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SINGAPORE

IN THIS EDITION

Decades of transportation planning focused on reducing vehicular congestion has created road designs with little infrastructure to support active mobility. As cities around the world increasingly embrace alternative modes of transport, this report highlights the need for rethinking design standards in Singapore to create more people-friendly roads and reduce dependence on cars.

L Street, a multimodal street in downtown Washington, DC.
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Streets for All: Designing Multimodal Streets for a Car-Lite Singapore

INTRODUCTION

In 2014, Prime Minister Lee Hsien Loong announced the government's intention to make Singapore "car-lite".[1] To achieve this goal, the Ministry of Transport (MOT) and the Land Transport Authority (LTA) adopted a three-pronged strategy:

- Improve and expand public transport systems.
- Provide alternative modes of transport.
- Curb growth of private vehicles and manage current usage.

Policies such as expanded Electronic Road Pricing, increasing capacity of the Mass Rapid Transit (MRT) system, and building cycling infrastructure have since been adopted to reduce reliance on cars. Despite these measures, alternative transport modes—such as bicycles and personal mobility devices—will remain secondary as long as road design prioritises cars.

Singapore's road infrastructure and traffic demand-management policies have created an environment where driving is the most convenient transportation mode. According to LTA's Land Transport Masterplan 2008, the average public transport journey time is 1.7 times longer than by car.[2] Even during peak hours, motorists can travel at high average speeds of 28.9 km/h on arterial roads and 64.1 km/h on expressways.

So what can planners do to narrow this difference? This report compares Singapore's road and street designs with select cities and countries, and suggests ways to redefine standards to exemplify a "people first", rather than a "motorist first", approach.

SHORTCOMINGS OF EXISTING ROAD & STREET DESIGN

Roads and streets fulfil different purposes and serve different needs. Technically, while roads facilitate the movement of people between destinations, streets are destinations in themselves. The design of Singapore's roads and streets is dictated by LTA guidelines that emerged from decades of transportation planning aimed at limiting congestion. The width and elements making up the road cross sections are determined by the road hierarchy, which is based on their functions and capacity. The LTA has a set of criteria to help guide safeguarding road reserves, and for developers to determine buffer distances between

roads and buildings. Cross sections and arrangements of the following five road categories are provided in the figures below:

- Major roads.
- Roads in industrial areas.
- Roads in residential areas for public housing.
- Roads in residential areas for private housing.
- Service roads.

While these typical cross sectional details provide a standard for uniform street design, their narrowly defined classifications do not cater to the needs of a wide spectrum of road users. (Please see Annex A for details of the typical cross sections.) Standard features can guide engineering efficiency for thoroughfares with high-speed traffic, but the typical cross sectional details provided by the LTA's Code of Practice (Street Works Proposals Relating to Development Works) mainly serve motorists and pedestrians. They do not cater sufficiently to the needs of children, the elderly, mobility-challenged groups, cyclists and other vulnerable modes of mobility. They also segregate users in their "rightful" realm, allowing vehicles to dominate and making motorists "kings of the road".

While pedestrian crossings are ample, not all are friendly to the elderly, parents with prams, and the physically challenged. In ensuring smooth traffic flow, especially when turning traffic volumes are significant, parallel pedestrian crossings at some signalised junctions have been removed in favour of three-legged ones. This results in pedestrians spending more time waiting to cross safely, increasing their travel time and making walking undesirable. Overhead bridges and underpasses replace at-grade crossings in high traffic areas, but only a handful are equipped with gentle ramps to provide an alternative to stairs. A start has since been made in progressively installing lifts at many overhead bridges, but it is an expensive exercise.

Motor-centric streets do not make the most efficient use of valuable urban space. While a vehicular lane can only transport 600-1,600 people per hour, two-way protected cycling lanes as well as sidewalks can each move 6,500 to 7,500 per hour.[3] To truly work towards a "car-lite" Singapore, urban planners need to move away from the conventional approach and redistribute power from cars to humans.

