discomfort. For one-way streets or two-way streets with pedestrian refuge islands, consider less steep off-ramps of **1:20–1:25** regardless of the target speed.

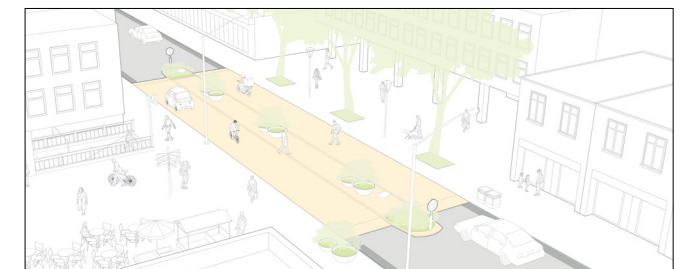


**Placement**

**MID-BLOCK**

Use mid-block raised crossings to create safe crossing opportunities in long urban blocks, where intersection crossings are further than 80 m apart.

Plateaus are raised crossings that extend through a longer stretch. Use this tool where the crossing demand is high and multiple or undefined desire lines are present. Those can be as long as applicable to the local context.



**INTERSECTIONS**

Ensure the crossing is aligned to and as wide as or wider than the sidewalk's clear path.

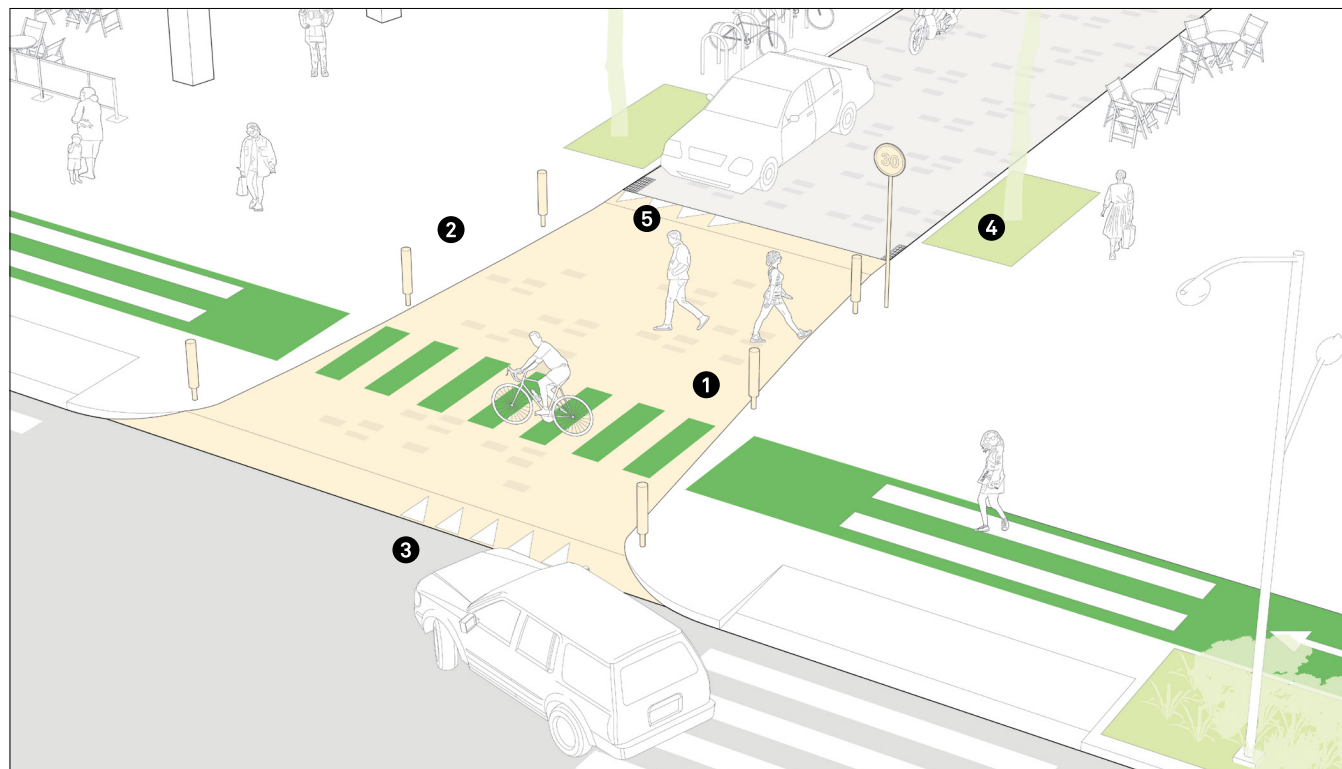
Daylight the intersection by prohibiting parking and adding curb extensions at the corners (if applicable) to improve mutual visibility between motorists and crossing pedestrians.

Raised crossings can be signalized or unsignalized.

Raised crossings, plateaus, and continuous sidewalks operate similarly, but have differences in design approach.



→ Atlanta, USA



**Overview**

Continuous sidewalks are similar to raised crossings, but its materials resemble the street's sidewalks. Those convey clear priority to pedestrians and cyclists moving along a major street and require turning motorists to slow down and yield.

**APPLICABILITY**

**Target Speeds** Side Street 10–30 km/h, Corridor 10–50 km/h

**Traffic Volumes** Low / Mid

**Co-benefits** Accessibility, crossing

**Placement** Intersection

**Signals** Unsignalized

Continuous sidewalks are generally implemented at the intersection between major and minor streets.

Combined with other tools, continuous sidewalks can create a gateway to a slower speed street.

**Design Guidance**

**CRITICAL**

- 1 Ensure level continuity along the continuous sidewalk to create an universally accessible crossing.
- 2 The plateau should be as wide or wider than the walking and cycling facilities.
- 3 The front ramp should have a steep gradient to slow down and raise awareness of turning motorists. It is generally wider than the rear ramp.
- 4 Daylight the continuous sidewalks to keep a free crossing path and to ensure a clear sight line between motorists and pedestrians. Add curb extensions where applicable.
- 5 Consider stormwater management when implementing continuous sidewalks. Ensure continuity for the street gutters, for instance, by adding upstream water inlets or creating covered channels.

**RECOMMENDED**

- Prioritize building the continuous sidewalk using the same or a similar material as the sidewalk and cycle track (when applicable).
- When applicable, ensure continuity for the cycle facility along the main street and over the device.
- Enhance visibility with dedicated lighting for low-light conditions.

**Key Dimensions**

**Width (w)**

A recommended minimum width of **5 m** should be provided, with an absolute minimum of **4 m**. The width may be increased as required to align with existing sidewalk width and desire lines.

**Ramp front length (fr) and rear length (rr)**

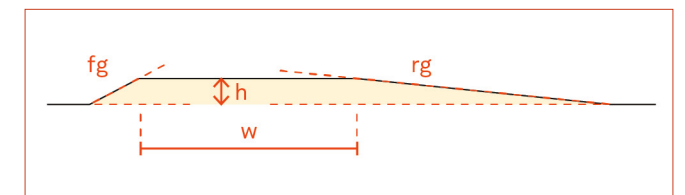
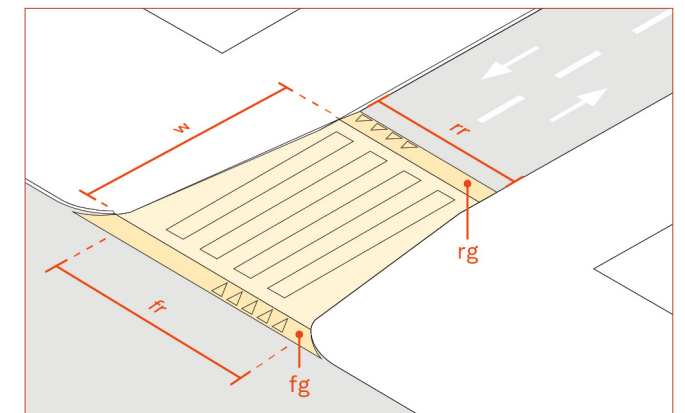
Generally equal to the roadway width. In most cases, the ramp facing the perpendicular street (front ramp, fr) is generally wider than the ramp on the other side of the continuous sidewalk (rear ramp, rr) to accommodate turn movements, depending on the street hierarchy and the design, control and managed vehicles.

**Front ramp gradient (fg)**

In the front, the ramp gradient ranges between **1:5–1:8**.

**Rear ramp gradient (rg)**

On two-way streets and on one-way streets approaching the intersection, the rear ramp gradient should range between **1:8–1:15**. On one-way streets moving away from the intersection, a gentler gradient of **1:15–1:20** may be used.



**Placement**

**INTERSECTION**

Continuous sidewalks are placed at intersections, typically across minor streets or across driveways.

The landing location of both ends of the continuous sidewalk must ensure accessibility for pedestrians (and cyclists when applicable) and be free of obstructions. Those must not disrupt stormwater management systems, fire hydrants, and other utilities.

Meet pedestrian desire lines and do not create significant deflections to the sidewalk clear path.

**GATEWAYS**

Continuous sidewalks are often used as a component of a gateway treatment to communicate to motorists they are entering a street with lower speeds and/or different access rules.

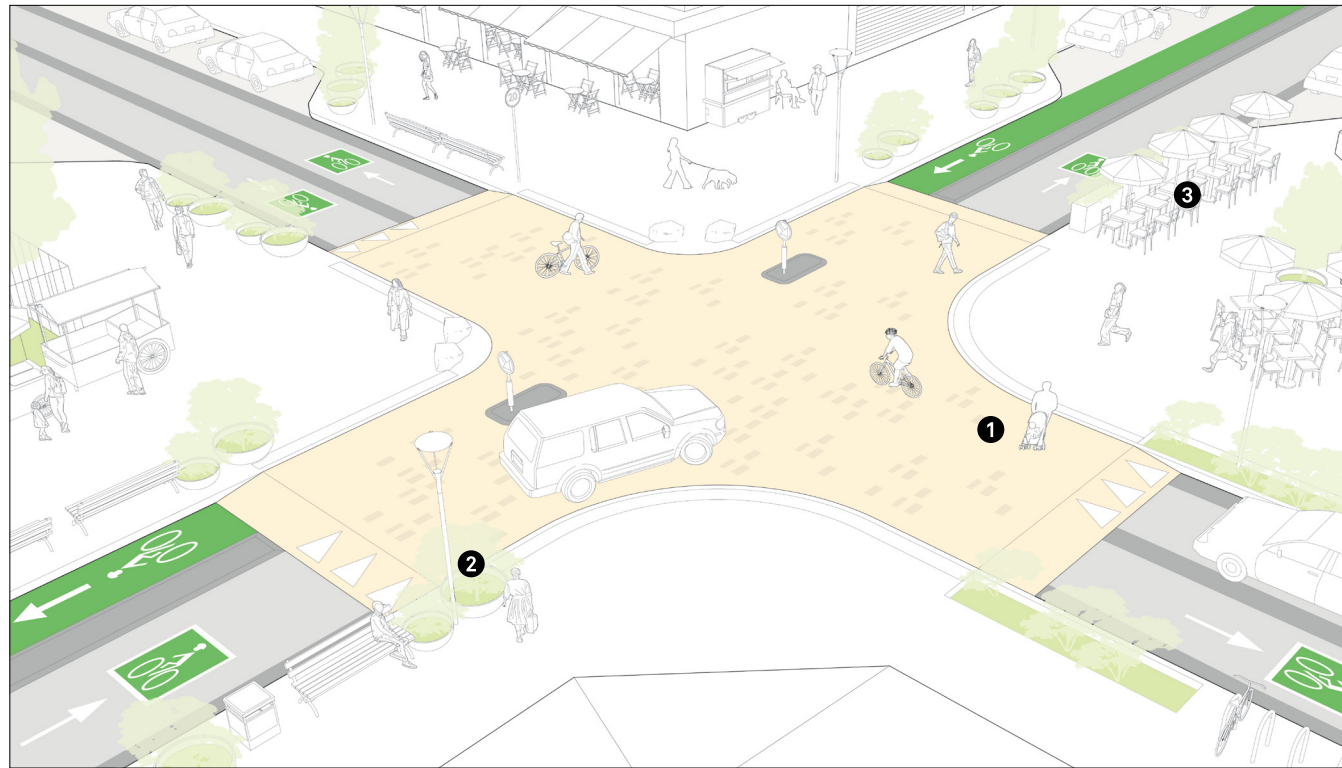
Combine continuous sidewalks with clear signage and other speed management elements to establish an effective gateway.



→ Geneva, Switzerland



→ London, UK



**Overview**

Raised intersections help enforce safe speeds due to their vertical deflection, while communicating pedestrian and cyclist priority to motorists, improving visibility and yielding behavior.

**APPLICABILITY**

**Target Speeds** 10–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Accessibility, crossing, landscaping

**Placement** Intersection

**Signals** Unsignalized / Signalized

Design the raised intersection so that vehicle speeds are never above 30 km/h as motorists navigate the tool.

Raised intersections can be applied both at unsignalized and signalized intersections, offering an opportunity to enhance pedestrian accessibility and safety.

For design speeds of 40 or 50 km/h, adopt less steep ramp gradients and use additional signage to alert motorists.

**Design Guidance**

**CRITICAL**

Ensure the element is designed so that vehicle speeds are never higher than 30 km/h as motorists navigate the raised intersection. If necessary, combine the raised intersection with other tools such as central islands or, as a last resort, automated enforcement.

- 1 Ensure level continuity between the flat portion of the tool and the surrounding sidewalks to create an universally accessible crossing. Add tactile paving or detectable warning strips to alert visually impaired people.
- 2 The plateau must cover the entire intersection and extend through the approaches. Strive to accommodate all pedestrian desire lines.
- 3 Daylight the intersection to not obstruct the crossing path and to ensure clear sightlines between motorists and pedestrians. Add curb extensions where applicable.

Build raised intersections with high resistance materials, especially if a large amount of heavy vehicles is expected.

Add proper lighting to ensure visibility of the most vulnerable users in all weather conditions.

Consider stormwater management when implementing raised intersections. Ensure continuity for the street gutters, for instance, by adding upstream water inlets or creating covered channels.

**RECOMMENDED**

Use sinusoidal ramp profiles to increase comfort for cyclists.

If possible, use the same or a similar material used in the sidewalk to better convey pedestrian priority. Ensure contrasting colors or edges for people with vision impairment.

**Key Dimensions**

**Approach length (L)**

The approach length should be equal or wider than the sidewalk width. Longer approaches allow motorists to better yield to crossing pedestrians.

**Approach width (w)**

The width should be equal to the roadway width.

**Ramp gradient (rg)**

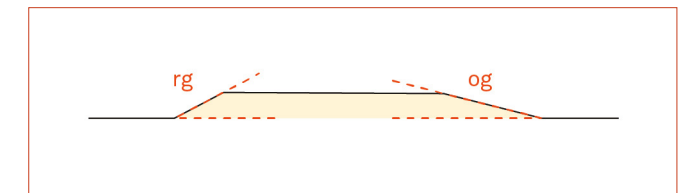
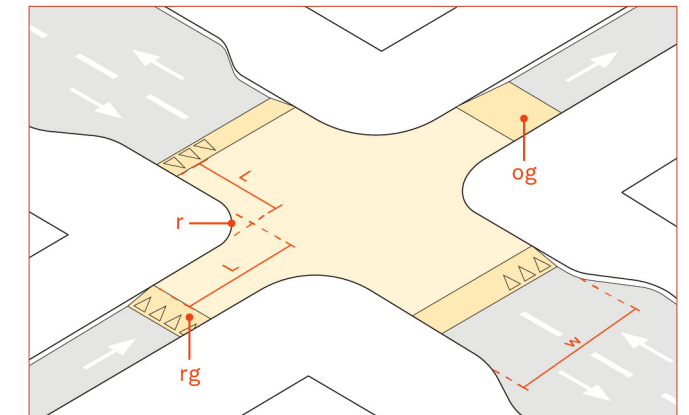
The gradient typically ranges between **1:10–1:25** for target speeds between **20–40 km/h** and suitable for passenger cars. For high frequency bus routes and target speeds of **30 km/h** or below, use gradients between **1:15–1:20** to reduce passenger discomfort.

**Off-ramp gradient (og)**

For one-way streets or two way streets with pedestrian refuge islands, consider less steep off-ramps of **1:20–1:25**.

**Corner radius (r)**

Corner radii should be as small as possible for the specific intersection configuration. For more information, see 7.3.2 Rightsized Corner Radius.



**Variations**

**SIGNALIZED RAISED INTERSECTIONS**

Though more common in speeds 30 km/h or lower, raised intersections can also be applied to higher speed signalized intersections.

Assign pedestrian leading intervals and short signal cycles, especially where traffic volumes are higher, to ensure opportunities for crossing without long wait times.

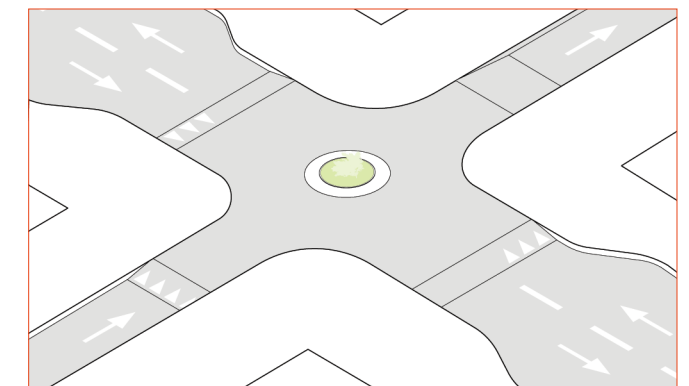


→ Córdoba, Argentina

**RAISED MINI ROUNDABOUT**

Intersections with mini roundabouts can be raised, combining vertical and horizontal deflection, further increasing its speed management effectiveness.

Ensure pedestrians and cyclists can cross at all legs and, in streets with lower target speeds and traffic volume, share the road bed with motorists.





### Plateaus

**Material** Stone

**Location** Lisbon, Portugal

Plateaus are applicable at locations with high crossing demand where desire lines are multiple. Apply plateaus through a long stretch of street.



### Cyclists and Pedestrian Crossings

**Material** Concrete

**Location** Lima, Peru

Raised crossings can include safe facilities for cyclists, along with pedestrians. Clearly mark each user's crossings to guide navigation of all users.



### Raised Crossing on Street with Median

**Material** Asphalt

**Location** Kisumu, Kenya

In two-way streets with medians, raised crossings cross the whole span between sidewalks.

Ensure there are no height difference between the raised crossing and the median, to avoid tripping hazards.



### Plateau with Pavement Change

**Material** Stone tiles

**Location** Milan, Italy

Changing the pavement material at the plateau helps better convey priority for pedestrians along the element.



### Continuous Sidewalk on Two-way Street

**Material** Granite

**Location** London, United Kingdom

Continuous sidewalks can be implemented at the intersection of two-way streets and larger corridors, provided the ramp is wide enough to accommodate both turning movements.

The ramp length, however, doesn't have to accommodate two vehicles side-by-side simultaneously, which would result in a wide curb cut. Instead, establish which movement has priority, with vehicles exiting the minor street and entering the major corridor usually having to yield.

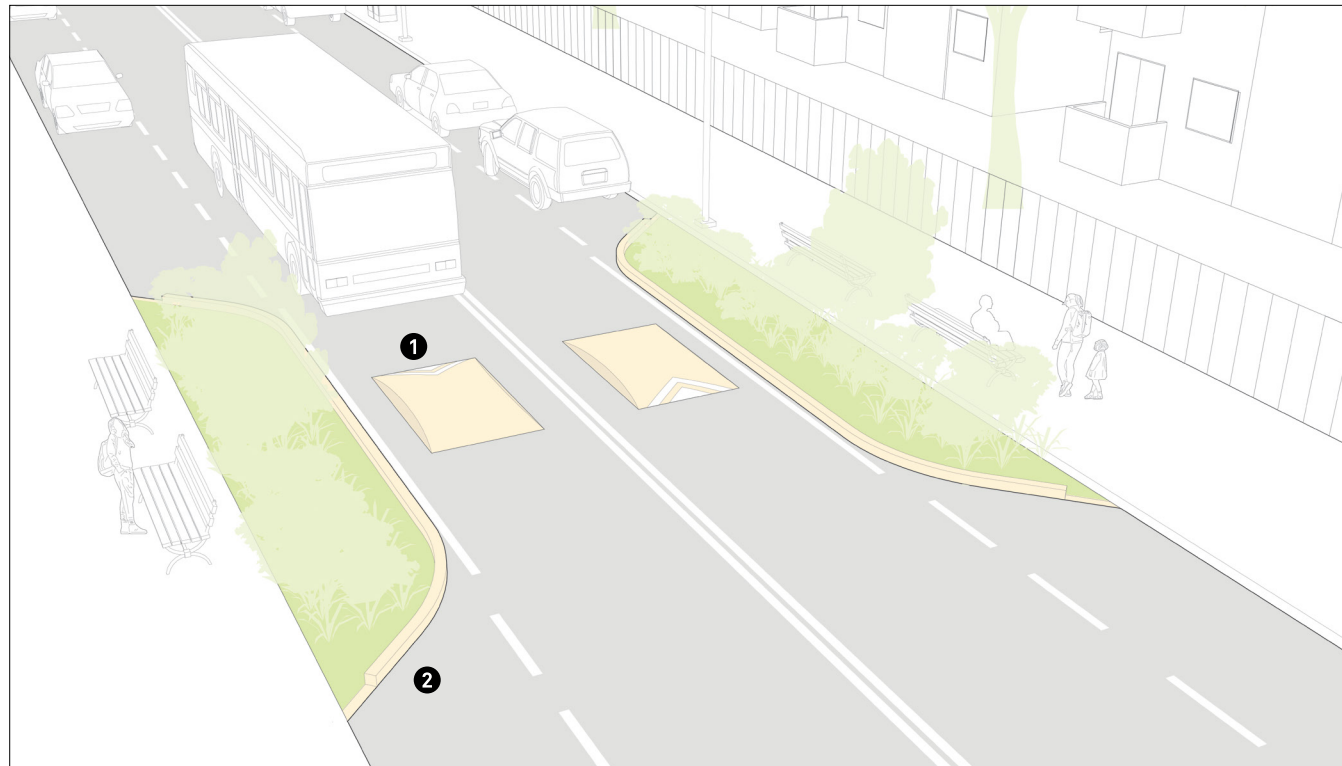


### Concrete Raised Crossings

**Material** Concrete

**Location** Pune, India

Concrete (pavers or poured on-site) can be effectively used to build raised crossings. Rely on local construction practices to adapt safe speed tools to the local context.



**Overview**

Speed cushions are similar to speed humps, but have wheel cut-out openings to allow large vehicles like buses to pass unaffected, to increase passenger comfort while reducing car speeds.

**APPLICABILITY**

**Target Speeds** 10-40 km/h

**Traffic Volumes** Low / Mid

**Co-benefits** Bus passenger comfort

**Placement** Mid-block / Approach

**Signals** Unsignalized

Speed cushions are well-suited for bus and emergency service routes, particularly for ambulances.

Additional applications include vehicle path guiding to support cycle bypasses in narrow spaces.

**Design Guidance**

**CRITICAL**

Ensure that the position and width of the cushions and the gaps make them effective in reducing the speeds of the managed vehicle. For instance, if they are designed to slow down passenger vehicles, this comprises small cars to SUVs.

**1** Conversely, consider the track width of ambulances, fire trucks, buses, and other vehicles that should be less affected by the deflection element. Design the speed cushions' position, dimensions, and gap accordingly.

When providing bypasses for cyclists, ensure there are separators before the speed cushion to impede motorists from diverting into the bypass to avoid the speed cushion.

Speed cushions generally do not pose issues to stormwater management.

**RECOMMENDED**

Wider speed cushions can be used where it is required to slow larger vehicles.

**2** Combine speed cushions with horizontal geometry tools to increase its efficacy for all motorists, including those in larger vehicles and motorcyclists.



→ Annecy, France

**Key Dimensions**

**Base width (bw)**

The base width ranges between **1.70 m–2.0 m** depending on the managed and control vehicles, and **1.80 m** minimum recommended for bus routes and large vehicle with double rear wheels. Narrower speed cushions of **1.60 m** can be used when the design vehicle is an ambulance (e.g. near hospitals) or a minibus.