Figure 1: Dutch junction design features continuous designated bike lanes protected by curb islands.
Source: Biotic Design Studio

INFRASTRUCTURE

Danish separated bicycle tracks are clearly segregated by a curb.

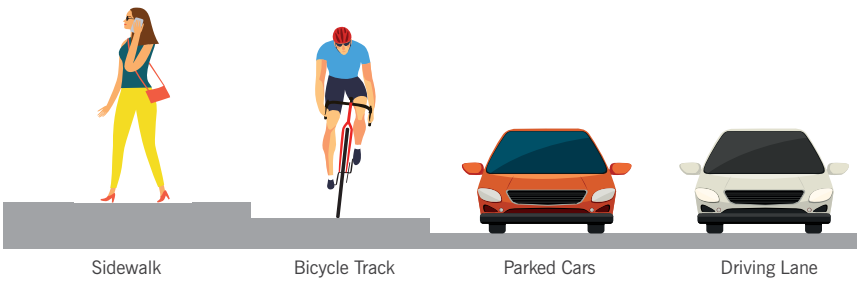

Figure 2: Danish streets include pedestrian, cyclist and car lanes with curb divisions.
Source: Cycling Embassy of Denmark

Infrastructure that prioritises motorised traffic also creates safety issues. Pedestrians jaywalk when they find it cumbersome to use overhead bridges or underpasses, increasing chances of injury. The lack of cycling networks causes cyclists to use pedestrian pathways. Prof Wong Yiik Diew from the Nanyang Technological University found that safety concerns remain the biggest barrier to the uptake of cycling in Singapore, and that cyclists using pedestrian crossings can hinder pedestrians, especially vulnerable road users such as the elderly and those with disabilities.[4] Cyclists on the other hand list crowding on walkways and roads as one of the main deterrents to using bicycles. Prioritising cyclists and pedestrians in the design of roads and streets would encourage safer active mobility.

INCLUSIVE ROADS: A GLOBAL PERSPECTIVE

Designing of roads for multiple modes of transportation is not new and has been done in many cities and countries. These can be categorised into three broad categories:

- Multimodal roads and streets that cater to all users and modes.
- Roads catering exclusively to non-motorised traffic and public transport.
- Full pedestrianisation.

AMSTERDAM AND THE NETHERLANDS

Activists in Amsterdam took to the streets in the 1970s demanding safer streets after traffic casualties peaked, with more than 400 children killed in 1971 alone.[5] This eventually led to the creation of *woonerf*, a people-centric street typology, and the development of a dedicated cycling infrastructure. By the 1980s,

Figure 3: A cyclist on Bencoolen Street uses the pedestrian walkway rather than the bike lane. *Source: CLC*

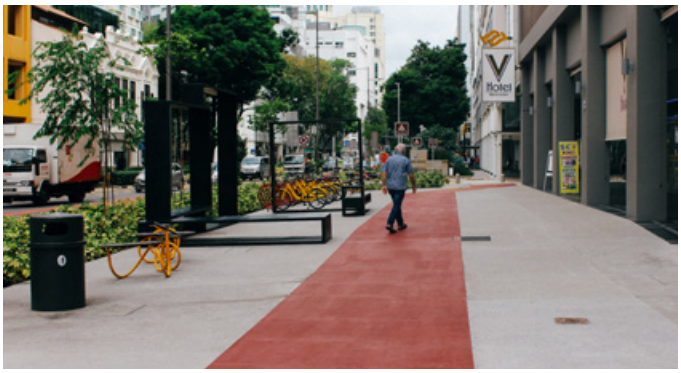

Figure 4: Conversely, a pedestrian uses the cycling section of the shared path, creating a barrier for approaching cyclists. *Source: CLC*

Figure 5: A cyclist at the intersection of Bencoolen Street and Bras Basah Road experiences an interruption in trip flow due to intersections that prioritise fast automobile traffic. *Source: CLC*

Figure 6: A cyclist has to push his bicycle down Bras Basah Road due to the disjointedness in the cycling network and likely collision with pedestrians. *Source: CLC*

many other Dutch cities followed suit and introduced their own measures to create cyclist-friendly infrastructure. Today, the Netherlands boasts of the world's largest cyclist population, and a comprehensive cycling network with protected infrastructure criss-crossing the country.

COPENHAGEN

Copenhagen, another city famous for its cycling culture, is also known as the birthplace of the pedestrianisation movement. The Stroget, the high street in downtown Copenhagen and the main artery of its pedestrian network, went car-free in November 1962. The initiative, disguised as an extended holiday closure, was not all rosy. It met with widespread, often strident, opposition. However, after seeing the Stroget's successful transformation—with more shoppers, plentiful outdoor sidewalk cafes and public spaces—the pedestrian network expanded to include a maze of small streets and historical squares, making it the world's oldest and longest pedestrian street system.

SYDNEY AND SEVILLE

In Australia, Sydney was the first city to pursue multimodal design at Bourke Street. The creation of a two-way off-street cycling lane led to a 408% increase in cycling. With traffic calming, curb extensions, and lighting for cyclists, the track exemplifies a design that deprioritises cars.[6] Likewise, the Spanish city of Seville saw daily cycling trips surge from 6,000 to more than 70,000 after urban planners pushed for protected cycling lanes created by reclaiming vehicular lanes, setting an example for other Spanish municipalities.[7]

TAIPEI

In Taiwan, the government reduced the carriageway size in Taipei and added cycling lanes after the city's then mayor, Ma Ying-jeou, funded an emissions-reduction policy. The city created 498 km of cycling lanes and widened shared pedestrian and cyclist pavements to 3.5 m. Bicycle use in Taipei has increased 24% since 2011, and the popular bikeshare system, YouBike, has higher daily rental than London, New York or Paris.[8]

These examples show that infrastructure changes to protect cyclists and pedestrians boost on-road active mobility.

SINGAPORE'S INITIATIVES

In Singapore, the Urban Redevelopment Authority (URA) and LTA have initiated multimodal policies, such as the Ang Mo Kio cycling network and cycling-related improvements in Tampines, Bishan, and Toa Payoh. The URA and LTA's Walking and Cycling Plan encourages facilities such as showers and lockers in new developments, and has initiated "Car-Free Sundays" in the Civic District. While these efforts toward multimodal street policy are innovative and experimental, a reimagined car-lite street network requires a more robust approach.

In May 2017, the LTA completed Bencoolen Street improvements, including road dieting (or lane reduction/road narrowing), lane reclamation for a cycling path, and a covered pedestrian walkway. While this is

a step towards multimodal streets, the area is too small to form an adequate cycling network, resulting in low utilisation of the cycling path. Singapore saw its first on-road cycling lane installed on Tanah Merah Coast Road in 2017, but it is not protected from heavy vehicles that frequent the route.[9]

The LTA has also attempted to create more inclusive streets to address the needs of users such as the elderly and children, with "Silver Zones" and "School Zones", respectively. In 2004, the LTA rolled out the "School Zone" initiative, adding "SLOW" and "SCHOOL" road markings, and red-textured road surfaces to alert drivers. The initiative was further enhanced in 2014 by reducing speed limits (40 km/h) at roads fronting 10 primary schools.

"Silver Zones" are specially demarcated to remind drivers to slow down for the sake of elderly persons living in the area. Special features include a 40 km/h speed limit, rumble strips and narrower roads to slow down traffic, and "rest points" along the road divider for the benefit of the elderly.

REPRIORITISING THROUGH DESIGN

While Singapore has progressed in building infrastructure to support active mobility, its road-design protocol needs to rethink the user hierarchy to provide a more holistic categorisation. The existing structure primarily prioritises traffic movement, and does not fully recognise the tensions and conflicting needs of various road users. Many key reforms to the conventional approach to road and street design stem from applying a new user hierarchy that puts pedestrians at the top and cars at the bottom.