**Flat top width (tw)**

The top width typically ranges between **1.10 m–1.30 m** and depends on the base width, the cushion height, and the ramp gradients.

**Base length (L)**

The length ranges between **3.0–4.0 m**, and depends on height and gradient dimensions.

**Height (h)**

The height should range between **6–10 cm**, with **7 cm** as the recommended height.

**On/off-ramp gradient (rg)**

Ranges between 1:8 - 1:10 for flat top speed cushions.

**Side ramp gradient (sg)**

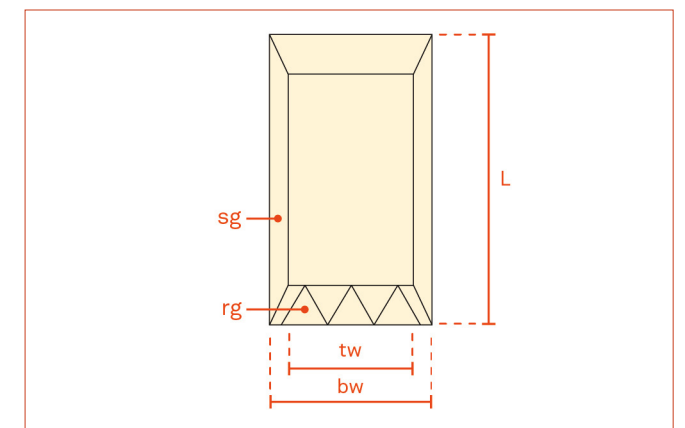
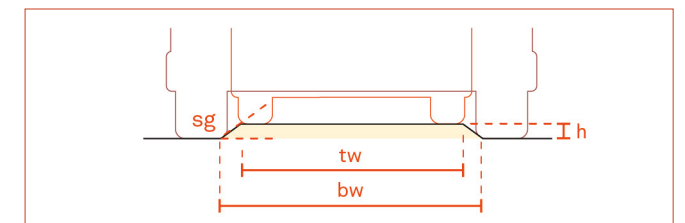
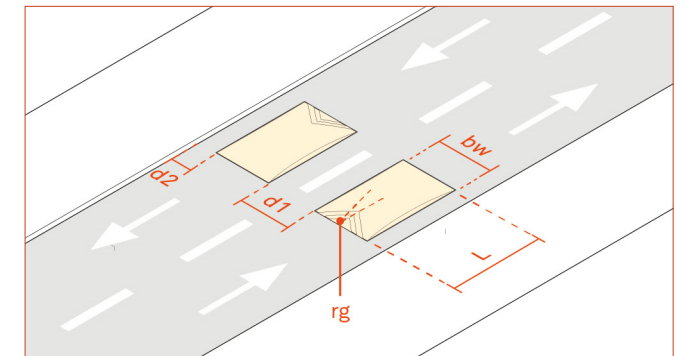
The gradient of the sides should range between **1:4–1:6** for flat top speed cushions.

**Spacing distance (d1)**

In two-way streets, it ranges between **1.0 m–1.2 m**. In streets where large buses are present no less than 1.0 m.

**Distance from curb (d2)**

In two-way streets, it ranges between **0.70 m–1 m** (can be 0.50 m narrower in two way streets below 6 m with low volumes). Consider providing bypasses for cyclists instead of providing a larger distance from the curb to keep travel lane dimensions within the safe width. *For more information, see 5.1.1 5 Lane Widths.*



**Placement**

**VEHICLE PATH GUIDING**

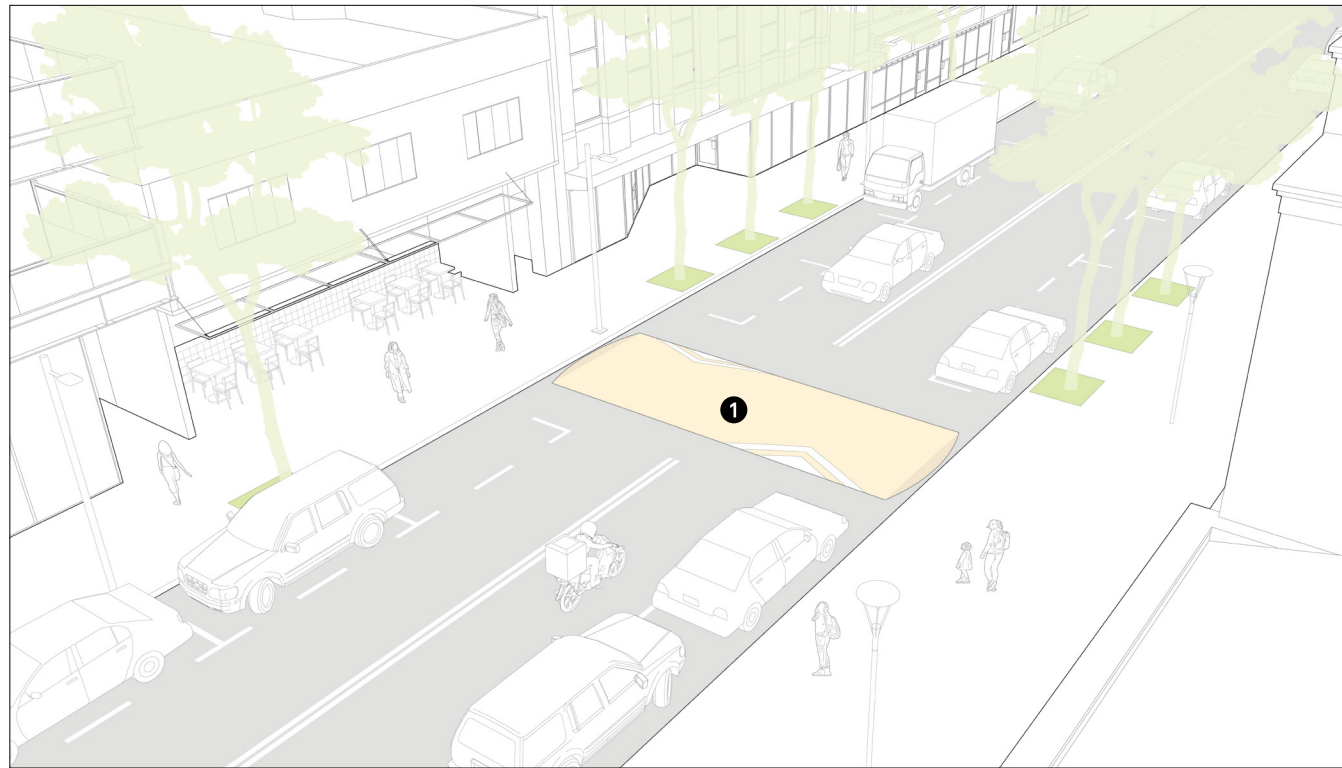
Speed cushions can be used to nudge motorists to follow a certain trajectory, with the most comfortable way to traverse it is to follow the centerline of the cushion.

Combined with the vertical deflection effect, vehicle path guiding can be used to ensure lateral distance from other users, like cyclists, or support clearance from specific objects.

**PLACEMENT**

Speed cushions can be placed at mid-block or at the approach of an intersection, but away from pedestrian desire lines.

They can be placed upstream of marked pedestrian crossings to increase yielding from motorists. *For more information, see Global Street Design Guide Chapter 6.*



**Overview**

Speed humps are an effective and versatile vertical deflection tool. They can be built using a wide range of materials and be placed at almost any mid-block location. However, this tool brings no added benefits to the street other than speed reduction.

**APPLICABILITY**

**Target Speeds** 10–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** None

**Placement** Mid-block / Approach

**Signals** Unsignalized

For speeds between 40–50 km/h adopt less steep ramp gradients and use additional signage to alert drivers upstream of the device.

**Design Guidance**

**CRITICAL**

Adopt device spacing and ramp gradients compatible with the target speed. Streets with lower target speeds require steeper gradients. Speed humps can be designed so that they only cause discomfort for motorists exceeding the target speed.

1 Use markings, signs, and lighting to ensure device awareness and visibility for all users.

Leave a gap between the speed hump and the curb.

Side ramps help ensure the speed hump does not obstruct surface drainage along the curb. It also makes the side edges more sturdy and less hazardous for various users.

**RECOMMENDED**

Adapt the type of ramp profile depending on local resources and mix of street users.

On streets with frequent bus service, consider adopting speed cushions to increase passengers' comfort. However, evaluate the tradeoffs if motorcyclists are a frequent user as they can easily avoid such devices.

Consider providing a bypass for cyclists. If not possible, use sinusoidal ramp profiles to better accommodate those going through the device.

Speed humps bring limited co-benefits to the street. Consider adopting raised crossings to increase the street's permeability and accessibility for pedestrians.

**Key Dimensions**

**Length (L)**

The length typically ranges between **3–5 m**. For sinusoidal speed humps of **12 cm of height**, at **20 km/h** target speed, the length is generally **3–3.5 m**, while at **30 km/h** target speed, the length is **4.5–5 m**.

**Height (h)**

The height ranges between **7.5–12 cm**. For sinusoidal and flat top speed hump the recommended height is **12 cm**. For roundtop and dome speed hump the recommended height is **10 cm**.

**Width (w)**

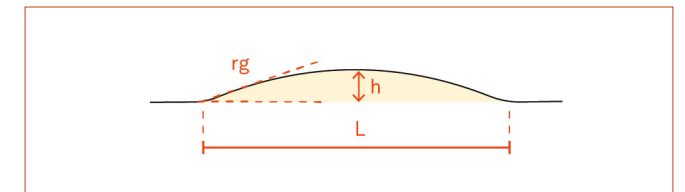
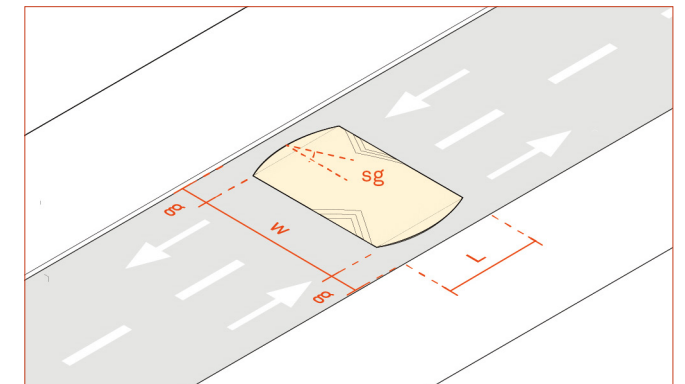
The width is as wide as the roadbed, minus gutter offset (when applicable).

**Gutter offset (g)**

The offset is typically between **0.50–1.00 m** depending on the dimension of the gutter. The offset should be wide enough not to interfere with surface drainage and to allow for a cyclist to bypass the speed hump. Avoid too wide offsets that may encourage motorcyclists to bypass the device where motorcycle use is high.

**Ramp gradient (rg)**

The gradient typically ranges between **1:10–1:20** for target speeds between **20–40 km/h** and suitable for passenger cars. For bus routes and target speeds of **30 km/h or below**, use gradients between **1:15–1:20** to reduce passenger discomfort. For high frequency bus routes consider the use of speed cushions.



**Side ramp gradient (sg)**

The gradient of the side ramps should not be steeper than **1:6**. Unless the speed hump stretches from curb to curb, do not use vertical walls at the edges of the device. The side ramp increases construction sturdiness and avoids creating tripping hazards or damaging vehicle wheels.

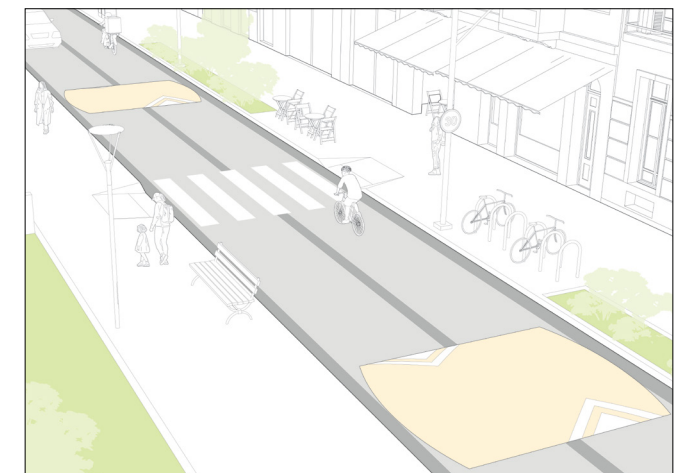
**Placement**

**MID-BLOCK**

Whenever implementing raised crossings is not feasible, distance speed humps 5-10 m from any pedestrian or cyclist marked crossing to ensure motorists slow down and create opportunities for people to cross the street. *For more information, see Global Street Design Guide 6.3.5.*

Avoid placing speed humps where crossing demand is high as they can become tripping hazards for pedestrians. Instead, try to ensure the desire line is met with adequate infrastructure, such as a raised crossing.

Do not place speed humps within the perpendicular projection of driveways, pedestrian ramps, or access points.



→ Example of a traffic-calmed pedestrian crossing



**Overview**

Speed bumps have sharper ramp gradients than speed humps, and require motorists to further reduce speed to go over them. They are usually more affordable and require less space to be implemented than other vertical deflection tools.

**APPLICABILITY**

Target Speeds 10–30 km/h

Traffic Volumes Low

Co-benefits None

Placement Mid-block / Approach

Signals Unsignalized

This tool is compatible with low traffic environments where target speeds are below 30 km/h.

**Design Guidance**

**CRITICAL**

1 Speed bumps must be highly visible and contrast with the pavement, especially because they can be trip hazards for pedestrians, cyclists, and motorcyclists.

Ensure clearance from gutter drains not to interfere with stormwater management.

**RECOMMENDED**

Speed bumps should be set back 5–10 m from crossings. When placed before a crossing, a series of speed humps can improve yielding behavior.

Due to their sharper gradient, speed bumps are harder for cyclists to navigate. Consider adding central or lateral bypasses.

In contexts where motorcyclists are frequent, consider alternative or additional measures to manage their speed.

Speed bumps can be built using a wide variety of materials, including prefabricated ones, making them usually easier to implement and adjust. However, the choice of material must consider the street surface and pavement, and local available resources.

**Key Dimensions**

**Length (L)**

The length ranges between **0.25–0.95 m**. Typically modular rubber speed humps tend to be **~0.50 m** for **30 km/h** target speeds.

**Height (h)**

The height ranges between **3–10 cm**. Typically **5 cm** for **30 km/h**, **7 cm** for **15 km/h**, and **10 cm** for **10 km/h** target speeds.

**Width (w)**

The width should be as wide as the roadbed, minus gutter offset (when applicable).

**Gutter offset (g)**

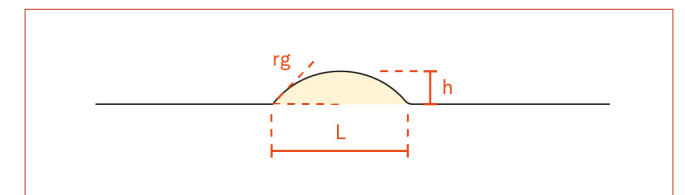
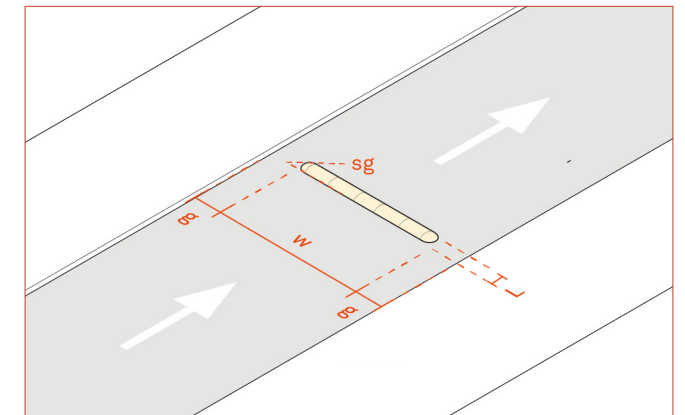
The offset is typically between **0.50–1.00 m** depending on the dimension of the gutter. The offset should be wide enough not to interfere with surface drainage and to allow for a cyclist to bypass the speed hump. Avoid too wide offsets that may encourage motorcyclists to bypass the device where motorcycle use is high.

**Ramp gradient (rg)**

The gradient typically ranges between **1:3–1:8** for target speeds between **10–30 km/h**.

**Side ramp gradient (sg)**

The gradient of the side ramps **should not be steeper than 1:6**. Unless the speed hump stretches from curb to curb, do not use vertical walls at the edges of the device. The side ramp increases construction sturdiness and avoids creating tripping hazards or damaging vehicle wheels.



**Variations**

**CYCLE STREETS**

On cycle streets, where cyclists have priority over motorists, speed bumps with a cyclists bypass ensure safe driving speeds while promoting a comfortable ride.

**DRIVEWAYS**

Speed bumps can be placed in driveways and small alleys with poor visibility to ensure entering and exiting motorists approach the intersection with safe speeds, which will also help increase yielding behavior.

Do not place speed bumps in pedestrian desire lines, especially aligned with the sidewalk clear path.

If the driveway or alleyway has significant pedestrian movement, use other tools as speed bumps might pose trip hazards.



→ London, UK.



### Speed Humps on Arterial Streets

**Material** Concrete

**Location** Bogotá, Colombia

As a part of the city's strategy to reduce traffic deaths and injuries, Bogotá has implemented nearly 80 speed humps on arterial streets: 10 in Avenida Guayacanes, 6 in Avenida Villavicencio, 8 in Circunvalar, and 53 in Avenida Boyacá.

These speed humps are designed to align with the target speed of 50 km/h, featuring an adequate ramp gradient and a height of 9 cm—less steep than humps designed for 30 km/h, for example. They are also installed in sequence, with spacing ranging from 300 to 400 meters, preventing motorists from accelerating between them and exceeding the target speed.

In Avenida Guayacanes, the first to receive the speed humps, the intervention resulted in a sharp reduction in speeding: while over 60% of the drivers drove above the 50 km/h speed limit before the implementation, with motorcyclists reaching 70% of noncompliance; after the implementation only around 2% of all motorists are noncompliant.<sup>3</sup>

This also resulted in a sharp decrease in traffic deaths and injuries, with Avenida Boyacá seeing the biggest reduction.<sup>4</sup>



### Traffic-calmed Pedestrian Crossing

**Material** Concrete

**Location** Lusaka, Zambia

Speed humps upstream of marked crossings increase yielding for people crossing.



### Speed Bump with Sidewalk Extension

**Material** Modular rubber

**Location** Quito, Ecuador

Narrower lanes help enforce target speed and increase the efficiency of speed bumps.

This combination also increases safety and comfort for pedestrians, creating additional co-benefits to a street with elements that ensure lower speeds.



### Modular Speed Cushions on a Two-way Street

**Material** Modular rubber

**Location** France

Speed cushions can be built using modular materials for a faster implementation and benefits in the short-term.

This variation can also be helpful to test and introduce speed cushions where they are not commonly used.

# 7.3

## Horizontal Geometry Tools

7.3.1 Overview

7.3.2 Rightsized Corner Radii

7.3.3 Pinchpoints

7.3.4 Chicanes and Lane Shifts

7.3.5 Central Islands

Horizontal geometry tools redesign the road bed and curb and uses several strategies such as creating horizontal deflection for motorists, increasing the perception of enclosure, and guiding turning movements. Motorists slow down to comfortably navigate the device or to negotiate passage with other road users. An array of options, with varied applicability, will help achieve safe speeds.

Since these tools change the roadway edge, they create opportunities to reallocate space and bring co-benefits including shorter pedestrian crossings, added green and blue infrastructure, landscaping, seating areas, play areas, cycle parking, and many other options.

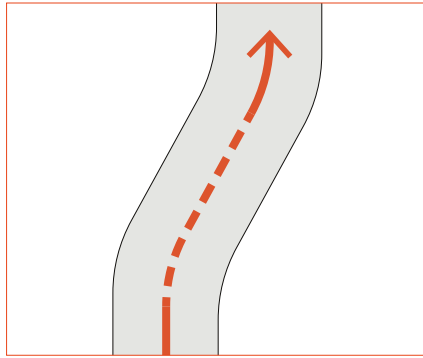


→ London, UK

### Speed Reduction Mechanisms

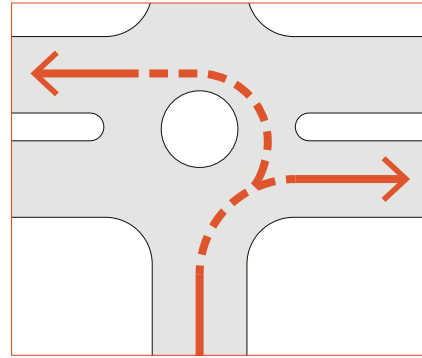
Horizontal geometry tools comprise a wide range of variations. In common, their speed reduction effect is caused by three basic mechanisms described below.

One individual tool may combine different mechanisms. The sharper the deflection needed to navigate the device, the bigger impact it has on reducing speed.



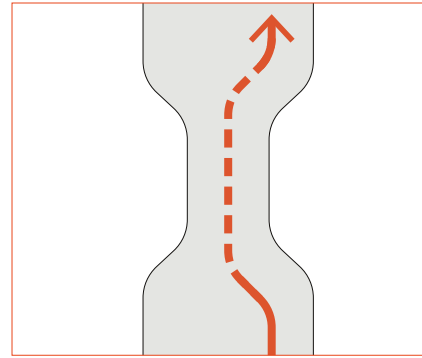
#### LATERAL SHIFT

Bending roadway edges requires motorists to shift the vehicle's path laterally. Motorists need to reduce speeds to navigate the device comfortably.



#### TURN GUIDING

Changes to intersection geometry reduce the effective turn radius of different vehicular movements. It impedes large radius movement and fast turns.



#### PINCHPOINT

A momentary narrowing of the roadway produces the pinchpoint effect. That increases the visual friction with the sides of the roadway or while passing by other road users, causing a reduction in speed.

### Horizontal Deflection Features



#### CURB EXTENSIONS

Curb extensions or bulb-outs change the alignment of the curb and extend the sidewalk space. They can be implemented using physical curbs or interim materials, such as markings, bollards, and planters.



#### CURB ISLANDS

Pedestrian refuge islands, corner refuge islands, median, median tips and central islands are examples of curb islands. They create physical barriers in the road bed that require road users to avoid them. Similarly, curb islands can also be built using interim materials.



#### MOUNTABLE ELEMENTS

Mountable elements, such as aprons and corner wedges, help manage the speed of vehicles of different sizes. They use traversable yet uncomfortable pavement surfaces (usually by the lane's edge) to define a more constrained geometry for smaller vehicles while allowing larger vehicles to go over them at low speeds.

### Additional Considerations

#### FEATURE EDGES

Avoid curb extensions and islands with sharp corners and edges. Favor rounded corners for increased durability and to avoid hazards to all users, particularly pedestrians, cyclists, and motorcyclists.

#### TOOL COMBINATION

Increase tool impact on speeds by combining horizontal and vertical deflection strategies.

#### VISIBILITY

Horizontal geometry tools might not be expected by motorists. The key strategy to prevent vehicles from colliding with these elements is to reduce speeds systematically, with a focus on keeping regularly and closely spaced measures.

Adding edge markings, vertical devices with reflective striping, and improved lighting can enhance visibility in low-light conditions.

#### STORMWATER MANAGEMENT

Analyze the street topography, rain patterns, and the local drainage system to address stormwater management.

When necessary, install drains upstream of the device to prevent stormwater accumulation. If this is not feasible, incorporate openings to maintain street gutter continuity.

Some horizontal deflection elements, such as chicanes and pinchpoints, create an opportunity to add green infrastructure, such as bioswales. *For more information, see Global Street Design Guide 7.2.*



→ France



→ Istanbul, Türkiye

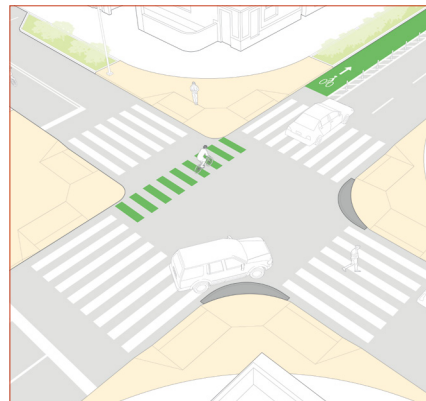


→ Fortaleza, Brazil

## Horizontal Geometry Tools Summary

Horizontal geometry tools vary in type and design depending on context, function, and project goals. This and the next spreads summarize the tools covered in this chapter.