Many cities and countries around the world have formalised such design elements into guidelines used for all new road developments and retrofitting:

UNITED KINGDOM

As early as 1998, the UK's Department of Environment, Transport and the Regions prepared a guide to facilitate multimodal streets. In 2007, the country's Department of Transport and the Department for Communities and Local Government compiled a manual for residential streets to guide professionals involved in the design, approval and adaptation processes. It defined the relative importance of "place" and movement function, which subsequently informs the design forms. It advocated the need to move away from hierarchies of standard road types based on traffic flows and/or accesses provided, with specific design guidelines and principles for a wide array of streets, roads, and intersections. Similarly, Transport for London's Roads Task Force report features a matrix highlighting the different roles of streets and roads.

Figure 7: "Silver Zones" include street features to assist the elderly at street crossings. *Source: LTA*

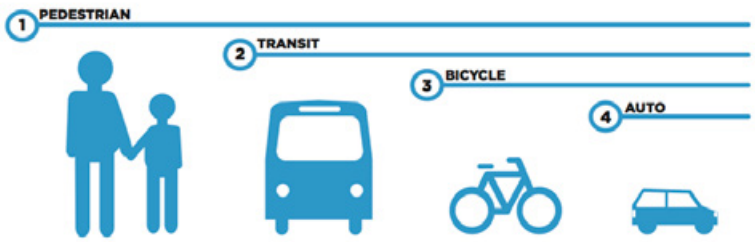

Figure 8: Needs of street users must be prioritised to serve alternative modes to cars.
Source: Complete Streets Design Guidelines, Complete Streets Chicago[10]

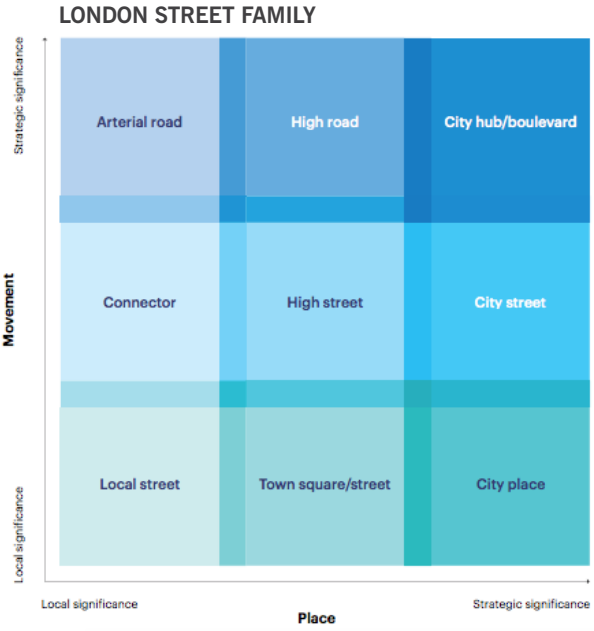

Figure 9: Transport for London's street characterisation matrix describes the different roles of streets as places and corridors for movement.
Source: Transport for London

USA

In the United States, the National Complete Streets Coalition created "Complete Streets", a transportation design approach to serve all road users and promote safe, healthy, environmentally sustainable transport. Rather than viewing multimodal streets as special projects, "Complete Streets" advocates a paradigm shift in street design to integrate multimodal design principles in new road construction as well as maintenance. A 'Complete Street' typically includes: sidewalks, dedicated cycling paths, public transit stops, plentiful pedestrian crossings and median islands, pedestrian-friendly crossing signals, curb extensions, and narrow travel lanes.[11]

The National Association of City Transportation Officials (NACTO) has published a Global Street Design Guide to bring best practices learned from the US to an international audience. It provides street measurement methodologies, implementation strategies and examples of specific street improvements. In addition, the guide explains exact dimensions of design features that promote street hierarchies with pedestrians first.