### Rightsized Corner Radii



#### CORNER ALIGNMENT

Target Turn Speeds 10–15 km/h

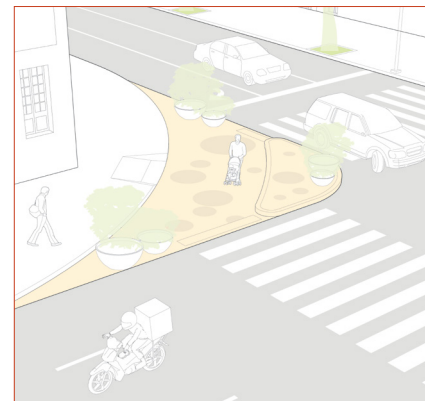
Traffic Volumes Low / Mid / High

Co-benefits Accessibility, crossing distances, landscaping

Placement Intersection

Signals Unsignalized / Signalized

See pages 266–267



#### SLIP LANE REMOVAL

Target Turn Speeds 10–15 km/h

Traffic Volumes Low / Mid / High

Co-benefits Accessibility, crossing, landscaping

Placement Intersection

Signals Unsignalized / Signalized

See page 268



#### CORNER REFUGE ISLAND

Target Speeds 30–50 km/h

Traffic Volumes Mid / High

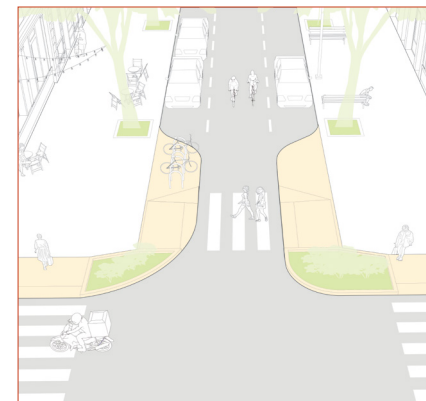
Co-benefits Cyclist safety

Placement Intersection

Signals Unsignalized / Signalized

See page 269

### Pinchpoints



#### CORNER BULB-OUT

Target Turn Speeds 10–15 km/h

Traffic Volumes Low / Mid / High

Co-benefits Shorter crossings, public space enhancement

Placement Approach / Intersection

Signals Unsignalized / Signalized

See pages 272–273



#### YIELD PINCHPOINT

Target Speeds 10–30 km/h

Traffic Volumes Low / Mid

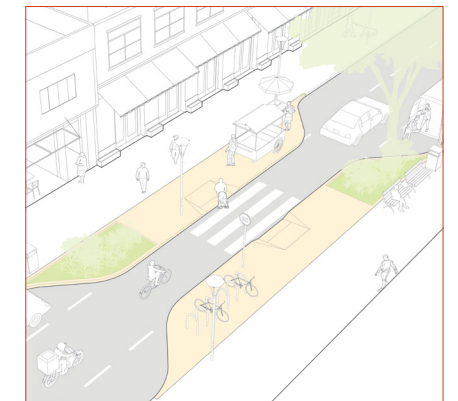
Co-benefits Shorter crossings, landscaping, volume management

Placement Mid-block

Signals Unsignalized / Signalized

Multilane No

See pages 274–275



#### MID-BLOCK PINCHPOINT

Target Speeds 10–50 km/h

Traffic Volumes Low / Mid / High

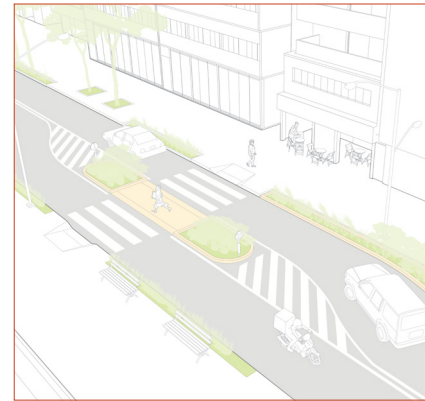
Co-benefits Shorter crossings, public space enhancement

Placement Mid-block

Signals Unsignalized / Signalized

See pages 276–277

Chicanes and Lane Shifts



**ONE-WAY CHICANE**

Target Speeds 10–40 km/h

Traffic Volumes Low / Mid

Co-benefits Public space enhancement

Placement Mid-block / Approach

Signals Unsignalized

Multilane No

See pages 280–281

**TWO-WAY CHICANE**

Target Speeds 10–50 km/h

Traffic Volumes Low / Mid / High

Co-benefits Public space enhancement, added crossings

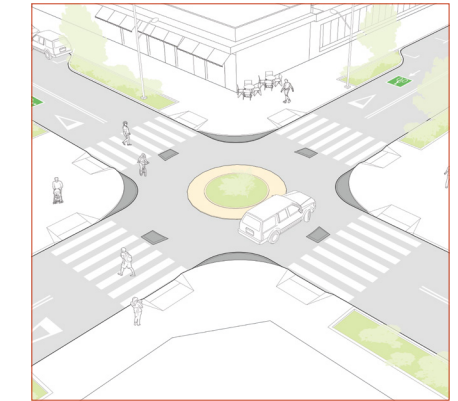
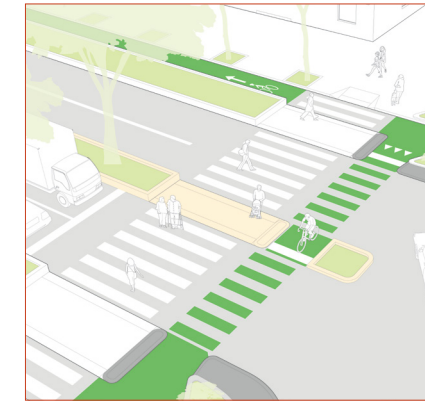
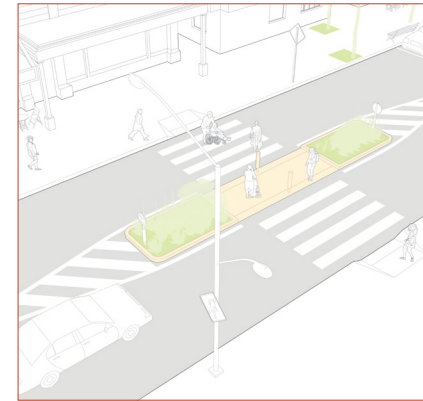
Placement Mid-block / Approach

Signals Unsignalized / Signalized

Multilane No

See pages 282–283

Central Islands



**MID-BLOCK PEDESTRIAN REFUGE ISLAND**

Target Speeds 20–50 km/h

Traffic Volumes Low / Mid / High

Co-benefits Landscaping, protected pedestrian and cyclist crossing

Placement Mid-block / Approach

Signals Unsignalized / Signalized

Multilane Yes

See pages 286–287

**INTERSECTION REFUGE ISLANDS AND MEDIANS**

Target Turn Speeds 10–15 km/h

Traffic Volumes Low / Mid

Co-benefits Public space enhancement

Placement Intersection

Signals Unsignalized / Signalized

Multilane Yes

See pages 288–289

**MINI ROUNDABOUT**

Target Turn Speeds 10–15 km/h

Target Through Speeds 20–30 km/h

Traffic Volumes Low / Mid

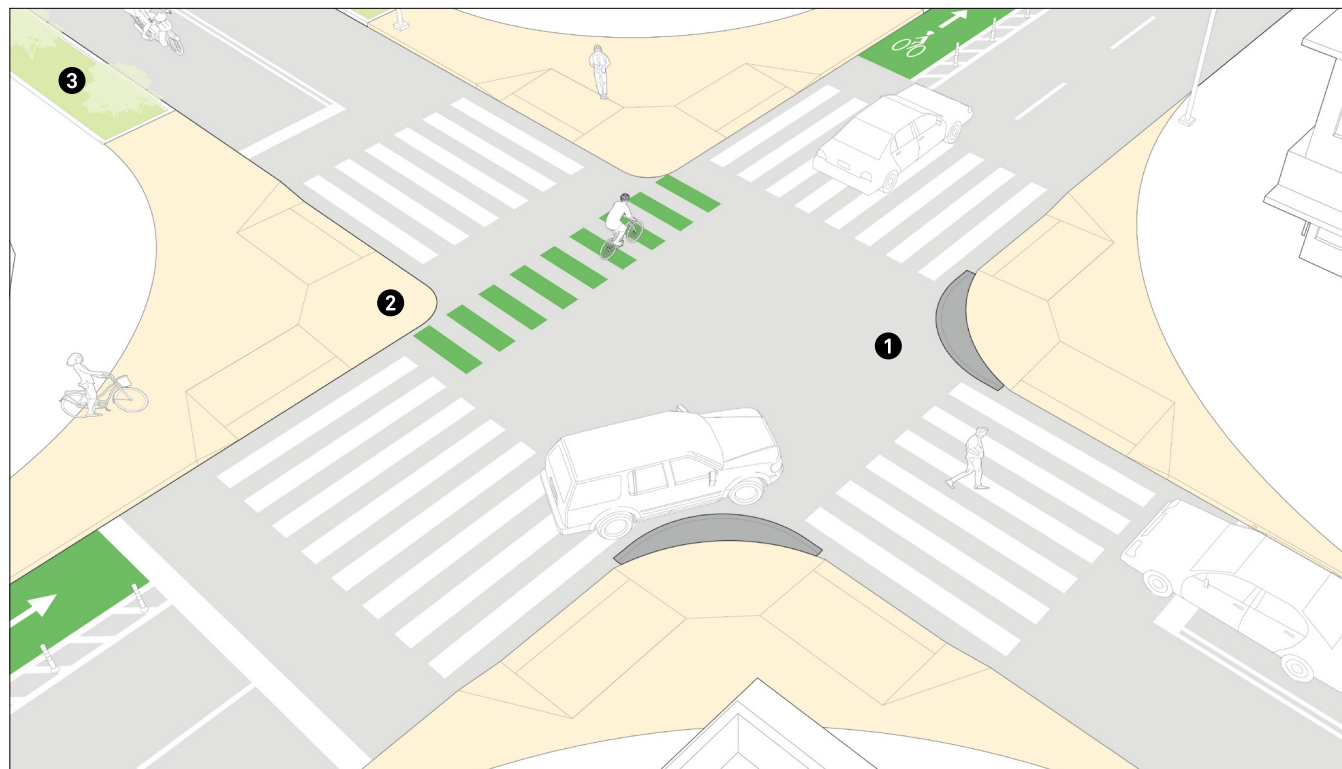
Co-benefits Landscaping

Placement Intersection

Signals Unsignalized

Multilane No

See pages 290–291



**Overview**

Corner alignment extends the sidewalk by designing sidewalk corners with the tightest radius possible for safe speeds. Corner alignments increase mutual visibility between pedestrians and motorists, increase waiting space, and reduce the crossing distance.

**APPLICABILITY**

**Target Turn Speeds** 10–15 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Accessibility, crossing distances, landscaping

**Placement** Intersection

**Signals** Unsignalized / Signalized

This tool is applicable to any intersection with existing oversized corner radii.

In streets where the design speed is 30 km/h or higher, ensure travel lanes are aligned across the intersection.

**Design Guidance**

**CRITICAL**

**1** Realign travel lanes across opposite legs of the intersection, particularly if design speeds are 30 km/h or higher. Rightsize travel lanes when designing corner alignments. *For more information, see 5 Safe Speed Geometry.*

**2** Design corners with the tightest radius possible. Consider target turn speeds of 10–15 km/h. Do not adopt turn speeds higher than 10 km/h on simulation software.

Ensure universal accessibility for pedestrians. Use the extra space that results from the corner alignment to ensure a clear path for all users and to better accommodate pedestrian ramps, tactile paving or detectable warning strips, and other accessibility elements.

**RECOMMENDED**

Curb alignment can be implemented using temporary pavement materials and without operational changes.

Adopt techniques such as adding mountable elements, and recessed stop bars to accommodate large vehicle turns while ensuring a rightsized turn radius for the managed vehicle.

Consider the approaches and the resulting effective turning radius. Wider streets allow for larger effective radii even with smaller corner radii.

Consider combining this tool with intersection pedestrian islands or medians for safe turning speeds.

**3** Add landscaping, green infrastructure, seating, and other street furniture as applicable.

**Key Dimensions**

**Curb radius (r)**

While standard corner radii are **3–5 m**, in urban settings, smaller corner radii of **1.5 m** are preferred and corner radii exceeding **5 m** should be the exception. *For more information, see 5.2 Safe Turn Geometry.*

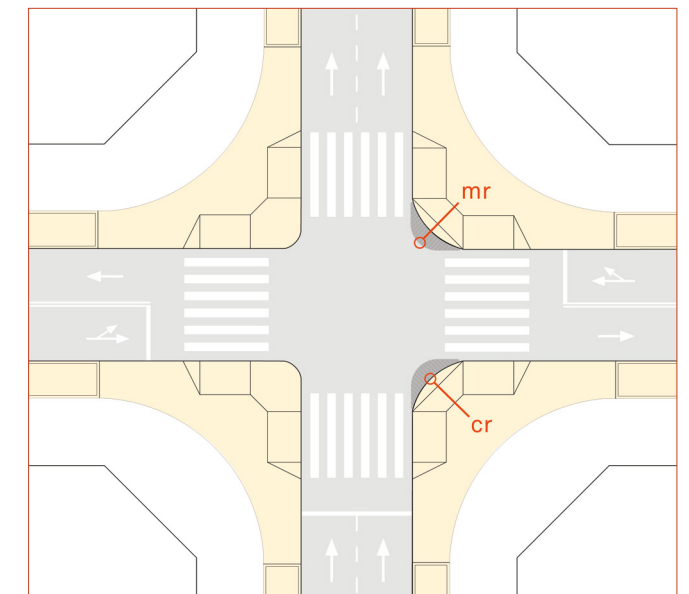
**Mountable elements radius (mr)**

When large vehicles routinely turn, wider corner radii can be complemented by the use of mountable elements to manage the speeds of vehicles of different sizes. The radius of the mountable elements should be based on the turn radius of the managed vehicle at a design speed of **5–10 km/h**.

**Mountable elements height (h)**

Mountable elements, like corner wedges can be flush with the roadbed level with a change in pavement texture or, for better compliance, have a mountable curb.

The height of the mountable elements ranges between 5–8 cm.



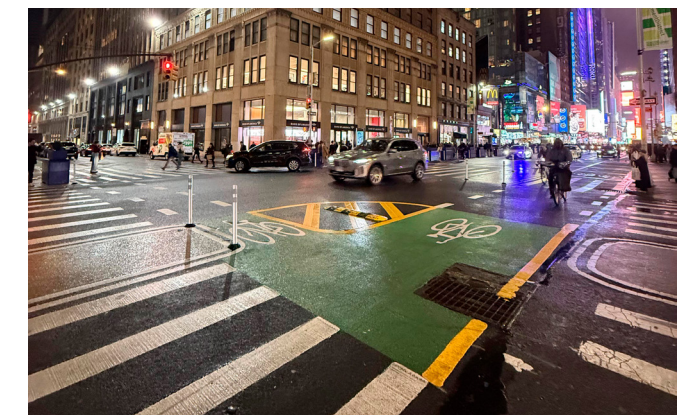
**Supporting Tools**

**MOUNTABLE ELEMENTS**

Corner wedges are mountable features that help further reduce the effective turn radius for the managed vehicle, while allowing larger vehicles to traverse them as they turn.

These can be implemented using materials like cobble stones, concrete pavers, bricks, etc. or using prefabricated speed bumps. The objective is to create a surface motorists will try to avoid while turning.

Corner wedges can be tripping hazards for pedestrians. Interrupt the element at pedestrian crossings and desire lines.

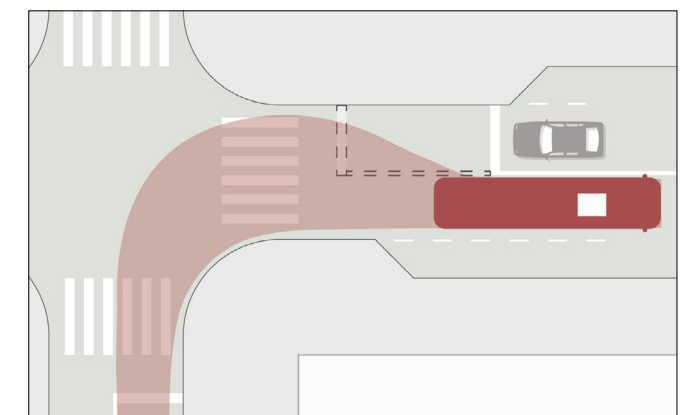


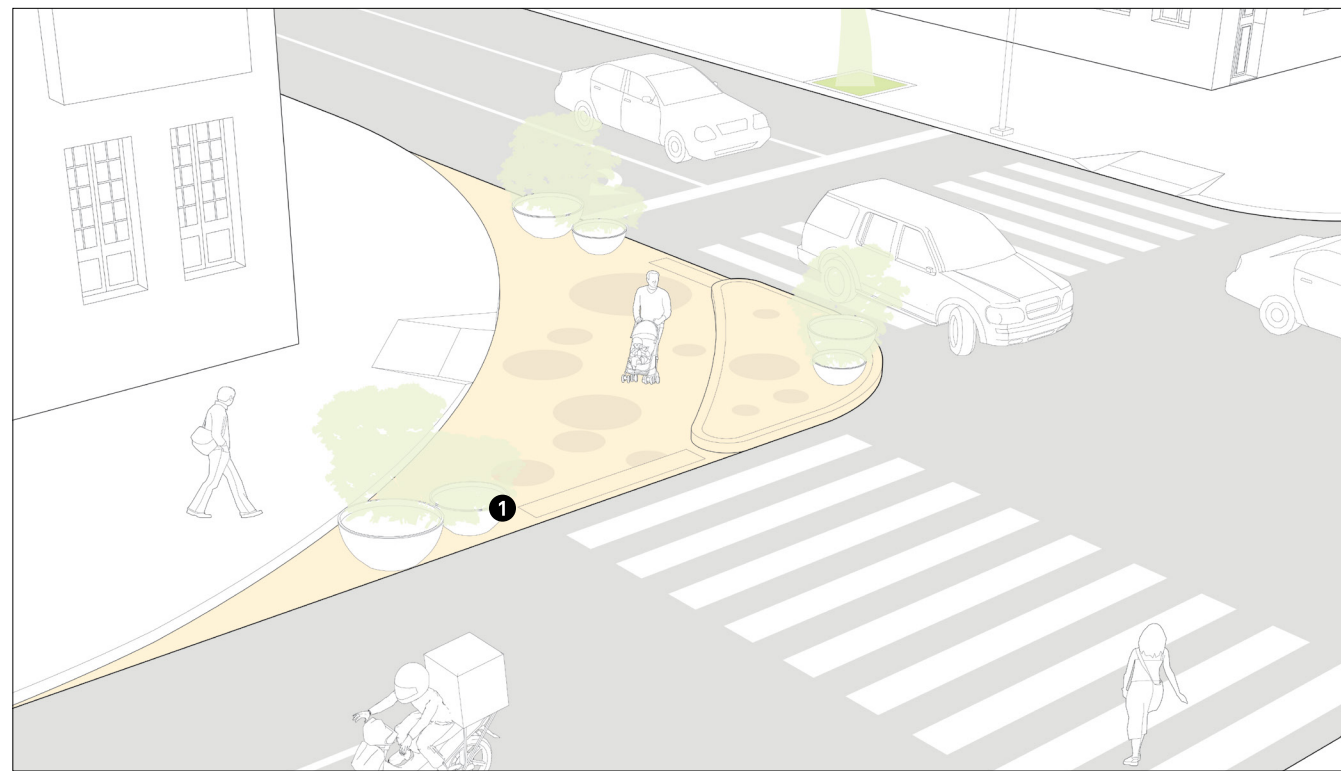
→ New York City, USA

**RECESSED STOP BAR**

Recessed stop bars help accommodate the different turn radii of frequently operating managed vehicle and the occasionally present control vehicle at safe speeds. *For more information, see 3.1 Design, Control, and Managed Vehicle.*

This technique is most effective at signalized intersections and enables smaller corner radii.





**Overview**

Slip lane removal extends the sidewalk to include the travel lane and the traffic island. Slip lanes are sometimes provided at intersections of major streets and allow vehicles to turn at higher speeds and reduce motorist and pedestrian visibility, creating potentially unsafe conditions.

**APPLICABILITY**

**Target Turn Speeds** 10–15 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Accessibility, crossing, landscaping

**Placement** Intersection

**Signals** Unsignalized / Signalized

Applicable to intersections with existing slip lanes.

Slip lane removals reduce pedestrian exposure and increase the available pedestrian space, making room for street furniture and landscaping.

**Design Guidance**

**CRITICAL**

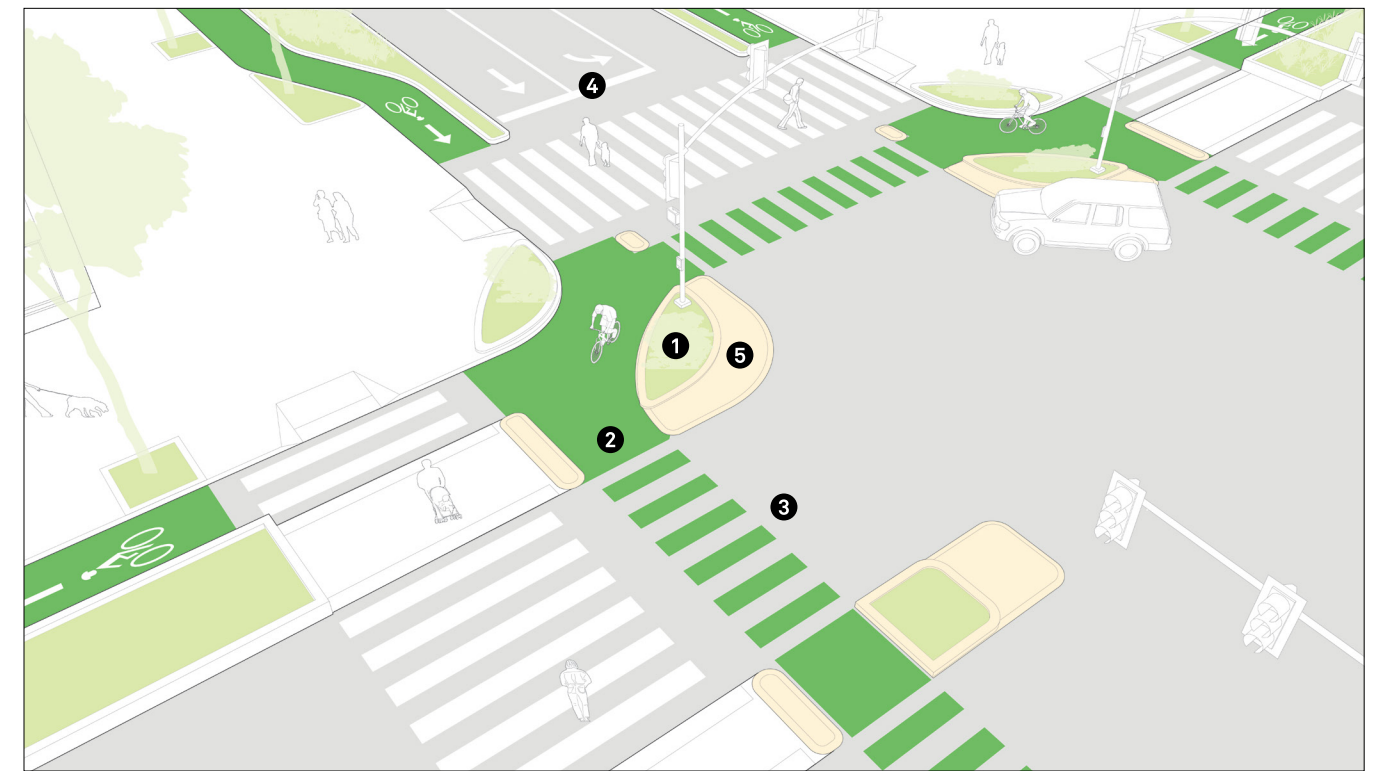
1 Employ permanent or interim materials, such as vertical elements like as flex posts, planters, bollards, delineators or other barriers to protect the reclaimed pedestrian space and prevent illegal use of the former slip lane.

Adjust drainage systems to ensure proper water flow and prevent pooling. Also consider universal accessibility to accommodate all users, including those with reduced mobility or visual impairments, by ensuring unobstructed pedestrian clear paths, accessibility ramps, and appropriate curb designs.

**RECOMMENDED**

Slip lane removals increase the available pedestrian space, making room for street furniture and landscaping.

If using interim materials, take extra care to prevent motorcyclists' and cyclists' encroachment into the reclaimed space for use as a shortcut. Use planters, benches and other fixed objects strategically placed to prevent or highly discourage this behavior.



**Overview**

The corner refuge island enhances the physical protection of cycle facilities, positioning cyclists prominently ahead of right-turn conflicts and creating safe, simple cyclist movements through intersections.

**APPLICABILITY**

**Target Speeds** 30–50 km/h

**Traffic Volumes** Mid / High

**Co-benefits** Cyclist safety

**Placement** Intersection

**Signals** Unsignalized / Signalized

Corner refuge islands are applicable in intersections where multiple facilities meet, generally at higher volumes and speeds.

Corner islands are generally added at signalized intersections, but a similar approach can be adopted to unsignalized ones.

Corner refuge islands are appropriate to both unidirectional and bidirectional cycle facilities.

**Design Guidance**

**CRITICAL**

1 Corner islands reduce turning radii while offering physical protection for cyclists at conflict points and creating refuge spaces.

Radii should be small enough that vehicles turn at speeds of 15 km/h or lower. This usually results from a 3–4.5 m curb radius.<sup>5</sup>

2 Provide cyclists with advanced stop lines, making them better placed in the sightline of turning vehicles, decreasing sideswipe and right-hook conflicts.

3 Setback cycle crossing ideally 5 m from the adjacent travel lane to further improve cyclists visibility to turning motorists. However, pedestrian crossings must align with the sidewalks clear paths. Otherwise, reduce the cycle crossing setback.

**RECOMMENDED**

4 Recess motorists' stop bars as needed in lieu of increasing the corner radius.

5 Add corner wedges to accommodate large vehicle turns while ensuring a rightsized turn radius for the managed vehicle.

Add fixed elements like traffic signal poles or landscaping on the corner refuge island to increase protection.

Protected intersections can be achieved without moving existing curbs by using interim materials, with modifications making the intersection more compact and organized.

More than a rigid template, the principles behind protected corners can be adapted and applied to a variety of intersection configurations with cycle tracks or lanes. For more information, see *Global Street Design Guide Chapter 6.4.4*.

SNAPSHOTS



### Curb Alignment

**Material** Stone tiles

**Location** London, United Kingdom

Capital redesigns at the corners are an opportunity to reconfigure the intersection, creating more public space, and adding other uses and utilities that are not possible in interim transformations.



### Corner Refuge Island at Mini Roundabout

**Material** Granite curb and concrete pavers

**Location** Amsterdam, Netherlands

Protected corners at roundabouts ensure cyclists are protected from vehicles, especially as the device makes motorists either turn or deflect horizontally from their path.



### Corner Refuge Island

**Material** Cobblestones and concrete

**Location** Ljubljana, Slovenia

Ensure the pavement differences help communicate where cyclists and pedestrians are expected to navigate and wait, especially if there aren't any elements like planters or bollards on the corner island.



### Corner Redesign with Interim materials

**Material** Paint, planters, and bollards

**Location** New York City, USA

Using interim materials in corner redesigns brings short-term benefits and creates the opportunity for testing new design parameters.



### Interim Compact Intersections

**Material** Paint and bollards

**Location** Fortaleza, Brazil

Interim materials can help redesign intersections, adjusting their turn radii and reclaiming space for pedestrians and other uses.

Flexible bollards ensure motorists are aware of the element and vehicle path, even at low-light conditions.



### Slip Lane Removal using Interim Materials

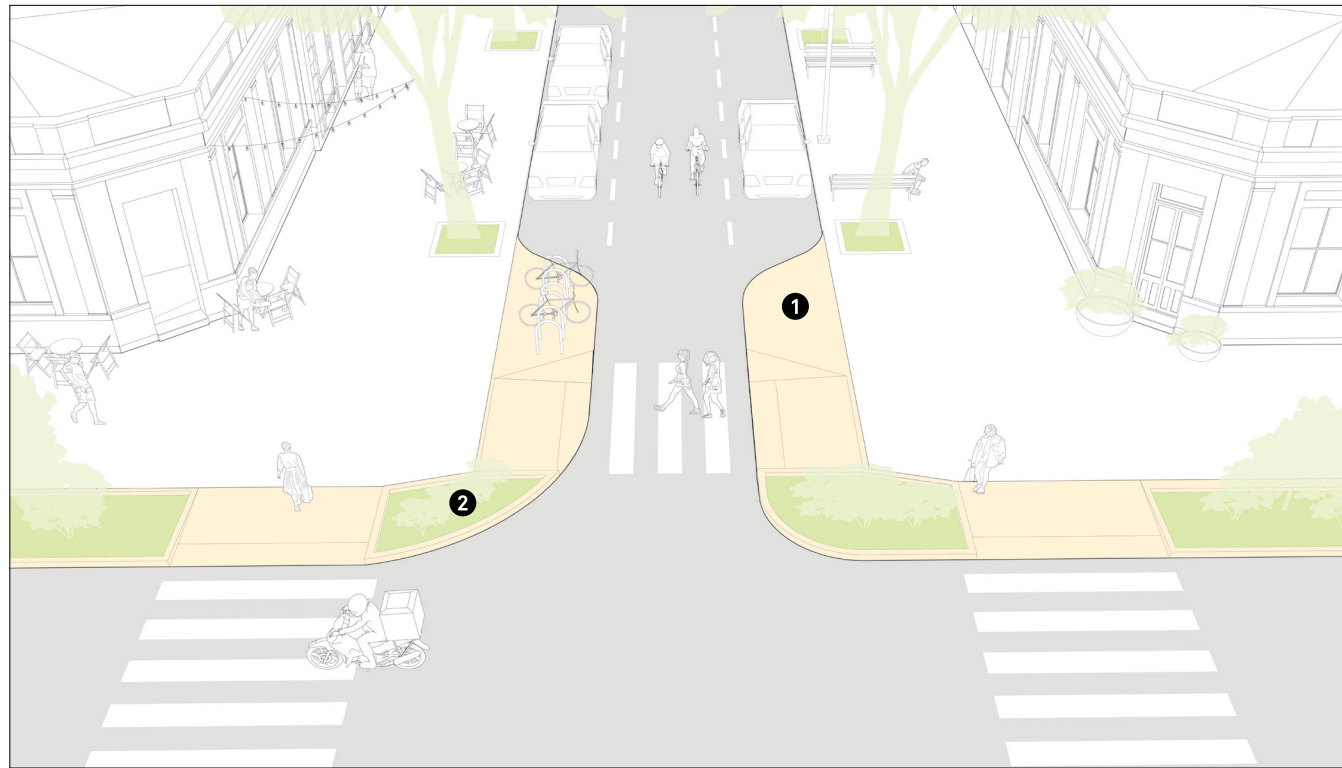
**Material** Paint and bollards

**Location** Chicago, USA

Slip lanes can be transformed using paint and bollards, creating additional space for people walking and other uses in the short-term.

Ensure the slip lane is painted in a contrasting color to the existing pavement to better communicate the change to motorists and pedestrians. Bollards or similar high-visibility elements are also fundamental to signalize the circulation changes.

SNAPSHOTS



**Overview**

Bulb-outs are extensions of the sidewalk into the parking lane. They should be installed whenever on-street parking is present to increase visibility, reduce the crossing distance, provide extra waiting space, and allow for seating or landscaping.

**APPLICABILITY**

**Target Turn Speeds** 10–15 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Shorter crossings, public space enhancement

**Placement** Approach / Intersection

**Signals** Unsignalized / Signalized

Corner bulb-outs are applicable in any street with a parking lane, and can be implemented as a standard solution in any redesign.

Bulb-outs help self-enforcing target turn speeds from 10 to 15 km/h.

**Design Guidance**

**CRITICAL**

**1** Daylight intersections by removing parking within **6–8 m** of the intersection.

Ensure universal accessibility by using curb extensions to accommodate accessible pedestrian ramps.

**2** Strive for the tightest possible corner radii. When designing the corners of a block entry lane, adjust corner geometry as needed.

Ensure crossing visibility with pedestrian-scaled lighting.

Traffic control devices must be unobstructed in the intersection and should be free of tree cover or visual clutter.

Adjust drainage systems to ensure proper water flow and to prevent pooling.

**RECOMMENDED**

Rightsize lane widths to further reduce crossing distances where possible.

Design the curb extension to incorporate additional uses and functions such as seating, space for street vendors, and green infrastructure.

Corner bulb-outs can be used to create a gateway treatment. Combine with signage and landscaping to communicate entrance into a street with lower design speed.

Where applicable, implement a protected corner for cyclists. *For more information, see Corner Refuge Island under 7.3.2.*

Bulb-outs can be used to incorporate transit stops or stations. *See Global Street Design Guide Chapter 6.5.*

**Key Dimensions**

**Daylight distance (d)**

The daylight distance should be **6–8 m** measured from the edge of the parking lane to the edge of the pedestrian crossing. Ensure pedestrian crossings are aligned with the pedestrian clear paths.

When used to accommodate a transit stop (transit bulb), ensure a minimum of **3 m** clearance from the edge of the stop to the pedestrian crossing marking. *For more information, see Global Street Design Guide Chapter 6.5.5.*

**Bulb-out width (bw)**

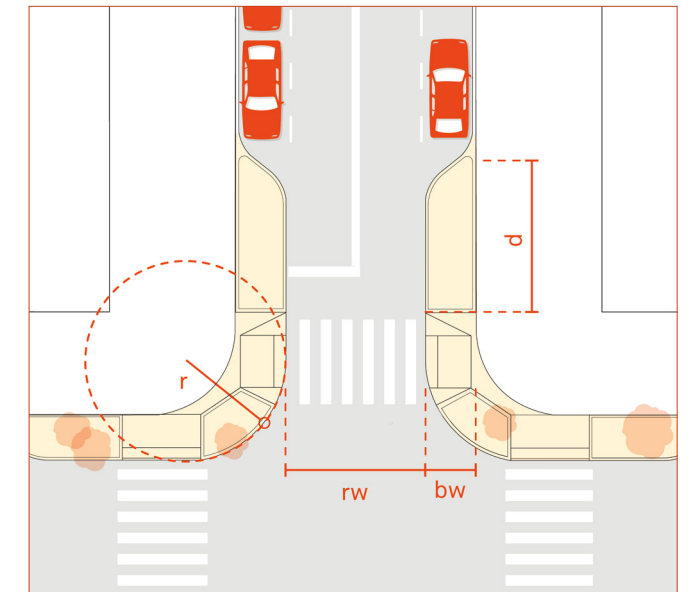
The minimum width is **1.8 m**, equal or wider than the parking lane (minus the shy distance between the curb and the effective roadway space).

**Corner radius (r)**

See *Corner Alignment* under 7.3.2.

**Roadway width (rw)**

See 5.1.1 *Lane Widths*.



**Placement**

**LANES ENTERING AND EXITING BLOCKS**

Particularly on single-lane streets, block entry lanes often need larger corner radii than in the exit approach to accommodate larger vehicle turns. That results in slightly longer crossing distances. Consider transit, emergency, and freight routes to select the appropriate design and control vehicles and minimize the impact on corner radii.

On the block exit lane, particularly if turning onto multilane streets, the corner radius can be much smaller than the effective turn radius. That results in shorter crossing distances and in opportunities for additional public space.

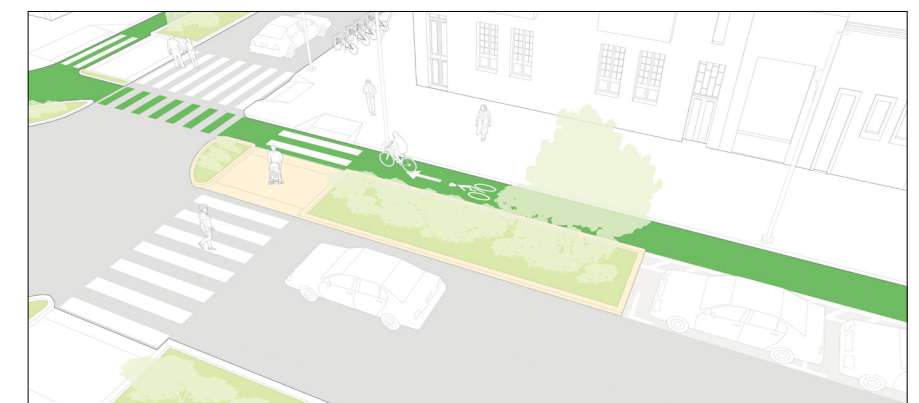


→ Fortaleza, Brazil

**EDGE ISLAND**

This variation is placed between cycle tracks and the roadway, offering protection for cyclists and pedestrians.

It allows pedestrians to navigate the crossing in two stages and negotiate conflicts with cyclists and motorists separately.





**Key Dimensions**

**Pinchpoint length (L)**

There is no minimum length when the pinchpoint is implemented using bollards or other vertical elements, in very low volume streets.

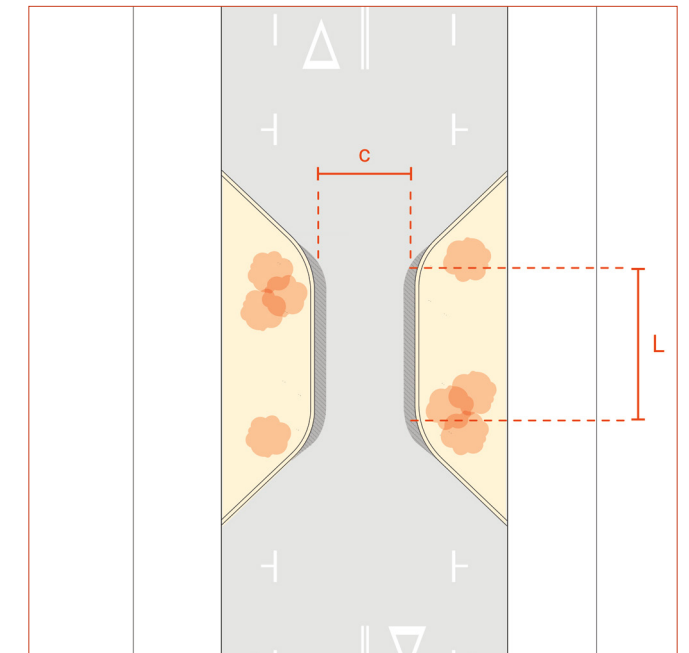
A bulb-out has a recommended minimum length of **6.0 m**, excluding the tapered sides of the curb extension.

When the yield pinchpoint includes a pedestrian crossing, ensure a minimum daylight distance of **3.0 m** on each side of the pedestrian crossing, measured from the edge of the parking lane to the edge of the pedestrian ramp or the pedestrian crossing marking.

**Clearance (c)**

Provide an effective clearance of **3.5 m** at the pinchpoint for emergency vehicle access. Mountable elements, such as aprons and overruns, can be used to maintain the roadway width of **3.0 to 3.5 m** maximum, ensuring effectiveness of the pinchpoint while still providing a minimum clearance of **3.5 m** (or greater where specified by emergency response requirements).

Pop-up implementations can help refine the tool's geometry while demonstrating its effectiveness and minimizing community and technical skepticism.



**Overview**

Also known as chokers, yield pinchpoints reduce the roadway from two lanes to one lane at a mid-block, forcing drivers to reduce speed and yield to traffic coming from the opposite direction.

**APPLICABILITY**

**Target Speeds** 10–30 km/h

**Traffic Volumes** Low / Mid

**Co-benefits** Shorter crossings, landscaping, volume management

**Placement** Mid-block

**Signals** Unsignalized / Signalized

**Multilane** No

Yield pinchpoints are only applicable in two-way streets, with one lane per direction.

They are most applicable on residential streets with low or medium volumes, and can be used to reduce traffic volumes as they reduce vehicle capacity.

**Design Guidance**

**CRITICAL**

Ensure motorists approaching from both sides are visible to each other, and that they can see people crossing, if the yield pinchpoint features a crossing.

1 Add signage, markings, and lighting to ensure motorists are aware of the device.

When applicable, make sure motorists leaving a traffic-calmed area have priority over those entering, so that the latter will reduce speeds.<sup>6</sup>

**RECOMMENDED**

Add central islands at entry points to further enhance the horizontal deflection effect.

Add pedestrian crossings where applicable. Ensure universal accessibility.

2 Add bypasses for cyclists to avoid conflicts with motor vehicles and avoid cyclist delay.

3 Use the curb extensions for landscaping, street furniture or other uses relevant to the context. However, make sure mutual visibility between users is retained.

Combine yield pinchpoints with vertical deflection tools such as raised crossings or speed humps to increase its effectiveness and potentially add co-benefits like at-grade pedestrian crossings.

**Variations**

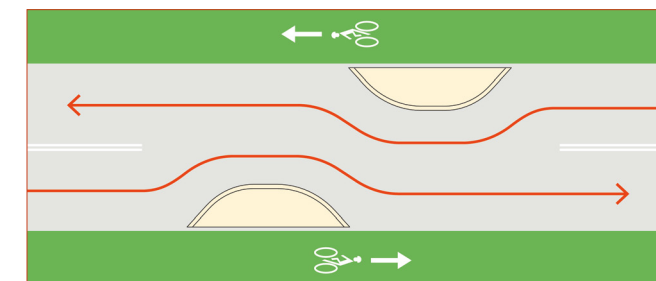
**Yield chicanes are similar to yield pinchpoints but add an extra lateral shift through the device to reduce speeds further.**

Ensure motorists approaching from both sides and navigating the element are visible to each other.

For increased efficacy, position bulb-outs at the motorists' near side (deflection at entry).

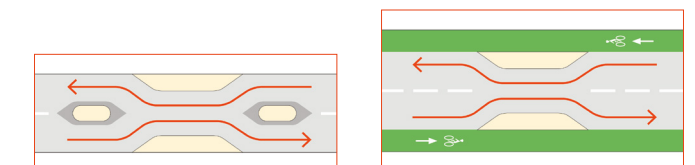
Use mountable curbs to define a more constrained geometry for smaller vehicles while allowing larger vehicles to navigate the device.

For more information, see 7.3.4 Chicanes and Lane Shifts.



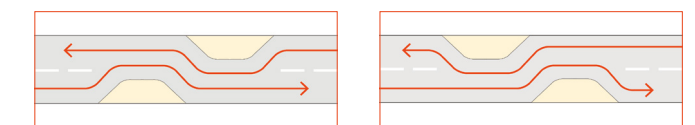
**Configurations**

Yield pinchpoints and chicanes can have a myriad of configurations. Below are a few common examples.



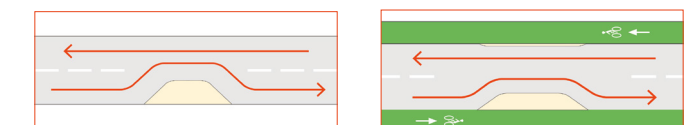
Yield pinchpoint

Yield pinchpoint with cyclist bypass



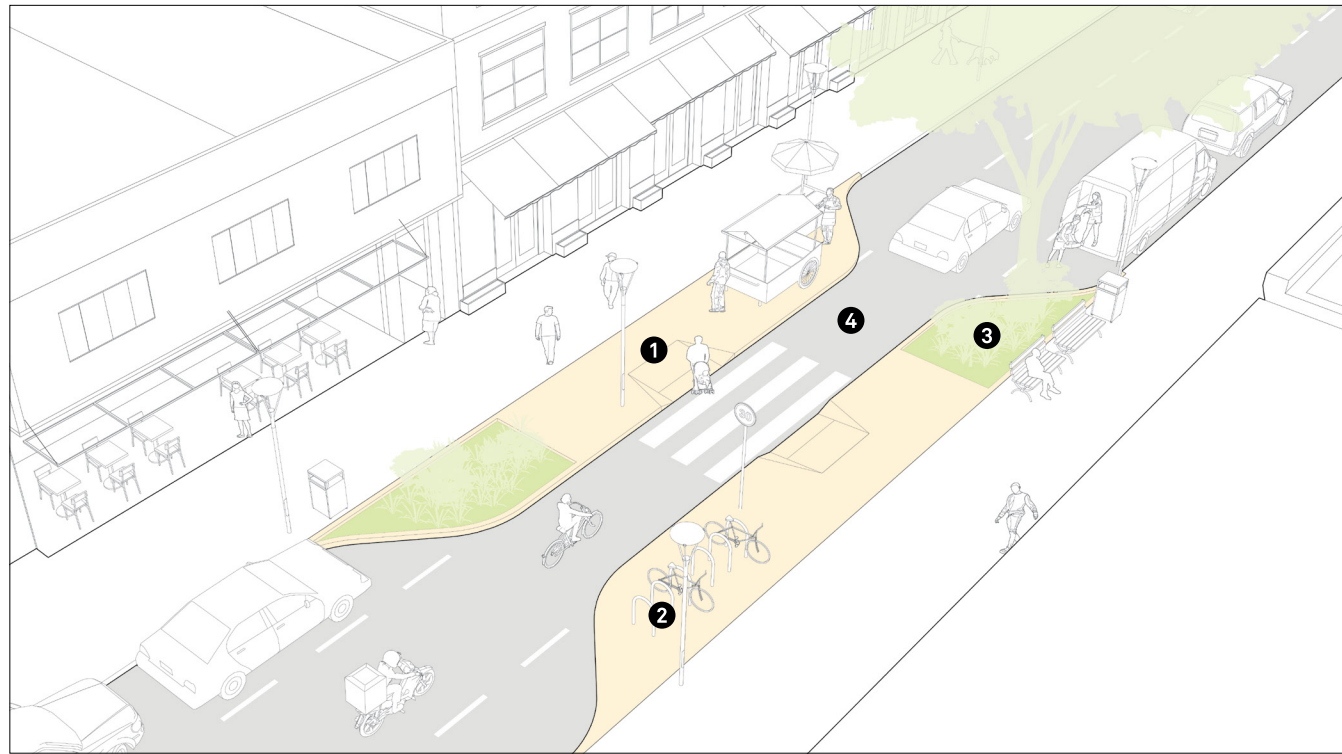
Yield chicane (deflection at entry)

Yield chicane (deflection at exit)



Yield pinchpoint: deflection to one side

Yield pinchpoint: deflection to one side with cyclist bypass



## Overview

Mid-block pinchpoints use curb extensions to physically and visually narrow the roadway. Paired with streetside design, pinchpoints increase motorists' awareness of the lane's edge and oncoming traffic, while potentially improving pedestrian crossings.

### APPLICABILITY

**Target Speeds** 10–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Shorter crossings, public space enhancement

**Placement** Mid-block

**Signals** Unsignalized / Signalized

Pinchpoints are best used on one-way streets, as their effectiveness is reduced on two-way streets, especially in multilane conditions.

Though applicable to multilane streets with 50 km/h target speeds, pinchpoints are less effective in these situations if not combined with other tools.

## Design Guidance

### CRITICAL

Extend the curb at mid-block locations replacing parking to create pinchpoints.

**1** If combined with pedestrian crossings, ensure those are universally accessible.

**2** Remove parking and other visual obstructions upstream of the crossing to enhance mutual visibility. Associate with pedestrian-scale lighting to ensure visibility in low-light conditions.

Combine with signs and markings to ensure motorists are aware of and can see the device even in low-visibility conditions.