To encourage these design elements at a local level, some US cities have created citywide policies that prioritise multimodal street improvements. San Francisco's local government initiated a Better Streets Policy, which requires city agencies to coordinate street-design plans with multimodal visions, and a Better Streets Plan comprising guidelines illustrating multimodal standards. Compared with the LTA's limited road typologies, the Better Streets Plan features detailed street types addressing a wider range of urban forms.

New York City's street design manual also takes a multimodal approach. The New York City Department of Transportation (NYC DOT) collects data on pedestrian and vehicle counts, and accidents, to understand current conditions, so as to create customised street adjustments to resolve particularly car-centric elements. For example, on Hoyt Avenue at RFK Bridge, the NYC DOT added markings, changed signal timing, developed new bicycle connections and added curb extensions to reduce crossing distances. These changes catalysed a 37% increase in weekend bicycle volumes and a 21% decrease in vehicular traffic.[12]

Washington, DC, which has the second-largest cycling rate in the US, has achieved massive increases in bike usage due to street design changes and the introduction of a bikeshare system. The percentage of DC's population that cycled tripled between 2006 and 2016, facilitated by widespread protected cycling lanes under the 'moveDC' plan. DC has added more than 80 km of cycling lanes, and has 140 more km planned for development by 2040, ensuring an extensive network that often makes cycling the quickest and most convenient commuting option. Unlike Singapore's street design guidelines, which do not mention bicycle infrastructure, DC's engineering guidelines include details of bicycle and pedestrian infrastructure, complete with suggested bike facilities for different neighbourhood types.[13]

Many key reforms to the conventional approach to road and street design stem from applying a new user hierarchy that puts pedestrians at the top and cars at the bottom.

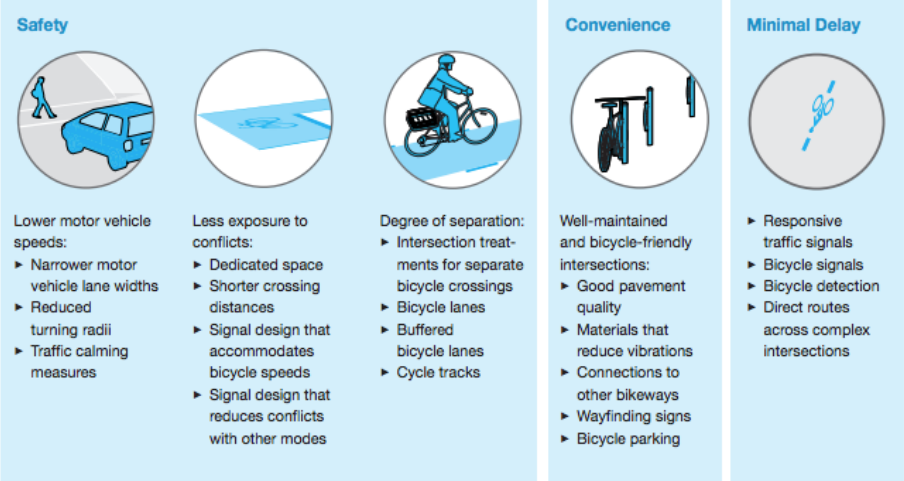

Figure 10: Promoting pedestrian and cyclist safety, convenience and speed makes these modes attractive journey options. *Source: NACTO*

BICYCLE FACILITY CONTEXTUAL GUIDANCE

Street Class	Desired Average Annual Daily Traffic	Posted Travel Speed (mph)	Desired Facility Type
Local	0 – 2,000	15 – 20	Neighbourhood Bikeway
Local	2,000 – 8,000	15 – 25	Shared Lane Marking
Collector Arterial	4,000 – 15,000	20 – 30	Bike Lane
Collector Arterial	4,000 – 25,000	25 – 40	Buffered Biked Lane
Collector Arterial	9,000 – 25,000	30 – 50	Protected Bike Lane / Cycle Track
Arterial Freeway	6,000 – 30,000+	45 – 60	Shared-Use Path

Figure 11: Washington, DC's engineering guidelines include different forms of bicycle infrastructure, similar to this guidance table explaining the appropriate bicycle infrastructure for different classes of streets. *Source: NACTO*

Some US cities have also applied bicycle and pedestrian street design guidelines without creating new cycling lanes. Portland (Oregon) and Minneapolis (Minnesota), for example, have created bicycle boulevards by designating low-traffic streets as bicycle pathways with signage and traffic calming measures. This allows cyclists to use existing road infrastructure retrofitted with design interventions that clearly communicate to vehicles the route's identity as a bicycle pathway. Here drivers expect cyclists to ride in the centre of the carriageway, normalising streets where bicycles thrive at the top of the transport hierarchy.

However, while street adjustments have encouraged cycling for decades, many cities still face challenges for lack of coordination. For example, Seville in Spain and Antwerp in Belgium have high cycling rates, but they cannot match Amsterdam or Copenhagen for want of uniform infrastructure designs. For cycling to be a viable mode, a route network must be intuitive and efficient.

CHINA

In Asia, China is now trying to manage cities with large blocks of non-mixed use developments, and huge roadways with wide and dangerous intersections created through years of rapid urbanisation. In 2016, the Chinese government released a new set of urban planning and development guidelines that prioritise walking and public transport over private vehicles, and advocate smaller blocks and narrower streets to improve the pedestrian environment. In the same year, Shanghai rolled out a new street design manual, the Shanghai Street Design Guide, arguing for reform and to reclaim the road from vehicles. Compiled jointly by the Shanghai Bureau of Planning and Land Resources, Shanghai Transportation Commission, and the Shanghai Urban Planning and Design Research Institute, the manual put forth guidelines for more people-centric street designs. Its recommendations included reducing road width, prioritising non-motorised transport modes, and smaller turning radius at roads to slow down traffic speed.

This was preceded by a major move by Shanghai in 2007 to reclaim road space for people. As part of the Bund's comprehensive reconstruction project, the city tore down the elevated section of the highway, and through traffic along the corridor was diverted underground. The at-grade, 11-lane road hindering pedestrian access to the waterfront and the historic buildings was narrowed to four lanes. The promenade was widened with space reclaimed from the roads and more pedestrian crossings were added. This resulted in significant improvement in overall pedestrian connectivity and accessibility.[14]

Figure 12: Cities with bicycle boulevards designate low-traffic roads as bicycle routes. *Source: City of Berkeley*

Figure 13: Shanghai's street design guidelines could be a model for developing Singapore's own multimodal street design manual. *Source: Shanghai Street Design Guidelines*

Figure 14: The planned North-South Corridor will feature a protected bike pathway connecting northern townships to the city centre, exemplifying multimodal a design that should be incorporated into Singapore's street design guidelines. *Source: LTA*

TOWARDS DESIGN STANDARDS THAT PUT PEDESTRIANS AND CYCLISTS FIRST

Singapore's conventional traffic engineering approach to road planning and design has accorded too much priority to vehicular traffic. Given its highly urbanised environment, Singapore must redesign its roads from a people-oriented perspective. While the current street design promotes adequate Level of Service (LOS) for vehicles, it does not consider bicycle or pedestrian LOS. The latter would take into account factors such as wait time, vehicle conflicts and speed, and sidewalk width.

In order to fundamentally alter how all users view roads and streets, the LTA's Code of Practice should include design standards and details for road cross sections that cater to both pedestrians and cyclists. The LTA has recently designed the North-South Corridor (NSC), Singapore's first integrated transport corridor due for completion in 2026, which will include bus lanes and cycling routes.[15] The NSC, originally designed as a motor-centric expressway, should be a prototype for multimodal

corridors and formalized in Singapore's street guidelines for replication in future projects. This way, the needs of other road users will no longer be an afterthought but a planning norm for new as well as retrofitted roads. By reprioritising pedestrians above cars, inconvenient three-legged pedestrian crossings and overhead bridges could be replaced with at-grade, parallel crossings in many cases.