There is no minimum length for a pinchpoint (it can be created using simply two fixed objects with the right distancing). If pedestrian crossings exist, the length should be enough to accommodate the crosswalk plus 8 m clear of visual obstructions upstream of the crossing.

In two-way streets, they should be combined with other speed management measures to maintain effectiveness.

Add bypasses for cyclists when applicable to reduce conflicts and increase comfort.

### RECOMMENDED

At pinchpoints, travel lanes can be intentionally narrowed compared to the rest of the street.

Pinchpoints can be more effective if combined with pedestrian crossings and/or vertical deflection tools.

Adjust drainage systems to ensure proper water flow and prevent pooling.

**3** Add landscaping to the pinchpoint to visually narrow the roadway space. Consider pedestrian crossing visibility, shy distances, and underground utilities.

**4** Maintain a minimum clear space of 3.5 m at the pinchpoint for emergency vehicle access.

Combine mid-block pinchpoints with vertical deflection tools such as raised crossings or speed humps to increase their effectiveness and potentially add co-benefits like at-grade pedestrian crossings.

## Key Dimensions

### Pinchpoint length (L)

There is no minimum length when the pinchpoint is implemented using bollards or other vertical elements, in very low volume streets. The recommended minimum for a bulb-out is **6.0 m**, excluding the tapered sides of the curb extension. When the pinchpoint includes a pedestrian crossing, see nearside and farside daylight distance recommendations below.

### Nearside daylight distance (d1)

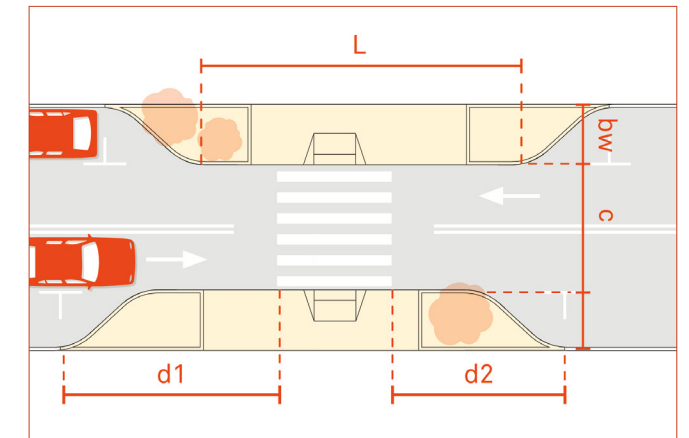
**6.0 m** minimum (**8.0 m** recommended) measured from the edge of the parking lane to the edge of the pedestrian crossing. When used to accommodate a bus stop (bus bulb), ensure a minimum of **3 m** clearance from the edge of the transit stop to the pedestrian crossing marking. See *Global Street Design Guide Chapter 6.5.5* for more information on transit stop placement.

### Farside daylight distance (d2)

The farside distance should be **4.0 m** minimum (**6.0 m** recommended) measured from the edge of the parking lane to the edge of the pedestrian ramp or the pedestrian crossing marking.

### Bulb-out width (bw)

The minimum width is **1.8 m**, equal or wider than the parking lane (minus the shy distance between the curb and the effective roadway space).



### Clearance (c)

For single lane, one-way pinchpoints, provide an effective clearance of **3.5 m** for emergency vehicle access. For more guidance see 7.3.3 Pinchpoints.

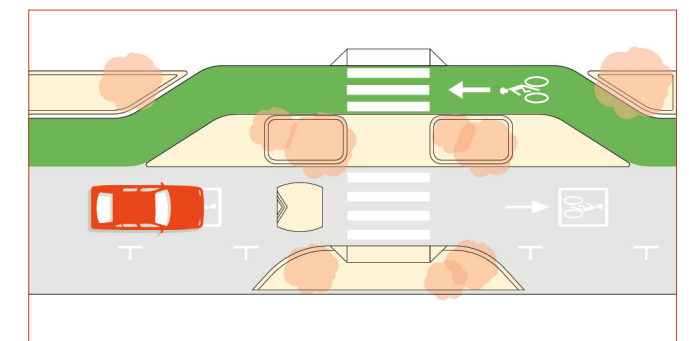
## Variations

### PINCHPOINTS WITH CYCLIST BYPASS

On streets with cycle facilities, consider adding bypasses for cyclists.

Use markings and signs to guide all users through the device, including indicating pedestrian priority at crossings when applicable.

The example to the right shows a pinchpoint on a contraflow cycle street. Cyclists riding in the same direction as motorized traffic share the lane, while contraflow cyclists can use the bypass. That also allows for a more stringent pinchpoint treatment.



### LARGE VEHICLE ACCESS MANAGEMENT

Vertical features such as bollards can be used to restrict access for large vehicles on certain streets, e.g. in bridges and residential areas that do not serve as routes for transit, freight, and emergency vehicles.

Such treatment restricts access for large vehicles while dramatically reducing speeds.



→ London, United Kingdom



**Interim Corner Bulb-out**

**Material** Paint and bollards

**Location** Fortaleza, Brazil

Corner bulb-outs can be implemented as interim transformations, allowing for short-term solutions and testing before capital constructions.

Along with corner radii adjustments, they can be combined with curb extensions along the block using the same materials.



**Yield Pinchpoint with Cycle Bypass**

**Material** Concrete and signage

**Location** Copenhagen, Denmark

A bypass for cyclists in a yield pinchpoint ensures they can circumnavigate vehicles that are negotiating the priority. Otherwise, when there are no motorized vehicles in the element, cyclists can also go through the pinchpoint.



**Interim Mid-block Pinchpoint**

**Material** Paint, bollards, planters and rocks

**Location** New York, USA

Interim curb extensions help narrow the roadway and create a pinchpoint effect, requiring motorists to navigate with more attention.

Flexible bollards with reflective strips help ensure visibility at night or during low-light conditions.



**Yield Pinchpoint with Cycle Bypass**

**Material** Granite, planting, asphalt

**Location** Copenhagen, Denmark

Whenever possible, provide a bypass for cyclists when navigating yield pinchpoints.



**Yield Pinchpoint with Speed Cushion**

**Material** Concrete

**Location** London, United Kingdom

Speed cushions help increase the efficacy of yield pinchpoints, further reducing speeds, while also helping guide vehicle paths for motorists.

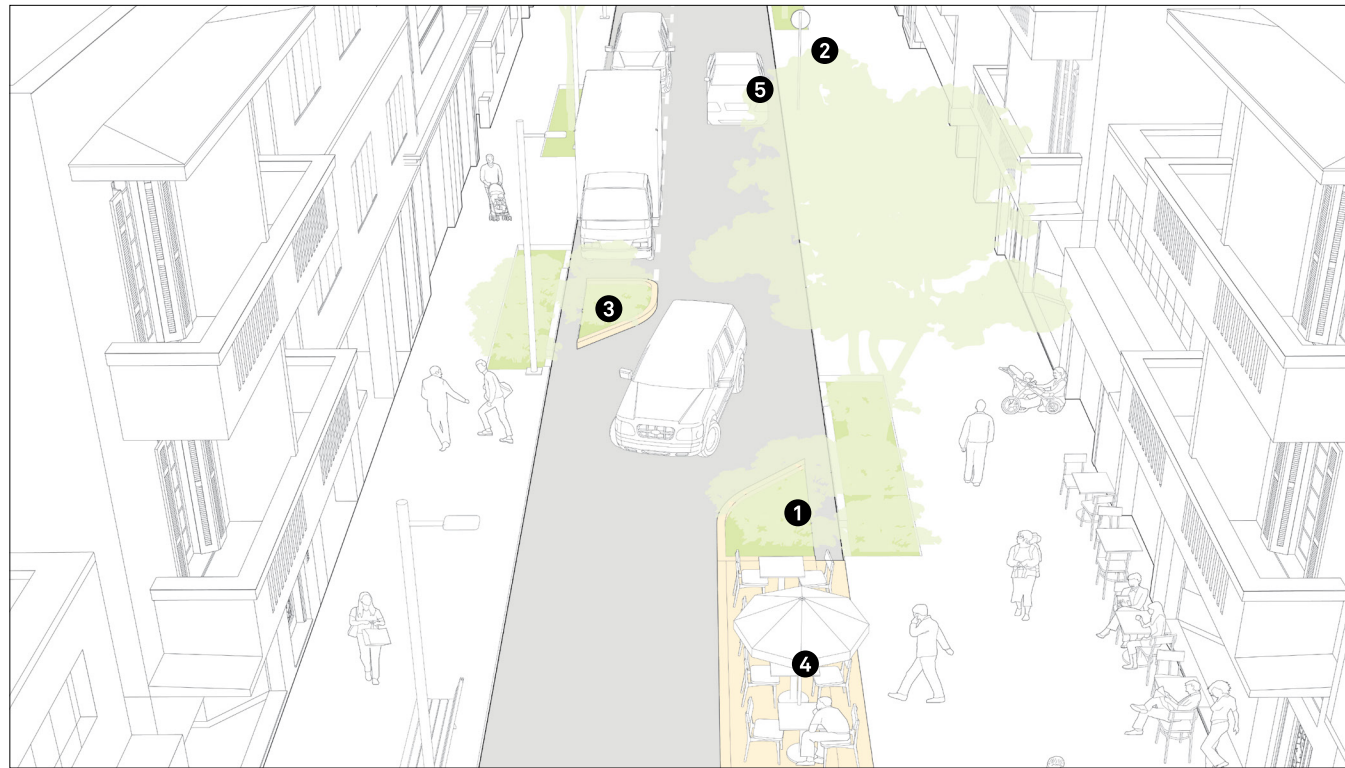


**Pinchpoint at Gateway with Speed Bump**

**Material** Granite, planting, asphalt

**Location** Copenhagen, Denmark

Aligned with the horizontal deflection effect, pinchpoints help communicate to motorists when they are entering a street with lower target speeds, especially when combined with other elements.



**Overview**

Chicanes and lane shifts use alternating parking, curb extensions, or edge islands to form an S-shaped path of travel which lowers vehicle speeds. The lateral shift also breaks driver's sightlines, increasing its traffic calming effect.

**APPLICABILITY**

**Target Speeds** 10–40 km/h

**Traffic Volumes** Low / Mid

**Co-benefits** Public space enhancement

**Placement** Mid-block / Approach

**Signals** Unsignalized

**Multilane** No

Chicanes are more commonly applied to single lane or one-lane-per-direction roadways, at mid-blocks, but can be adapted to other contexts.

In higher target speed roadways, especially 40 km/h, ensure the approach speed is compatible with the chicane's geometry.

**Design Guidance**

**CRITICAL**

**1** Staggered curb extensions or islands form the chicane. The position of their outermost points will be the key determinants of the chicane's pathway.

Ensure the chicane geometry is compatible with the street's target speed, and the managed, design, and control vehicles. Chicanes with narrower lane widths and sharper stagger angles lead to lower vehicular speeds.

Maintain an effective clearance space of 4.0 m at the chicane for emergency vehicle access.

**2** Ensure upstream visibility. Use signs and markings to warn motorists.

**RECOMMENDED**

**3** Integrate the chicane bulb-outs in the design of the street. Based on the immediate local context, consider the placement of seating areas, the parking side, landscaping, vendor stalls, loading areas, etc.

If applicable, place pedestrian crossings downstream of the device. Avoid placing crossings at the angled portion of the chicane.

**4** On streets with a single parking lane, alternate the side of parking to create a chicane.

**5** On one-way chicanes, intentionally break motorists' sightlines downstream of the device to further reduce speeds.

Change pavement material at the chicane to increase motorists' awareness.

**Key Dimensions**

**Stagger length (sL)**

The stagger length is defined as the distance between the outermost point of the curb extensions on each side of the chicane (P1 and P2), and typically ranges between **6–20 m**. A shorter stagger length leads to greater speed reduction.

**Stagger width (sw)**

The stagger width, also called free view width, ranges between **+1.0 m** and **-1.0**. A smaller width leads to greater speed reduction. A stagger width of 0 or negative is more effective when motorcycle use is high.

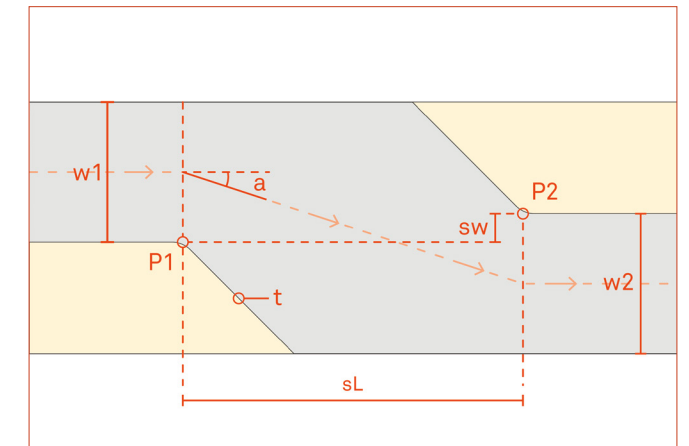
**Lane width (w)**

Rightsizing lane widths is a key determinant of the chicane speed reduction effect. For more information, see 5.1.1 Lane Widths.

**Path angle (a)**

A crucial parameter influencing speed reduction is the path angle, which is the angle through which a vehicle's lane is offset by the chicane. To achieve operating speeds of 30–40 km/h, path angles of **15–20 degrees** (or tapers between 1:2.7–1:3.6) are recommended.

Pop-up trials (e.g. using cones) can help refine the tool's geometry.



**Clearance**

An effective clearance of **4.0 m** minimum should be maintained at the chicane for emergency vehicle access.

**Taper (t)**

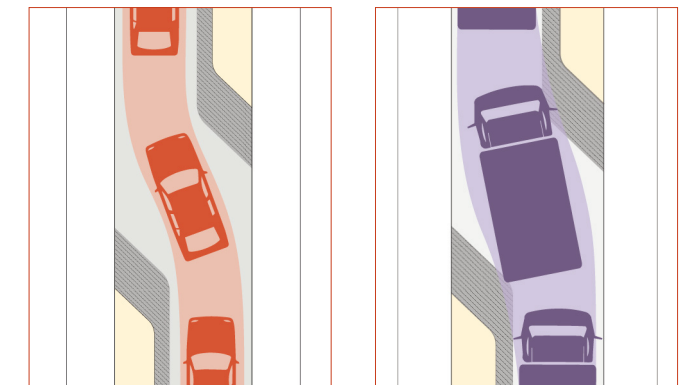
The taper angle of the curb extension should be larger than the path angle (a). Typically, the taper is 1:1 or at a 45 degree angle.

**Variations**

**MOUNTABLE ELEMENTS**

Those are areas on the edge of a travel lane that help demarcate the path for design vehicles. Use this device to help create a narrower path for smaller vehicles and to make motorists navigate the chicane more smoothly, while also allowing larger vehicles to navigate it, by partially going over the mountable surface when necessary.

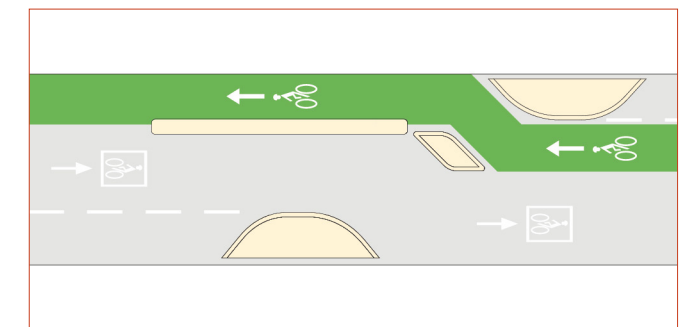
They can be built with a wide variety of materials, from concrete mountable curbs to a combination of speed bumps and signage, but should contrast the roadbed and be able to withstand the weight of all expected vehicles.

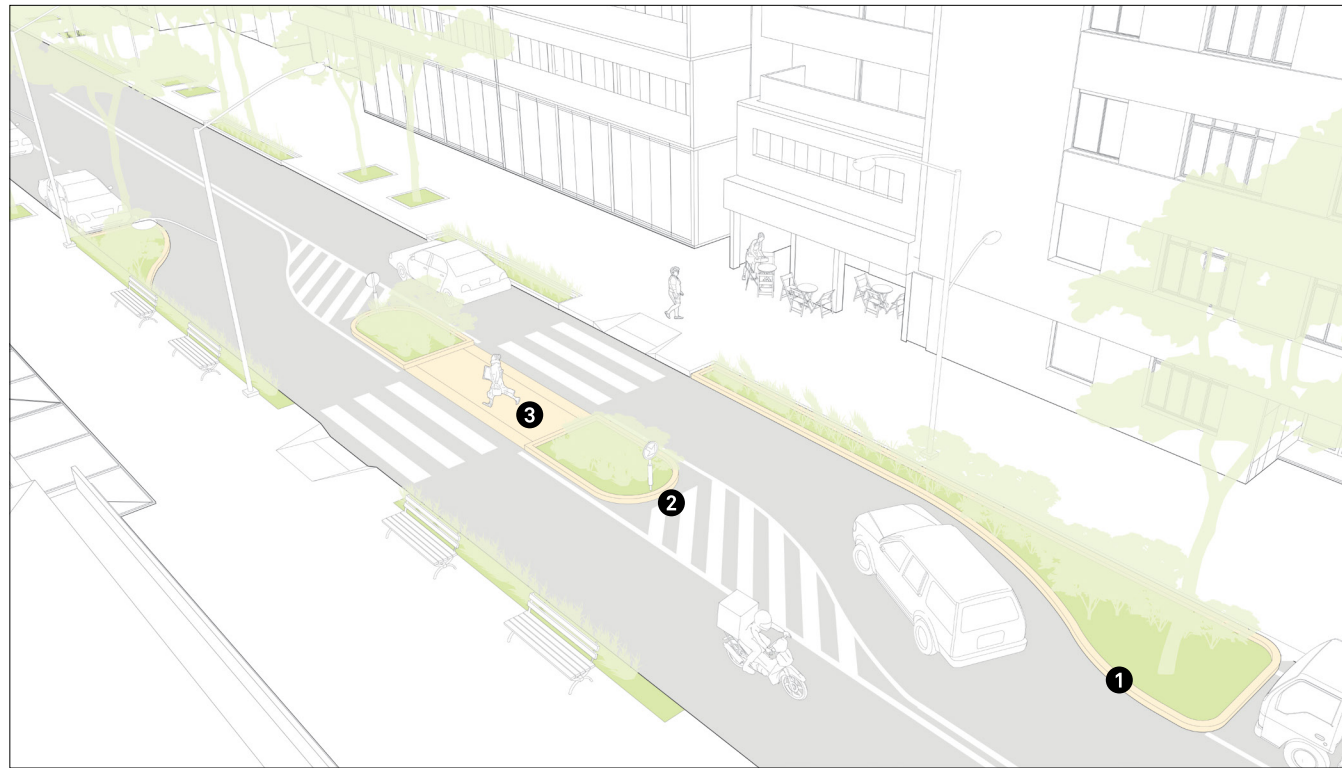


**CONTRAFLOW CYCLING**

In contraflow cycle streets, add bypasses for cyclists riding against traffic.

Ensure physical separation for cyclists traveling in the opposite direction from motorized vehicles.





## Overview

Two-way chicanes are similar to one-way, but require special consideration to retain efficacy and manage head-on conflicts. The central island in the two-way chicane can support mid-block pedestrian crossings.

### APPLICABILITY

**Target Speeds** 10–40 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Public space enhancement, added crossings

**Placement** Mid-block / Approach

**Signals** Unsignalized / Signalized

**Multilane** No

Two-way chicanes are more commonly applied to one-lane-per-direction streets, at mid-blocks.

Combine two-way chicanes with other tools such as median refuge islands and raised crossings to add co-benefits and further reduce speeds.

## Design Guidance

### CRITICAL

- 1 Staggered curb extensions or islands form the chicane. The position of their outermost points will be the key determinants of the chicane's pathway.
  - 2 Use a central island to prevent vehicles from encroaching into the opposing lane and thus reducing head-on collision risk and generating a more constrained vehicle path across the chicane.
  - 3 If the central island doubles as a pedestrian refuge, recess the bend 5–10 m from the crossing.
- Ensure mutual visibility between users moving in opposite directions at the chicanes.
- Maintain an effective clearance space of 4 m at the chicane for emergency vehicle access.

### RECOMMENDED

- Add cyclist bypasses as applicable.
- On two-way chicanes with pedestrian crossings, favor a configuration with a nearside bulb-out, so that the bend is located upstream of the crossing.
- Integrate the chicane's curb extensions in the design of the street. Based on the immediate local context, consider the placement of seating areas, the parking side, landscaping, vendor stalls, loading areas, etc.
- Change pavement material at the chicane to increase awareness for motorists.
- Pop-up trials (e.g. using cones) can help refine the tool's geometry.

## Key Dimensions

### Stagger length (sl)

The stagger length, which typically ranges between **6–20 m**, is the distance between the outermost point of the curb extensions on each side of the chicane (P1, P2, P3, and P4). A shorter stagger length tends to increase speed reduction.

### Stagger width (sw)

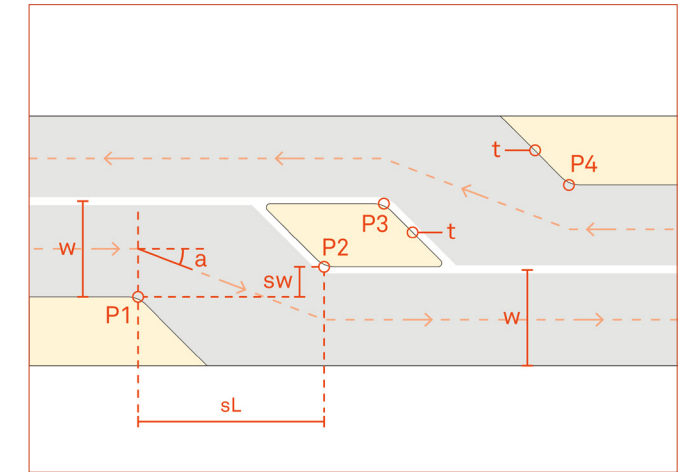
The stagger width, also called free view width, ranges between **+1.0 m** and **-1.0**. A smaller stagger width generally leads to greater speed reduction.

### Lane width (w)

Rightsizing lane widths is a key determinant of the chicane speed reduction effect. For more information, see 5.1.1 *Rightsize Vehicle Lanes*

### Path angle (a)

A crucial parameter influencing speed reduction is the path angle, which is the angle through which a vehicle's lane is offset by the chicane. To achieve operating speeds of 30–40 km/h, path angles of **15–20 degrees** (or tapers between 1:2.7–1:3.6) are recommended.



### Clearance

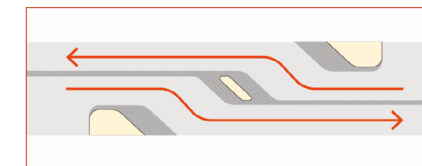
An effective clearance of **4.0 m** minimum should be maintained at the chicane for emergency vehicle access.

### Taper (t)

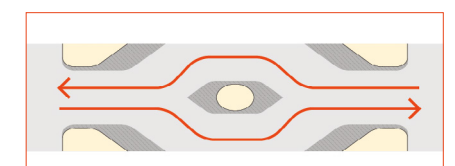
The taper angle of the curb extension should be larger than the path angle (a). Typically, the taper is 1:1 or at a 45 degree angle.

## Variations

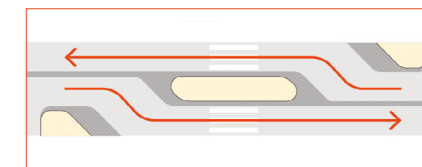
Two-way chicanes can have multiple configurations. Consider the most appropriate to the context based on the adjacent examples:



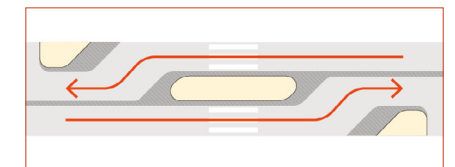
Staggered with diagonal island



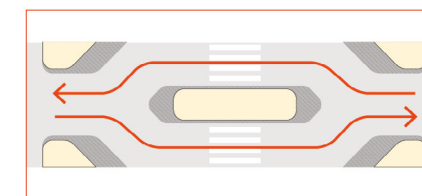
Symmetrical with central island



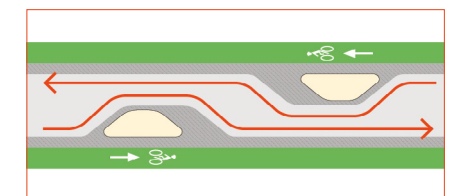
Near side staggered with pedestrian crossing



Far side stagger with pedestrian crossing (prefer near side if practical)



Symmetrical with pedestrian refuge



Yield chicane. For more information, see 7.3.3 Pinchpoints.