In the same vein as Shanghai or DC, which have adopted a pedestrian-centric street hierarchy, Singapore could apply 'Complete Street' principles to LTA guidelines. Some people-oriented street design principles that should be normalised in LTA guidelines include:

- Designing access for people of all ages and abilities.
- Designing crossings for all users by including wayfinding, signalling, pathways and appropriate street furniture.
- Minimising lane width of carriageways to decrease automobile speeds, and dedicating newly reclaimed space to cycling and pedestrian infrastructure.

The current LTA typology for an undivided two-lane road has a carriageway with 5-m wide lanes. This is excessive for cars given that public buses already ply on roads with lanes no wider than 3.7 m. Overly wide lanes encourage speeding, further endangering cyclists and pedestrians. The NACTO design guide recommends urban streets should not be designed for speeds exceeding 40 km/h, and speeds should drop to 30 km/h or below in denser areas. Lane width in such settings should be 3 m, or up to 3.5 m where buses and trucks share the road.

The redesigned typologies shown in Figures 15, 16 and 17 illustrate how typical dual 1-, 2-, and 3-lane road cross sections can be redesigned to be multimodal. Besides redesigning road cross sections, pedestrian crossings should also be redesigned with more at-grade access to improve walkability. Carriageway corners should have a smaller radius to shorten pedestrian crossing distances and reduce turning car speeds.

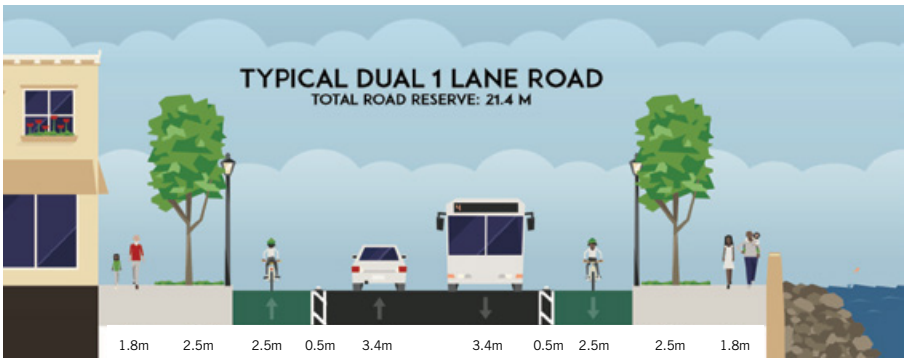

Figure 15: Redesigned street typology for Dual Way 1-Lane Roads. *Source: Designed by CLC, made using StreetsMix and Adobe Illustrator*

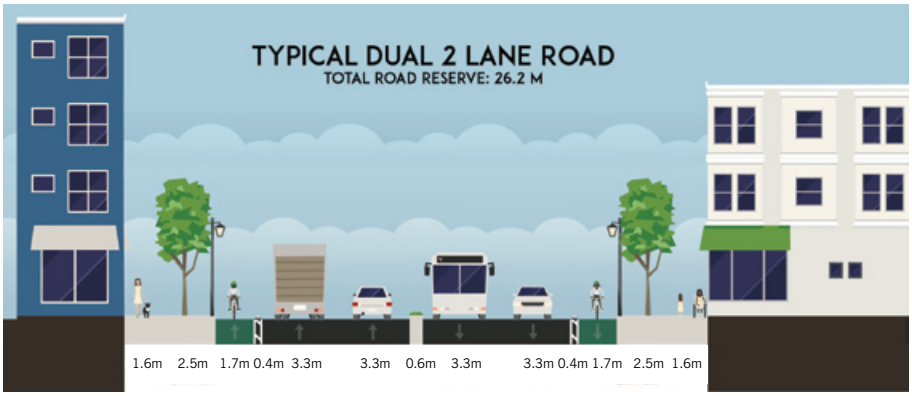

Figure 16: Redesigned street typology for Dual Way 2-Lane Roads. *Source: Designed by CLC, made using StreetsMix and Adobe Illustrator*