SNAPSHOTS



### Interim Chicane

**Material** Paint, planters and bollards

**Location** Santiago, Chile

Chicanes can be created using strategies for quicker deployment and adaptation, such as paint and bollards. This helps introduce the element and test design parameters for the context.



### Two-way Chicane with Speed Cushion

**Material** Concrete

**Location** London, United Kingdom

Combining speed cushions and two-way chicanes help increase the speed management effect by combining vertical and horizontal deflection.

When deployed on horizontal geometry tools, speed cushions also help guide motorized vehicle paths.



### Yield Chicane

**Material** Concrete

**Location** Auckland, New Zealand

In two-way streets, especially with lower traffic volumes, chicanes can also feature elements from yield pinchpoints. This variation further adds to the speed management effect, making it more effective even when two vehicles do not meet at the pinchpoint.



### Chicane with Parklet

**Material** Paint and bollards

**Location** Geneva, Switzerland

Chicanes also pose an opportunity to create public space for different uses, where the reclaimed roadway space can feature parklets or pocket parks.



### Interim Chicane with Added Public Space

**Material** Paint, planters, and bollards

**Location** Recife, Brazil

Interim chicanes can also be used to create public spaces for different uses, ensuring the roadway and sidewalk extensions are clearly marked by contrasting colors and the presence of delimiters such as bollards or planters.



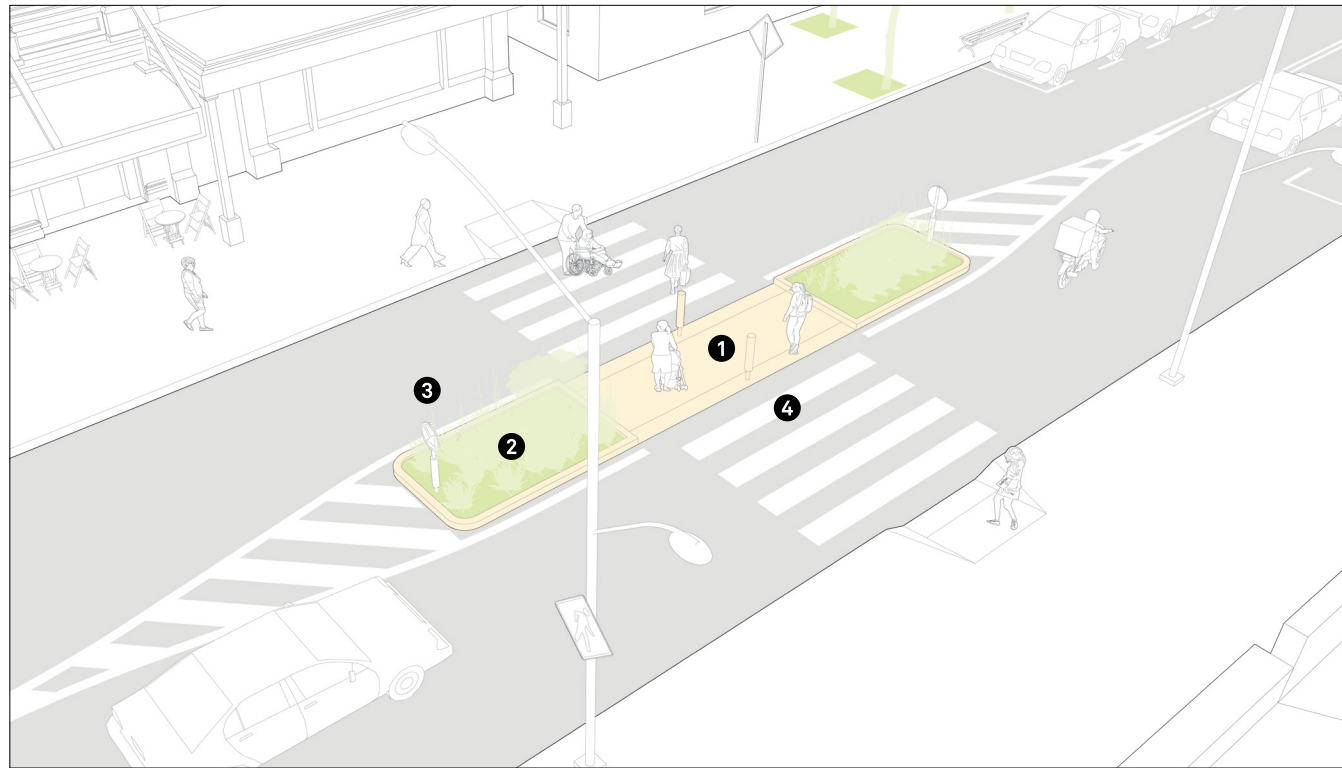
### Chicane in Shared Street

**Material** Planters, benches, and bollards

**Location** Fortaleza, Brazil

In shared streets, where design speeds are lower, the additional public space created by chicanes is even more easily reclaimed by other uses, especially when clearly delimited by urban furniture or bollards.

SNAPSHOTS



**Overview**

At mid-block locations, pedestrian refuge islands can be used to reduce lane width for vehicles, even on relatively narrow streets.

That creates a mix of pinchpoint and lateral shift effects to reduce speeds, while supporting two-stage crossings.

**APPLICABILITY**

**Target Speeds** 20–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Landscaping, protected pedestrian and cyclist crossing

**Placement** Mid-block / Approach

**Signals** Unsignalized / Signalized

**Multilane** Yes

Islands can be added wherever pedestrians have to cross more than two lanes of traffic in one go.

Refuge islands are more common in streets with higher traffic volumes and target speeds, but can be used in a variety of contexts.

**Design Guidance**

**CRITICAL**

**1** Pedestrian refuge islands should be at least **1.8 m** deep but have a preferred depth of **2.4 m**. That allows people using wheelchairs, pushing strollers, or carrying a bicycle etc. to fit on the refuge space. Ensure universal accessibility. *For more information, see the Global Street Design Guide 6.3.6.*

**2** Add physical protection at both ends of the island to protect and increase comfort of people waiting to cross.

**3** Pedestrian refuge islands should be clearly visible to motorists, be well lit, and provide reflectors for improved visibility in low-light conditions.

**RECOMMENDED**

Travel lanes can be reduced compared to the typical profile of the street to enhance the pinchpoint effect. Add markings around the island to guide motorists navigating the device.

**4** The width of the cut-through should equal the width of the pedestrian crossing or be at least as wide as the clear path. Install bollards to impede vehicles from parking or maneuvering in the pedestrian refuge, while preserving at least 1.8 m of clear path to be accessible for people in wheelchairs and pushing strollers or handcarts.

Where applicable, combine pedestrian refuge islands with raised crossings and bulb-outs to create accessible crossings and improve visibility.

Where applicable, add cyclist crossings and waiting spaces.

Add landscaping to improve thermal comfort and stormwater management. Make sure the chosen species do not block visibility above 1 m.

Combine pedestrian islands with horizontal deflection elements like chicanes to further reduce speed.

**Key Dimensions**

**Depth (d)**

Pedestrian refuge islands should be at least **1.8 m** deep but have a preferred depth of **2.4 m**.

**Length (L) and cut-through (ct)**

A pedestrian refuge island is ideally **10–12 m** long, providing enough protection at each end of the waiting space. The cut-through should accommodate pedestrian volumes and desire lines, and should be at least **4 m** wide.

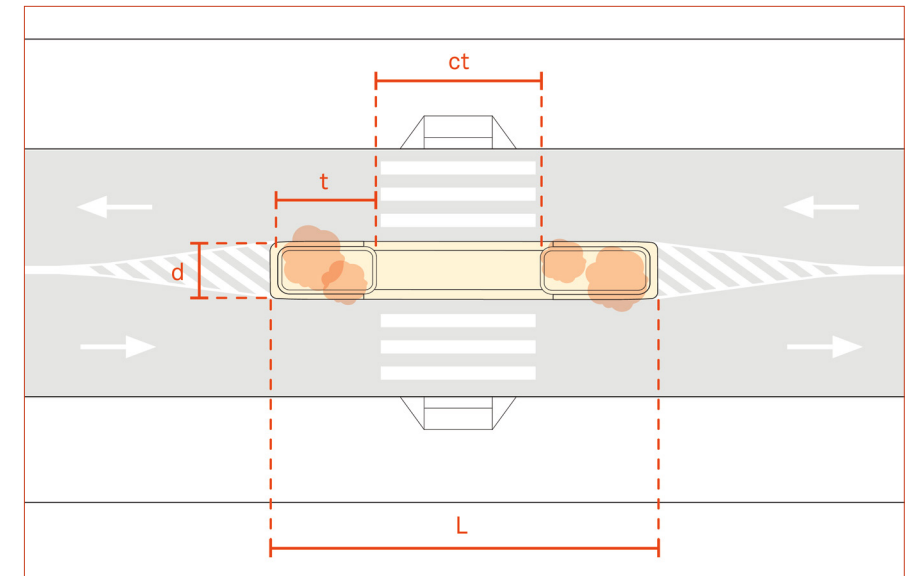
**Refuge island tips (t)**

The refuge island tips should have a recommended minimum dimension of **3 m**.

For shorter refuge island tips, sturdier protection is recommended.

**Clearance (c)**

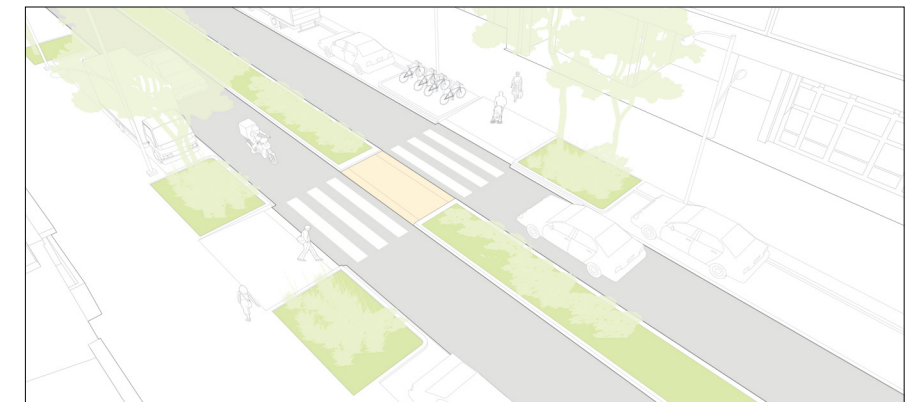
Provide an effective clearance **3.5 m** for emergency vehicle access.

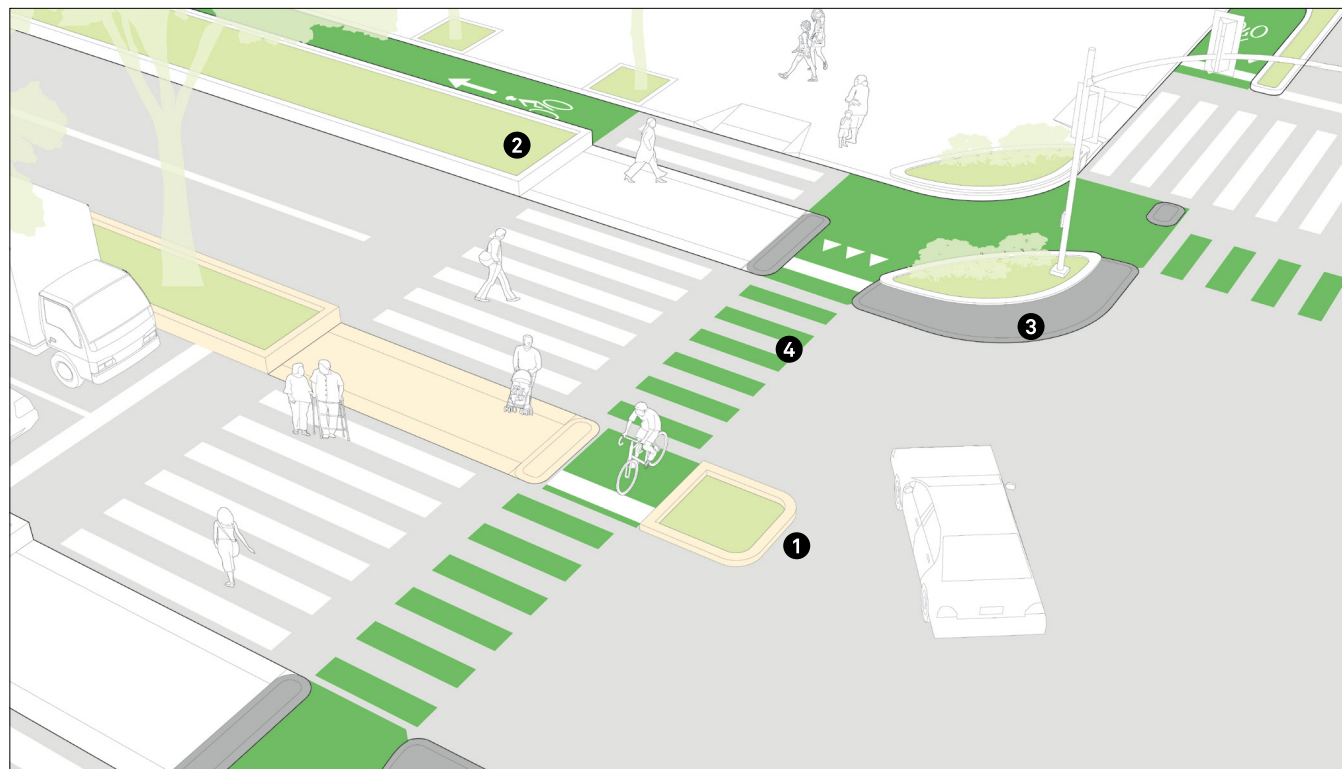


**Variations**

**MEDIAN CUT-THROUGH**

The median can be widened at the crossing point to fit a properly dimensioned refuge space while creating a pinchpoint effect. *For more information, see the Global Street Design Guide 6.3.6.*





**Overview**

At intersections, refuge islands and medians protect pedestrians and allow two-stage crossings. Median and island tips offer protection for people waiting to cross while reducing turn speeds.

**APPLICABILITY**

**Target Turn Speeds** 10–15 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Landscaping, added crossings

**Placement** Intersection

**Signals** Unsignalized / Signalized

**Multilane** Yes

Medians or refuge islands should be present when pedestrians have to cross three or more lanes consecutively.

These tools help manage turn speeds onto far-side lanes at intersections.

**Design Guidance**

**CRITICAL**

**1** All pedestrian refuges at intersections should have a tip or nose that extends past the pedestrian crossing. This protects people waiting on the median from moving vehicles and slows turning motorists.

Align median tips with sidewalk edges to reduce the speed of turning vehicles and maintain pedestrian crossing aligned with the clear path.

Install a median or refuge island when pedestrians have to cross three or more lanes.

**RECOMMENDED**

**2** To further reduce crossing distance, provide curb extensions at intersections where curbside parking is available.

Strive for the shortest crossing distances possible.

Adjust the median tip and receiving lanes' geometry to accommodate the managed, design, and control vehicles. Assume any of those vehicles can use all receiving lanes to turn.

**3** If necessary, make the corners or median tips mountable to accommodate large vehicles. *For more information, see 5.2 Safe Turn Geometry.*

**4** Where applicable, add cyclist crossings and waiting spaces.

**Key Dimensions**

**Depth (d)**

Pedestrian refuge islands should be at least **1.8 m** deep but have a preferred depth of **2.4 m**.

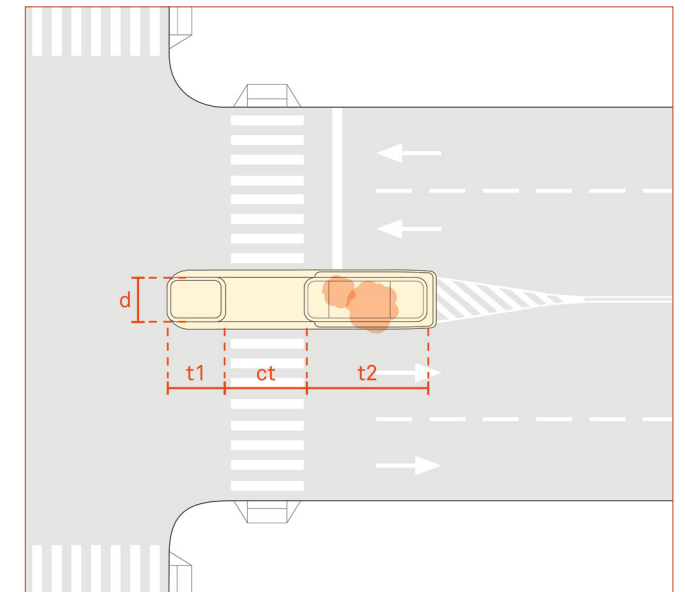
**Near side tip (t1) and cut-through (ct)**

The tip should be at least **0.5 m** long and aligned with the sidewalk edge. That may cause the cut-through to be narrower than the pedestrian crossing. Still, it should be at least as wide as the clear path. When possible, prefer wider tips of **1–1.5 m**.

For shorter refuge island tips, sturdier protection is recommended.

**Far side tip (t2)**

The refuge island tips should have a recommended minimum dimension of **3.0 m**.



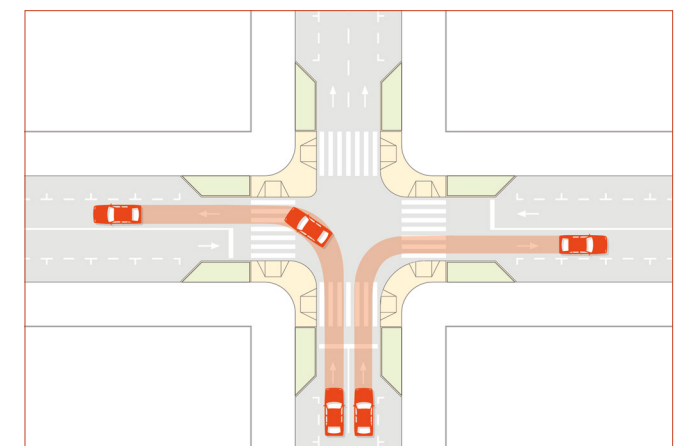
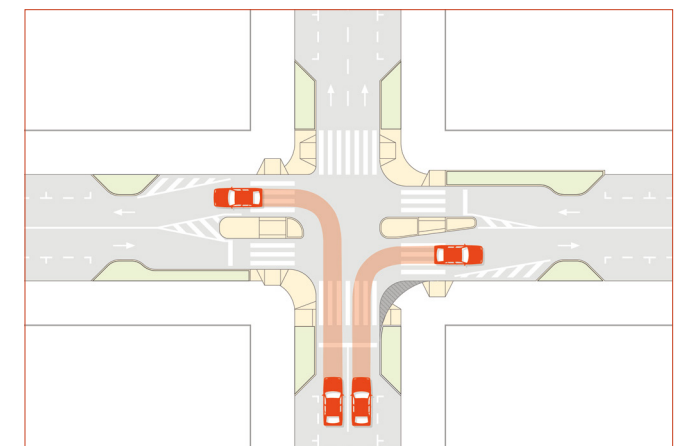
**Placement**

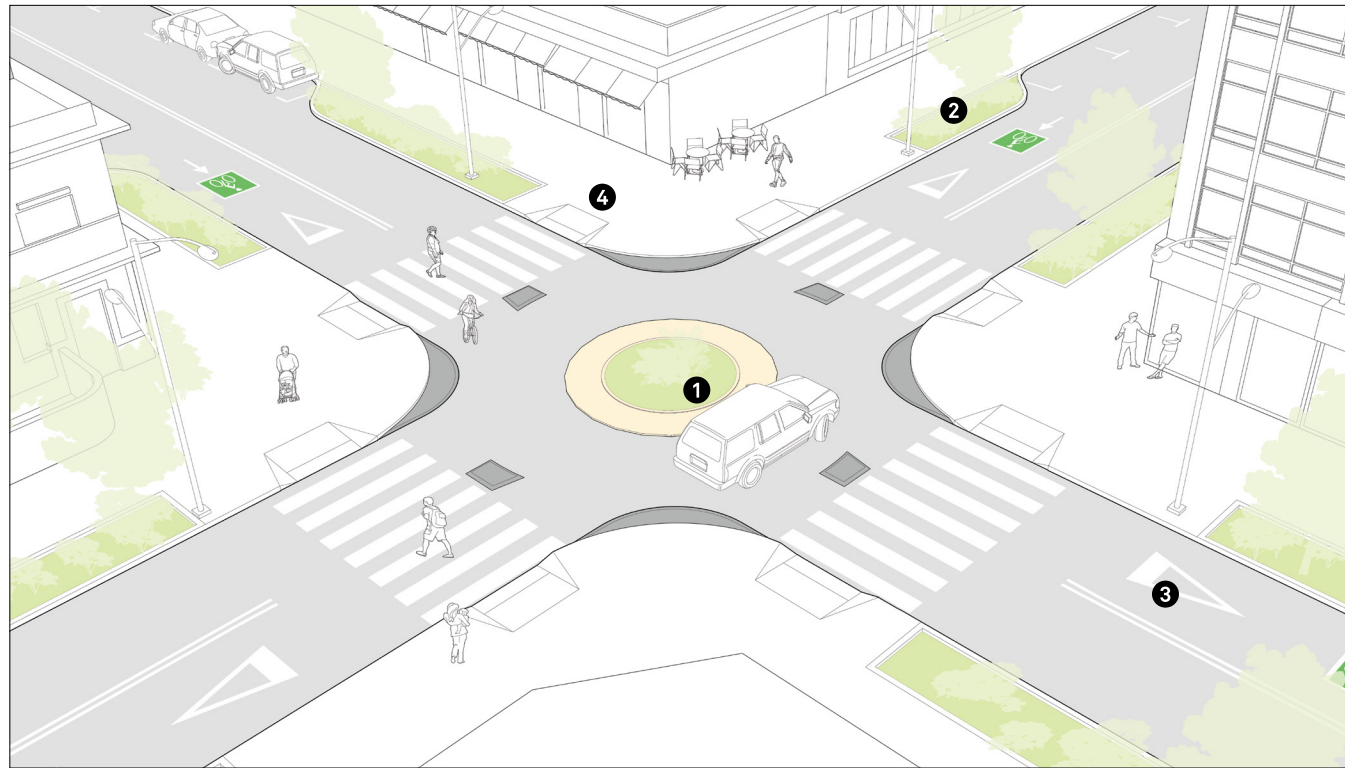
**UNDIVIDED TWO-WAY STREETS**

At the intersection of undivided two-way, two-lane streets, analyze the tradeoffs of implementing refuge islands or corner bulb-outs.

Refuge islands offer better speed reduction of left-turns in all directions and for through movements on its street, and allow for two-stage pedestrian crossing. However, it compromises right turn speeds by requiring larger corner radii. It also demands more accurate geometric detailing to accommodate turns in all directions, sometimes requiring complex corner geometry.

Corner bulb-outs expand the public space at the corners, have simpler geometry, result in shorter overall crossing distances, and support safe turn speeds, especially for right turns.





**Overview**

Mini roundabouts are circular intersections that have been shown to increase safety, reducing vehicle speeds and minimizing the points of conflict.

**APPLICABILITY**

**Target Turn Speeds** 10–15 km/h

**Target Through Speeds** 20–30 km/h

**Traffic Volumes** Low / Mid

**Co-benefits** Landscaping

**Placement** Intersection

**Signals** Unsignalized

**Multilane** No

Mini roundabouts are an effective treatment for controlling traffic at unsignalized intersections on low-volume, local streets.

If traffic volumes are higher, mini roundabouts can get saturated. In these situations, signalized intersections are generally more appropriate, but depend on other contextual factors.

**Design Guidance**

**CRITICAL**

In this type of intersection, motorists must yield to pedestrians and other vehicles navigating the intersection. Pedestrian crossings should be marked to clarify where pedestrians should cross and that they have priority.

- 1 Install mini roundabouts using markings or raised islands.
- 2 Prohibit parking at the approach and at the mini roundabout.
- 3 Add yield signs and markings at all approaches of the intersection.
- 4 Align pedestrian crossings as much as possible to desire lines.

U-turn movements shouldn't be a design requirement, particularly for large vehicles.

Manage the inner circle and inscribed circle diameters, as well as the mountable areas on the corner and the circle, to manage speeds from all movements at the mini roundabout.

**RECOMMENDED**

The design of a mini roundabout can be a complex and iterative process. Consider the intersection size, approach lanes configuration, user volumes, and managed, design, and control vehicles to define a suitable geometry. The guidance should be adapted to the context and tested before implementation.

Strive to provide horizontal deflection to right, through, and left turn movements.

If necessary, include mountable areas on the traffic circle or make it fully mountable to accommodate larger vehicles.

When pedestrian volumes are high, consider raising crosswalks or the full intersection to further reduce vehicle speeds and ensure accessible crossings.

Apply roundabouts in conjunction with plantings or trees, which enhance the traffic calming effect.

**Key Dimensions**

**Inscribed circle diameter (icd)**

The inscribed circle diameter of a mini roundabout is the diameter of the largest circle that can be inscribed within the intersection curbs. Mini roundabouts are circular intersections with an icd of maximum **25 m**. The recommended minimum diameter is **12 m** to allow for drivers to drive around, and not over, the central island. Smaller icd generally require the central island to be fully mountable.

**Central island diameter (cid)**

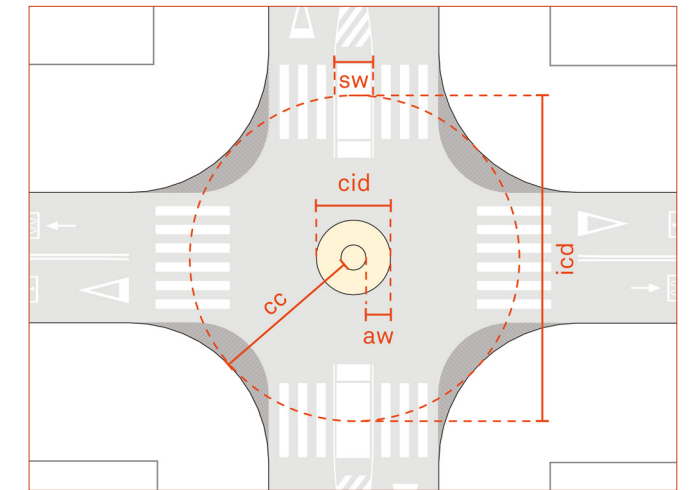
The central island of a mini-roundabout is typically a minimum of **1.5–4 m** in diameter including the aprons and in some cases can be fully mountable by large trucks and buses.

**Apron width (aw)**

The apron width typically ranges between **0.5–1.5 m** and depends on the control vehicle.

**Splitter islands width (sw)**

Provide a minimum width of **1.8 m** where the splitter island is intended to serve as a pedestrian refuge. Depending on the approach geometry, the splitter island may extend into the inscribed circle. Splitter islands should be designed to achieve adequate horizontal deflection of approaching vehicles.



**Corner clearance (cc)**

Provide an effective clearance of **5.0 m** minimum between the non mountable curbs of the corner and the central island. Mountable elements, such as aprons and corner wedges can be used to ensure the effective clearance but manage the speeds of smaller vehicles.

**Variations**

**MOUNTABLE ELEMENTS**

Mountable areas at the corners and around the traffic circle can enable occasional larger vehicles to make turns at safe speeds, while also managing the speeds of smaller vehicles.

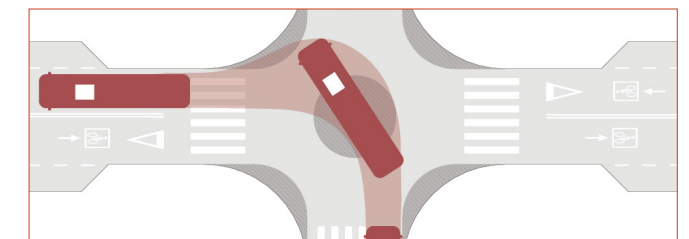
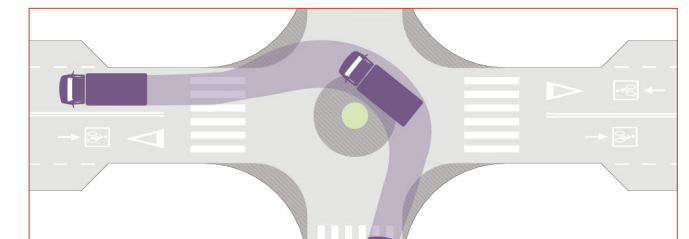
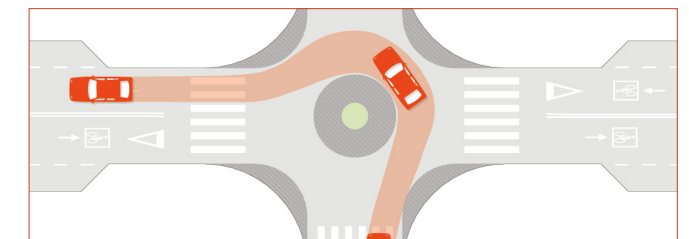
On-site trials to test the geometry can help refine the design. Use temporary paint to test the perimeter of the mountable areas, and cones to emulate the edge of the central island and, if applicable, the splitter island.

After the test, the mountable areas can be implemented using either an interim approach (e.g. combining signage and speed bumps or bollards) or, ideally, capital construction with more durable materials.

**FULLY MOUNTABLE INNER CIRCLES**

In small intersections where large vehicles need to be accommodated, such as buses or longer trucks, a fully mountable center island can be implemented at the center of the mini roundabout. The center island can feature a curb or half-curb and/or a raised sinusoidal shape.

Mountable elements at the edge of the circle, like road studs, can help to ensure compliance and reinforce the mini roundabout operation for the managed vehicles.





**Central Island with Pedestrian and Cyclist Cut-through**

**Material** Concrete pavers, curbs, and bollards

**Location** Quito, Ecuador

Central Islands must feature cut-throughs to ensure accessibility for people of all ages and abilities, for instance caregivers pushing strollers or people using wheelchairs. When there is a cycling connection through the device, it can also feature a separate cut-through for cyclists, especially if the cyclists volume is high.



**Interim Intersection Refuge Island**

**Material** Paint and bollards

**Location** Córdoba, Argentina

Central islands can also be built using strategies for faster deployment and easier adaptation. The island area must be clearly marked with paint and delimited with high-visibility bollards, and should aim for a tighter turn radius, but account for mountable areas for larger vehicles.



**Peanut-shaped Mini Roundabout**

**Material** Paint

**Location** Recife, Brazil

Mini roundabouts can adopt other shapes to better adapt the geometry of the intersecting streets, for instance to accommodate wider medians in two-way streets.

Peanut-shaped roundabouts can also be relevant in angled four-arm intersections



Before

**Mini Roundabout with Interim Materials**

**Material** Paint, bollards, and planters

**Location** São Paulo, Brazil

Mini roundabouts can be created using interim materials such as paint, bollards, planters, and other urban furniture. This approach helps in test configurations and design parameters.

Ensure pedestrians, especially on waiting areas, are protected by physical barriers that are also visible to motorists.

This approach also poses an opportunity to quickly combine and test other elements, such as sidewalk extensions and central islands.

Mountable areas in the mini roundabout can be created by using a slightly different paint pattern.



Pop-up



Interim

# 7.4

## Operational Tools

### 7.4.1 Modal Filters

### 7.4.2 Signal Progression and Coordination

### 7.4.3 Automated Speed Enforcement

Operational tools alter and enforce rules that affect the movement and right of way of different street users.

Such tools can be used to enforce the right of way at conflict points to prioritize the safety of vulnerable users, reduce volumes or restrict access of motor vehicles to certain streets, or simply enforce motorists' speeds.

The way they affect speeds also varies. The impact of the tools can range from simply changing motorists' perception of the roadway space, to enforcing crossings and speeds, to filtering out higher-speed through traffic.

Operational tools must be used as part of coordinated efforts to reduce speeds and be combined with physical measures for increased efficacy. Always take into consideration the local context of the street and area.

By changing the configuration of different street user networks, the impact of operational tools can stem beyond the device itself and profoundly change the character of the street to become more people-friendly.



## Modal Filters

Modal filters use physical and operational mechanisms to create nearly car-free streets, increase connectivity of the cycling network, and improve transit operations, while retaining local vehicular access. Travel purpose can affect motorist speeds, and trips cutting through neighborhoods tend to have higher speeds than local access ones. Modal filters break roadway continuity, removing speeding opportunities. Complement their application with additional speed management strategies. For more information, see 6.2 Network-level Considerations.



→ London. UK

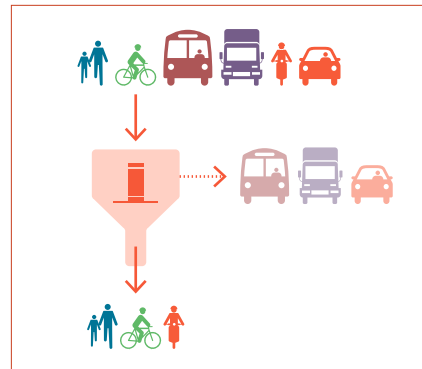
### Types

Modal filters can physically restrict passage of four-wheeled vehicles or use camera enforcement to set more specific filtering criteria.

Hybrid models can use both mechanisms in combination.

Flexible or actuated bollards can ensure emergency vehicle access. Modal filter planning should take into account public service and emergency vehicle access.

The recent growth of motorcycling in some countries can pose challenges to cities. There is no way to physically restrict motorcyclists' access without limiting cyclists'. Camera enforcement may be the most immediate way around but contextual equity considerations should be taken.

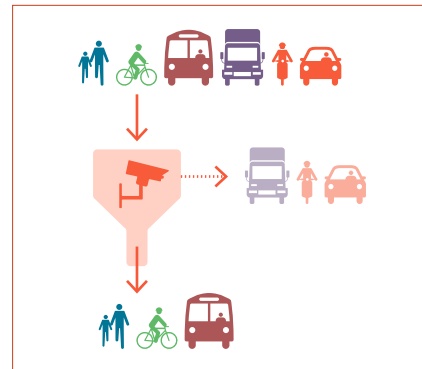


#### PHYSICAL FILTER

Physical filters restrict vehicle access by using elements such as bollards, planters, and curb extensions.

Their design parameters such as gap width or element height dictate what motorized vehicles can pass through, while ensuring access to cyclists and pedestrians.

Physical modal filters are often more cost-effective and simpler to implement than camera-enforced alternatives, while still offering comparable benefits in restricting through traffic.



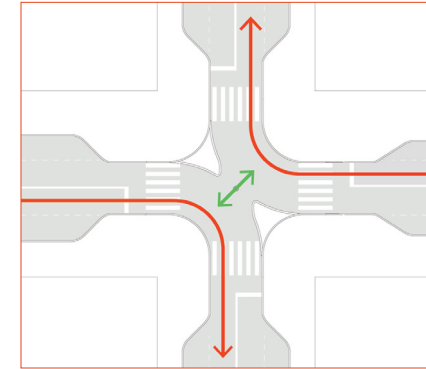
#### CAMERA-CONTROLLED FILTER

Modal filters can use cameras to allow certain designated users to pass through. Non-compliant vehicles can be either prevented access physically (e.g. by bollards or barriers) or dissuaded by fines.

Camera-controlled filters help facilitate access to local residents, bus routes, emergency vehicles, and freight vehicles under specific rules.

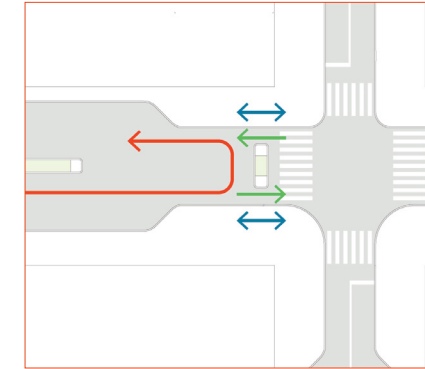
This mechanism also allows the device to operate at certain times of the day or days of the week.

### Interim and Permanent Materials



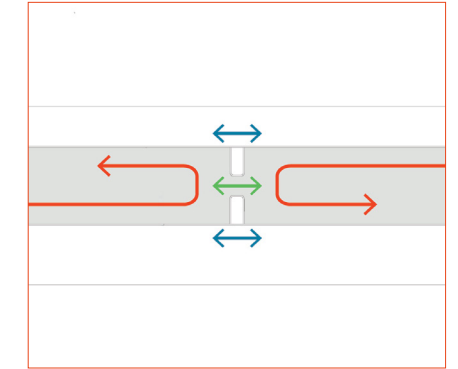
#### INTERSECTION

Intersection filters fully restrict through movements on one or multiple streets. Variations include diagonal diverters and median closures. Retain through access to authorized users.



#### APPROACH

Approach filters restrict fully or partially movements to and from a specific leg of an intersection. It mostly affects the direction in which it's placed.



#### MID-BLOCK

Mid-block filters can be used to restrict through traffic on the street. It may create more confusion with motorists, but can be useful when access requirements prevent filtering at the approach.

### Design Guidance

There are numerous ways to design modal filters, which can accommodate diverse mobility needs, and enhance the public realm by incorporating additional functions.

#### NETWORK DESIGN

The key design characteristics of a modal filter are defined by its role in reshaping the networks of different street users.

Restricted vehicular movements like forced turns, turn prohibitions, or closures, along with the permeability needs of the authorized users will define most of the filter's geometric design.

Use signs, markings and other visual cues to maximize wayfinding for all modes at the tool.

#### ACTIVE MODES PERMEABILITY

Modal filters must retain permeability for pedestrians and in the majority of cases for cyclists. Include accessibility ramps and cycle bypasses in the filter's design.

Low-volume streets can create safe conditions for sharing space between pedestrians and motorists. Consider that pedestrians may walk, roll, or jog along the shared roadway and design the tool accordingly.

#### TRANSIT GATES

Use camera-controlled modal filters to retain access to transit lines through filtered streets.

#### ACCESS LANES

On safe speed corridors with separate motor vehicle access lanes, add forced turns and modal filters to avoid turning the access lane into an additional through lane.

#### PUBLIC SPACE

Expand the footprint of the modal filter to include landscaping, seating, and other public realm enhancements. Larger filters can become pedestrian plazas. For more information, see 6.4.5 Neighborhood Plazas.

#### EMERGENCY ACCESS

Work with fire and emergency and disaster response departments to inform the design of the filter and accommodate their operations, ensuring emergency access is maintained without compromising the filter's overall effectiveness.

# Modal Filters

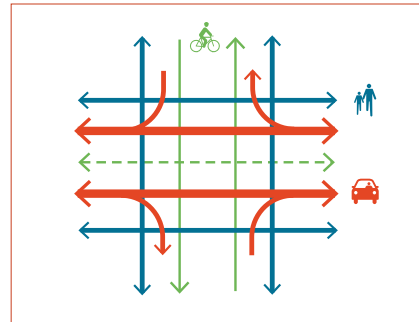
## Variations

### MEDIAN FILTER

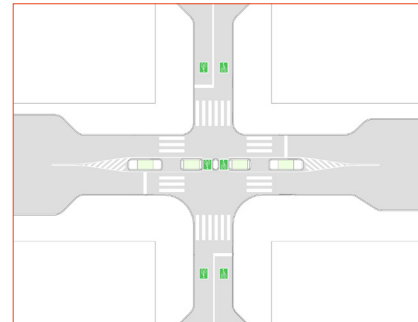
Prevent through traffic across a higher-volume street and left turns across traffic onto the minor street.

Add cut-throughs for pedestrians and cyclists to cross the median comfortably. This filter favors cycle traffic along the smaller street.

#### Operations



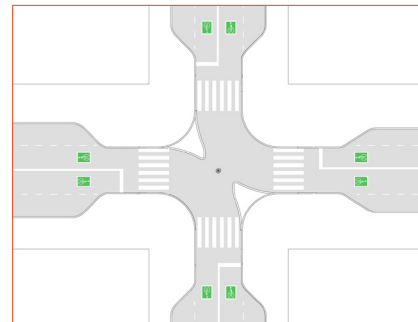
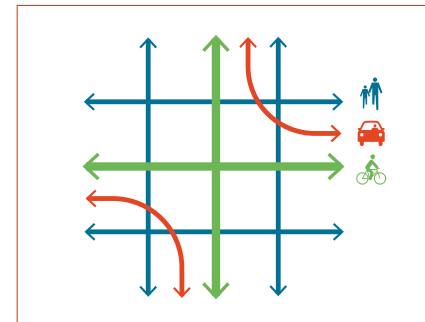
#### Design



### DIAGONAL DIVERTER

Add forced turns at the intersection and prevent vehicular through-traffic while retaining cycling permeability to both streets.

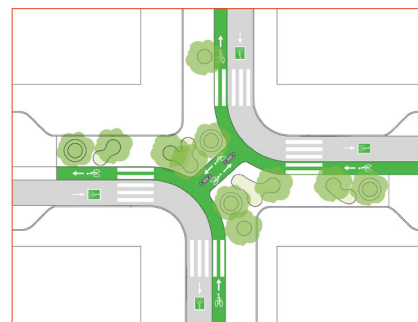
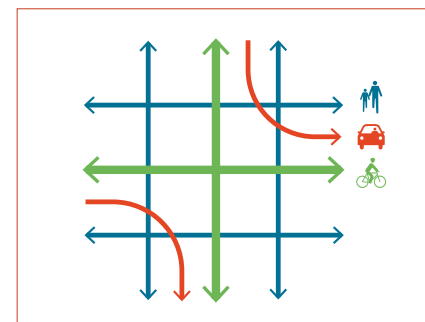
A diverter creates horizontal deflection, slowing down vehicles turning.



### DIAGONAL PLAZA

On larger intersections of one-way streets, add forced turns and prevent vehicular through-traffic to create a pedestrian plaza.

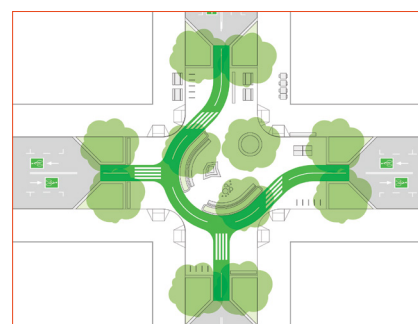
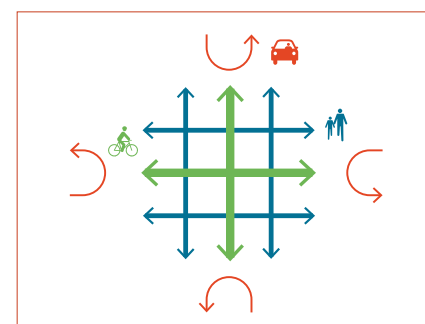
Add cut-throughs for cyclists and consider their layout to allow turns in all directions, yet maximizing the available pedestrian space by the corners.



### INTERSECTION PLAZA

Remove through traffic from all legs of the intersection to create a pedestrian plaza.

Add cut-throughs for cyclists. Consider bending those to maximize the usable public space in the center. Add street furniture and landscaping.

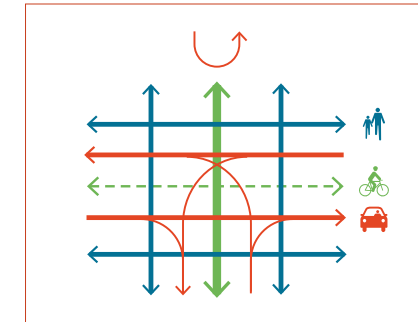


### ONE-LEG CLOSURE

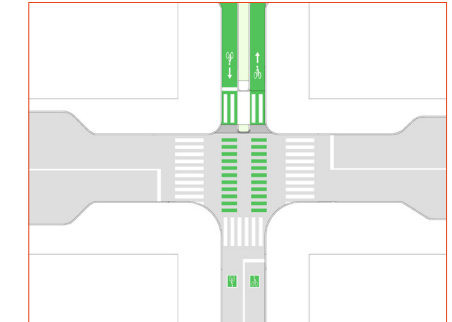
Extend sidewalk entirely on one leg of the intersection to create a full closure. Retain cycle bypass lanes.

Reclaimed space can be repurposed as public space.

#### Operations



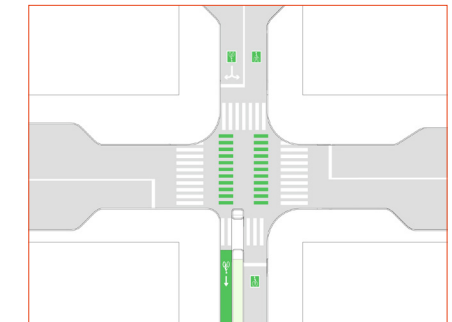
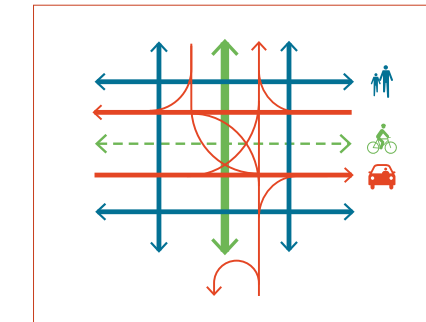
#### Design



### PARTIAL CLOSURES

Install a physical barrier over one receiving lane to prevent motor vehicles from turning onto the filtered street. Add cycle cut-throughs to retain permeability.

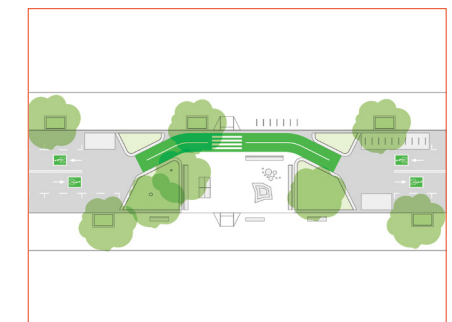
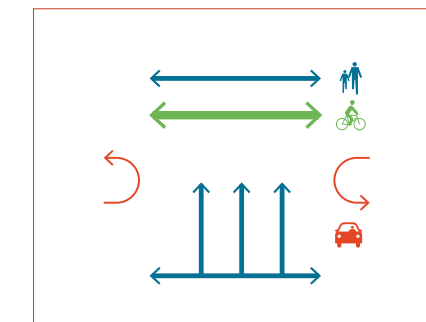
The narrowed roadway can operate as one- or two-way (configuring a yield entrance point).



### MID-BLOCK PLAZA

Extend mid-block modal filters to create playgrounds or pedestrian plazas. Mid-block locations are favorable to create playgrounds as they are further away from conflicts at intersections.

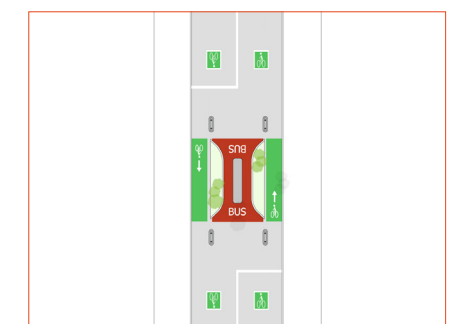
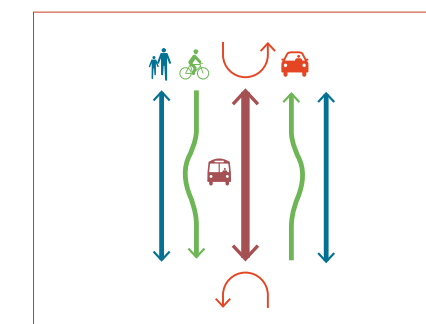
Bend the cycle bypass to maximize public space use.



### TRANSIT GATE

Transit gates allow managing private motorized traffic while retaining permeability for cyclists and transit vehicles.

This approach is more suitable on streets with low-frequency local transit routes, ensuring an acceptable level of interaction between cyclists and transit vehicles.





**One-leg Closures with Added Vegetation**

**Material** Concrete  
**Location** Copenhagen, Denmark

Modal filters also create opportunities for dedicating street space towards other goals, such as increasing vegetation and permeable area in a street.



**Partial Closure Filter Using Modular Materials**

**Material** Modular rubber and bollards  
**Location** Denver, USA

Modular materials can be used to install partial closure filters more quickly and test new network configurations.



**Camera-controlled Filter with Exception for Loading**

**Material** Automated license plate recognition cameras  
**Location** London, United Kingdom

Modal filters can be created through automated enforcement, allowing for more flexible rules such as time windows for freight vehicles, local residents, and emergency vehicles.



**Width-based Modal Filter**

**Material** Granite and metal bollards  
**Location** London, United Kingdom

Modal filters can use physical barriers or narrowings to restrict access by vehicle width, allowing pedestrians, cyclists, and smaller vehicles while deterring larger vehicles.

This presents a lower-cost alternative to restrict the movement of larger and heavier vehicles.



**Transit Gate**

**Material** Automated license plate recognition cameras  
**Location** London, United Kingdom

Automated cameras can add a more specific layer to modal filters by recognizing vehicle types. This enables cities to create selective permeability that allows free movement of transit and specific freight vehicles, while restricting through traffic.



**Median Filter at Signalized Intersection**

**Material** Concrete  
**Location** Mexico City, Mexico

When placed at the intersection with streets with higher traffic volume, median filters can be implemented along with traffic signals. This allows pedestrians and cyclists more crossing opportunities, as well as gaps so motorists can turn.

# Signal Progression and Coordination

Signals work in combination with geometric design to create a highly functional multimodal street. Among many other functions, its programming influences motorists' behavior and determines the pace of urban streets. They can be key elements in preventing unsafe speeds. Adjust signal programming so that motorists advance with safe progression speeds and a few consecutive intersections at a time. Conversely, long coordination zones can encourage motorists to speed, even with low progression speeds.

## Key Terminology

### SIGNAL PHASE

A signal phase is the time during which a particular signal color or message is displayed, telling road users when to go, stop, or clear the intersection. For vehicles, this typically means green, yellow (or amber), and red. For pedestrian and cyclist signals—though designs vary by country—green generally means go, red means stop, and flashing or amber signals mark the clearance time.

For pedestrians, longer green (or equivalent) phases and more clearance time mean that people will have more time to cross, allowing a safer crossing for senior adults, children, and people with reduced mobility.

For vehicles, in turn, longer greens means additional capacity for that movement.

### SIGNAL CYCLE

A signal operates in cycles repeating its phases, and the duration of the cycle is also called cycle length. They can be constant or change along periods of the day to suit different situations.

### PROGRESSION SPEEDS AND OFFSET

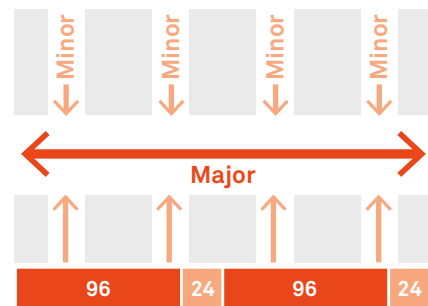
The coordination between the green phases of subsequent signals are called green waves, and the delays between the subsequent green phases are called offsets.

The combination of progression speeds and offsets influence the pace of signalized corridors. Coordinated signal timing synchronizes traffic movements along a corridor, and can be used to manage the speed at which traffic "progresses" along a street.

## Signal Cycles

Shorter cycle lengths reduce waiting times for pedestrians and can reduce travel time for vehicular traffic, especially outside more congested hours. Additionally, though longer cycles will increase traffic capacity, they will also increase waiting times and can create complaints from motorists.

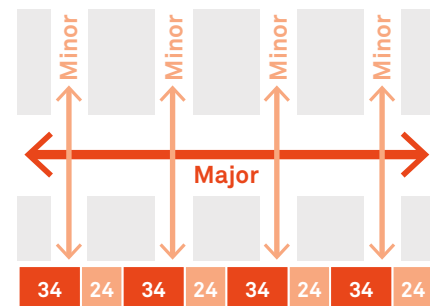
Long cycle lengths can make large avenues into barriers that separate neighborhoods and can make crossing the street or walking short distances frustrating or prohibitive. Long cycles should only be used if necessary to provide pedestrian crossing time on very wide streets.



**Long cycle lengths** (in seconds) should be used in limited cases as they can divide neighborhoods and make walking or crossing the street frustrating and prohibitive.

Pedestrian crossing times must be defined using the path length and consider speeds that are accessible for every street user. While walking speeds range from 0.3 m/s–1.75 m/s or 1 km/h–6 km/h, people who walk with assistance—canes, walkers, or other devices—are limited to speeds of 0.3 m/s–0.5 m/s.

Provide predictability and consistent opportunities to cross streets by including pedestrian lead intervals in every cycle in busier corridors. Actuated signals and beacons are applicable where pedestrian volume is very low and speed management is not sufficient to create safe crossings.

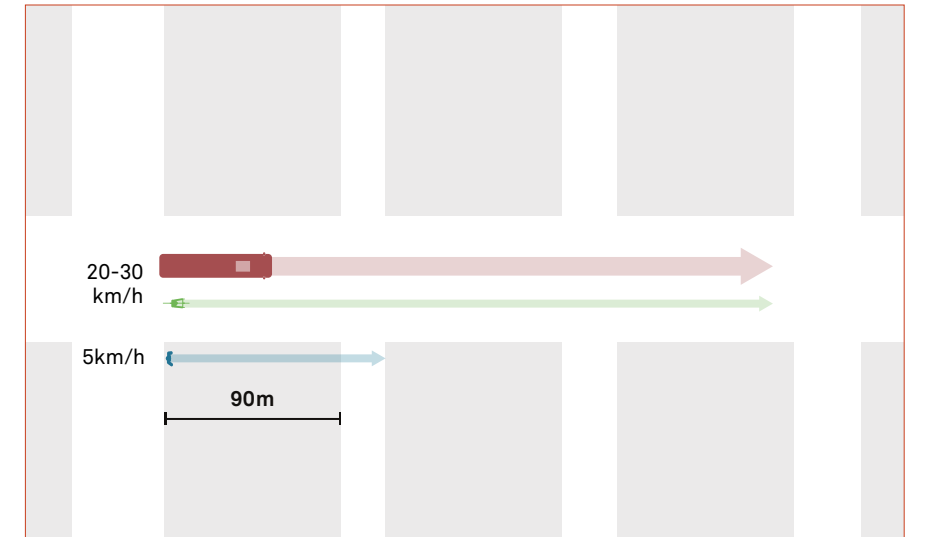


**Balanced cycle lengths** (in seconds) reduce waiting times in all directions and create crossing opportunities at closer intervals.

## Progression Speeds

As it is still possible for motorists to drive above the progression speed, set it below the safe target speed for the street. This will help ensure motorists drive at safer speeds, with little to no impact on travel times.

Lower progression speeds, such as 20–30 km/h, help optimize bicycle and transit movements. Depending on the distance between signals, this progression speed can also be synchronized with walking speeds, typically 1–1.5 m/s, providing relatively short wait times for people walking along the major street.



## Coordination Zones

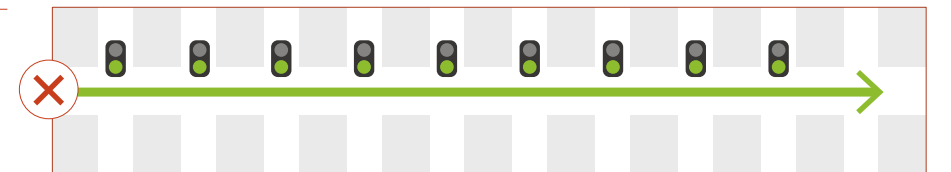
Even when signals are timed for a low progression speed, motorists may still exceed that speed in an attempt to "beat" the next red light, undermining the original intended effect and potentially inducing unsafe operating speeds between intersections.

Consider the segment length that is adequate to the target speed of that street, and set the length of coordination zones accordingly. *For more information, see 4.1.2 Adjust the Street Pace.*

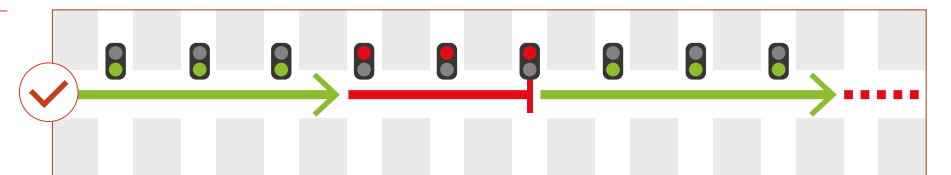
Limit coordination zones to a maximum progression of three consecutive traffic lights.

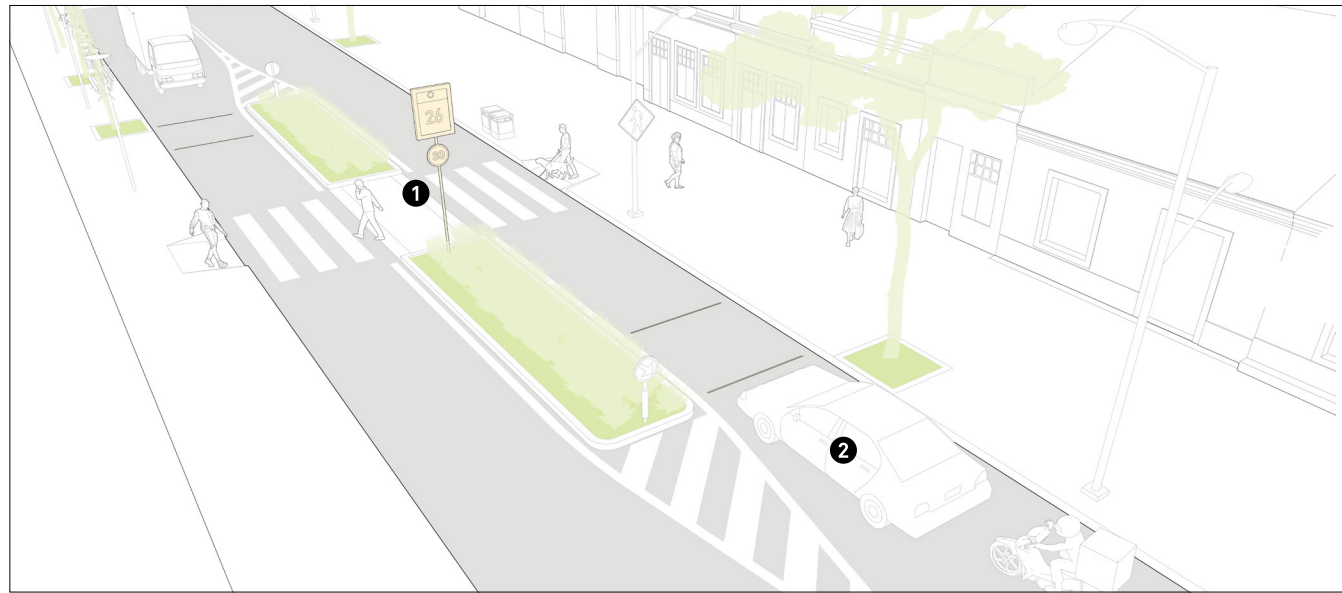
### 40 km/h target speed

Even with a low progression speed, longer coordination zones allow motorists to reach higher speeds.



Shorter coordination zones prevent incentives for motorists to speed.





### Overview

Speed enforcement cameras can display real-time vehicle speeds and compliance and, along with feedback signs, serve both as a deterrent and an educational tool. For these systems to be effective, they must be integrated with robust enforcement mechanisms—such as fines and demerit point systems or their local equivalents. Their impact can be further enhanced when combined with complementary measures, such as pedestrian refuge islands or other physical traffic calming interventions.

#### APPLICABILITY

**Target Speeds** 20–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** Crossings

**Placement** Mid-block / Approach

**Signals** Unsignalized / Signalized

**Lane configuration** Single-lane / Multilane

This tool is applicable when deploying an extensive combination of design-based speed management tools is not feasible or impractical.

Cameras are commonly used in unsignalized, high-volume corridors, but can be applied to a diverse range of contexts.

### Design Guidance

#### CRITICAL

For this tool to work, local authorities must be able to enforce fines and other legal consequences for non-complying motorists.

**1** Combine display speed cameras or feedback signs with other tools to increase the treatment effectiveness.

Add signage upstream of the device to ensure the posted speed is clear and the device is visible for motorists in all weather conditions, and from both directions of traffic as applicable.

Clearly displaying each motorists' speed is important to ensure transparency and mitigate community resistance. This can be combined with visual cues, such as green or amber lights, confirming if the motorist complies or not with the speed limit.

#### RECOMMENDED

**2** If using inductive loops to measure vehicle speeds, extend the median to fully contain them within the curbs. This design helps prevent motorists, especially motorcyclists, from swerving to avoid the sensors.

Communicate the implementation beforehand locally and through media. Deploy traffic agents at the site to explain the measure to motorists at peak hours and, if applicable, provide a grace period.

Ensure a reliable power supply and that enforcement data is transferred to the relevant enforcement agency.

Collect additional multimodal user volume data for planning purposes.

Avoid obstructing pedestrians attempting to cross at the edge of the roadway or on the pedestrian refuge island.

### Overview

Speed radars provide automated enforcement of vehicle speeds but do not contribute to broader street improvements or placemaking. Due to potential public opposition, they should be considered a measure of last resort, implemented when other speed management strategies are insufficient or impractical.

#### APPLICABILITY

**Target Speeds** 30–50 km/h

**Traffic Volumes** Low / Mid / High

**Co-benefits** None

**Placement** Mid-block / Approach / Intersection

**Signals** Unsignalized / Signalized

**Lane configuration** Single-lane / Multilane

### Design Guidance

#### DESCRIPTION

Automated speed enforcement is a highly effective tool to manage speeds, especially on high-volume streets where redesign might not be a near-term option.

For this tool to be effective, the right legal framework must be in place so that authorities can enforce fines and legal consequences.

Automated enforcement devices ensure a fairer and more equitable approach than manual enforcement.

#### DISCUSSION

Automated enforcement is more effective and has less resistance if paired with design measures that also reflect the target and posted speed in a street.

A public information campaign should accompany speed radar implementation. A multimedia campaign, with in-person education as needed, and grace periods with warnings issued in the first weeks after activation, can improve compliance and expand public support.

Automated enforcement can be used as a temporary speed management approach in multilane corridors, before they can be more profoundly redesigned.

#### Display Speed Camera at Gateway

**Location** Mexico City, Mexico

Display speed cameras can be deployed at the entrance of lower speed areas, as part of a gateway treatment. This further communicates to motorists that they are entering an area with a lower target speed.



#### Speed Radars near Schools

**Location** New York, USA

In 2019, New York State authorized NYC DOT to install speed radars in 750 school zones, working continuously since 2022. The devices are placed where high rates of speeding and crashes are observed.

By May 2022, over 2000 radars were active, leading to a 73% average reduction in speeding. The program has significantly reduced injury crashes, especially in high-traffic corridors, making school zones safer for students and pedestrians.<sup>7</sup>



# Resources

# Acknowledgments

## Global Designing Cities Initiative

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# Key Terms

---

## Active Mobility

Active Mobility or healthy transportation choices, refers to any form of human-powered transportation. These may include walking, cycling, or using a non-mechanized wheelchair that increases physical activity levels, positively impacting public health. All active modes of transportation are also sustainable modes of transportation as they leave minimal carbon footprint and do not contribute to carbon emissions.

---

## Clear Path

The pedestrian clear path defines the primary, dedicated, and accessible pathway on the street. It is an unobstructed, level, and smooth surface that ensures that pedestrians have a safe and adequate place to walk. Clear paths must be wide enough to allow two people in wheelchairs to pass one another, and are recommended to have a minimum width of 1.8 m.

---

## Cycle Lanes, Tracks, and Streets

Cycle lanes, also known as conventional bike lanes, are defined as a portion of the roadway that has been designated by striping, signage, and other pavement markings for the preferential or exclusive use of cyclists.

Cycle tracks are exclusive facilities physically separated from motor traffic and distinct from the sidewalks. They provide the highest degree of comfort and safety for cyclists. Protected cycle tracks achieve separation through raised buffers or parking lanes while raised cycle tracks are vertically separated to either meet the sidewalk-level or be a half-a-step between the sidewalk and the street level.

Cycle streets are streets where cycles share the road space with vehicles, and cars are considered guests. Speeds in these streets should not exceed 30 km/h. Design treatments manage motor vehicle speed and volume by calming or restricting through-traffic, while connectivity remains for cyclists. Cycle streets can play a key role in cycle networks, complementing and providing connections between other cycle facilities.

---

## Daylighting (intersection)

In intersection design, Daylighting consists of prohibiting parking and loading within a certain distance of an intersection to increase visibility between motorists and pedestrians. This can also be achieved through geometric design, by physically extending the curb, or raising the pedestrian crossing. Temporary or permanent bollards are often used to daylight intersections in low-compliance contexts.

---

## Exposure and Risk

For the purpose of this guide, Exposure is defined as the state of being exposed to risk. It is measured as the probability of a user being involved in a crash. Risk refers to any situation involving exposure to danger, injury, or loss that may involve factors such as perception, willingness, and convenience. Mathematically, it is defined as injury rate calculated as the number of injuries or crashes over the amount of exposure, or over the population. Risk may apply to perception of risk or the tendency to take risk.

---

## Facilities (Cycle or Transit)

Facilities, such as cycle facilities or transit facilities, are designated spaces within the street that are specifically designed for the movement of the given mode. Dedicated facilities ensure safe and efficient movement of the mode.

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## Filtered Permeability

Filtered permeability refers to physical and operational mechanisms to retain specific types of motorized modes, while keeping or increasing the connectivity of the pedestrian and cycling network. The devices used to implement filtered permeability are also called modal filters (see 7.4.1 for more information), and can be deployed through different tools like bollards, planters, camera enforcement, and many others.

---

## Flex Zones

Flex zones are spaces within a cross section of a street that can be dedicated to different uses, according to the immediate context of the street. Examples include loading zones, urban furniture, landscaping, curbside parking, street vendor pockets along the curbside, and many more. Flex zones help make an efficient use of limited space, address specific demands along the different contexts of a corridor, and include all users and activities.

---

## Green and Blue Infrastructure

Green and Blue Infrastructure refers to green spaces (green) and water bodies, natural or engineered (blue), and also refers to a planning and design approach for these resources in an interconnected network. The term describes the network of green spaces and water systems that mimic those found in nature and values their ability to deliver multiple environmental, economic, and social benefits.

---

## Infrastructure (Pedestrian, Cycle, or Transit)

Green and Blue Infrastructure refers to green spaces (green) and water bodies, natural or engineered (blue), and also refers to a planning and design approach for these resources in an interconnected network. The term describes the network of green spaces and water systems that mimic those found in nature and values their ability to deliver multiple environmental, economic, and social benefits.

---

## Pop-Up, Interim, and Capital Transformations

Pop-Up transformations are a quick way to generate excitement, demonstrate the immediate impacts of a design on a project site, and make the case for an interim or permanent project. They can last for a few hours or days, and sometimes happen recurrently, like weekend play streets or bike lanes. A pop-up project uses temporary paint, cones, freestanding delineators, moveable street furniture, and/or barriers.

Interim transformations provide instant benefits while advocating for scalable solutions. Interims can last from a few weeks to a few months and generally use street markings, paint, signs, fixed delineators, moveable street furniture, and/or barriers. Interims give the opportunity to experience the project and collect data over a slightly longer timeframe: before, during, and after the project.

Capital transformations are the ultimate goal of pop-up and interim interventions. They are built with more permanent materials, which make them less flexible for adjustments, and allow for broader and more transformations.

---

## KSI or Road Traffic Fatalities

KSI stands for Killed or Seriously Injured and the definition may vary from country to country. For the purpose of this guide, seriously injured refers to a non-fatal injury received due to a crash which prevents the person from walking, driving, or normally continuing the activities the person was capable of performing before the injury occurred. Killed refers to road traffic fatalities, where the person dies within 30 days after collision due to injuries received in a crash. Road Traffic Fatalities refers to both Killed and Seriously Injured.

---

## Mixed Traffic

The flow of traffic in which users and vehicles with different operating speeds and purpose are mixed without physical separation is referred to as Mixed Traffic.

---

## Roadway or Roadbed

Roadway, also known as roadbed or carriage way, is the part of a street is intended for vehicular movement, in contrast to a sidewalk or median. Often referred to as the curb-to-curb distance, it can be measured from one edge of the curb to the other.

---

## Street Capacity

For the purpose of this guide, Street Capacity refers to the volume of people or total number of persons that a street can move in the given space and time, using any mode of transport.

---

## Sustainable Modes

As the name suggests, any form of transport that is sustainable with respect to social, environmental, and climate impacts is a sustainable mode of transport. These modes do not use or rely on depleted natural resources. Instead, they rely on renewable or regenerated energy. This form of transport is socially equitable and offers increased mobility. This guide considers all active modes of transportation, collective transportation, along with vehicles using renewable energy, as sustainable modes of transportation.

---

## Traffic Calming

Use of physical design and other measures, including narrowed roads and vertical or horizontal deflections, with the intention of slowing down or reducing motor-vehicle traffic and speed to improve safety for pedestrians and cyclists is known Traffic Calming.

---

## Universal Accessibility

Universal Accessibility, in context of this guide, builds upon the principles of universal design. It refers to design that includes the needs of people whose physical, mental, or environmental conditions limit their performance. It aims to extend its definition to include people of all ages and abilities, who might be in a temporary situation of handicap at a given point. It addresses the larger issues of usability and access by making navigation and movement easier for everyone.

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**2 Addressing Speeds in the City:** 44 Melissa & Chris Bruntlett; 49 top Global Health Advocacy Incubator (GHA), bottom Comune di Bologna.

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**6 Street Transformations:** 130 Mapillary user “eric\_s”; 131 National Association of City Transportation Officials; 135 Seattle Department of Transportation (SDOT); 138 top and bottom Adria Goula Photo; 139 top and bottom Melissa & Chris Bruntlett; 144 top and bottom Dan Burden; 152 City of Fortaleza; 153 top Buenos Aires City Government, bottom United States Environmental Protection Agency; 154 top and bottom State Pune Municipal Corporation; 155 Attila Glázer/Lépték-Terv; 158 top WikiCommons user “FRED”; 159 top Michael King, middle and bottom ITDP Africa; 162 top Mapillary user “grobin”, bottom WikiCommons user “ZKang123”; 163 bottom Elements Creative India for ITDP India & Smart Cities Mission; 166 top and bottom New York City Department of Transportation; 167 top and bottom New York City Department of Transportation; 177 top Secretaría Distrital de Movilidad de Bogotá; 181 bottom Colectivo Tomate; 186 Bianca Macêdo.

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## About the Designing for Safe Speeds Guide

*Designing for Safe Speeds* supplements GDCI's *Global Street Design Guide* (GSDG), which sets a new global standard for designing urban streets that prioritize people. This guide builds on the existing GDCI publications on holistic street design and emphasizes speed management, one of the most critical factors in reducing traffic violence and saving lives. In line with GDCI work it maintains a comprehensive approach to help cities create safer, more livable streets for everyone. Though it can be used as a standalone document, *Designing for Safe Speeds* is best applied in combination with the GSDG, as it references key principles from the original guide, along other GDCI resources. Funded by Bloomberg Philanthropies, this document will inspire leaders, inform practitioners, and empower communities to advocate for and implement changes in street and network towards safe speeds, while helping achieve cleaner air, increased mobility, more physical activity, and other sustainability and livability goals.

"Eventually, the hope is that, street by street and project by project, entire cities will support and evolve into safe speed environments, creating more livable, sustainable, and healthier places for all"

**Skye Duncan**, Executive Director, Global Designing Cities Initiative



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