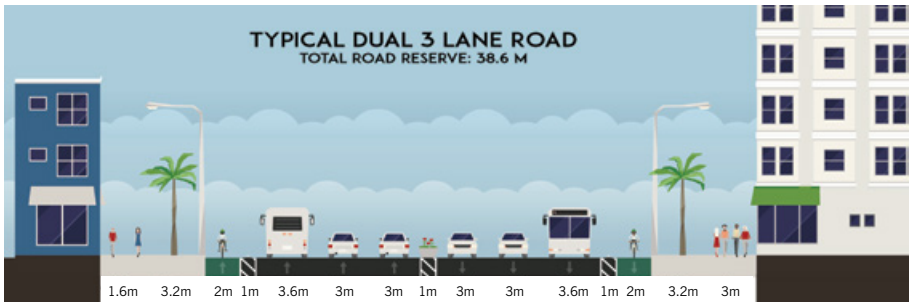

Figure 17: Redesigned street typology for Dual Way 3-Lane Roads. *Source: Designed by CLC, made using StreetsMix and Adobe Illustrator*

OPPORTUNITIES FOR IMPLEMENTATION IN SINGAPORE

In order to implement multimodal street design, Singapore needs a holistic framework and must set up a task force to oversee guidelines catered to specific geographic and demographic contexts. A framework is also needed to guide planners and traffic engineers to systematically identify and categorise precincts that can be made more people-centric. Precincts such as Housing & Development Board (HDB) town centres, transport hubs, conservation areas, roads with many activities and pedestrian movements, and roads with excess capacity are candidates for street reclamation through multimodal adjustments and pedestrianisation.

Multimodal street improvements can occur alongside maintenance works. New transport hubs and MRT stations also provide opportunities to review road space. The road and street networks leading to HDB town centres and activities nodes in employment centres such as industrial estates and business parks can be made people-centric.

People-centric elements can also be incorporated into the design of carpark

driveways in HDB estates to make them shared streets. Often, when walkways do not coincide with "desire lines", residents tend to create their own pathways and/or use carpark driveways given their directness and convenience. To encourage walking and cycling, activity and transport nodes should be latticed with many pedestrian-only spaces and shared streets. Speed reduction measures and increased walkability would benefit pedestrians, especially the elderly who may need smooth passages for wheelchairs. With narrower carriageways and defined cycling and pedestrian infrastructure, Singapore could increase multimodal connectivity within HDB communities that also link to surrounding street networks.

Conservation areas can include multimodal design without sacrificing their historical character. While these areas are best explored on foot, narrow walkways can diminish the experience. Like Bencoolen Street, Telok Ayer Street and Amoy Street within the Telok Ayer Conservation Area could be redesigned to prioritise pedestrians and cyclists. The conservation area at Kampong Glam needs bicycle infrastructure as well as more connected pedestrian paths to facilitate alternative transport modes. For example, the pedestrian pathway at the junction of Victoria Street and Jalan Sultan lacks consistent width and collides with bus stops. Furthermore, Jalan Sultan's three lanes in each direction could be reduced to two, or narrowed, to create an on-street protected cycling lane.

Roads in industrial areas could be made suitable for active mobility by adding better cycling and pedestrian lanes. Commercial shopping streets can also be prime candidates for redesign. Orchard Road's five lanes can be decreased, or even removed completely, in favour of cycling and pedestrian infrastructure and public spaces, reclaiming the road as a place and not just an artery for movement.

To ensure successful implementation and execution, mindsets of professionals such as planners, designers and traffic engineers need to change to embrace a more holistic and people-centric approach to urban

> To encourage walking and cycling, activity and transport nodes should be latticed with many pedestrian-only spaces and shared streets.

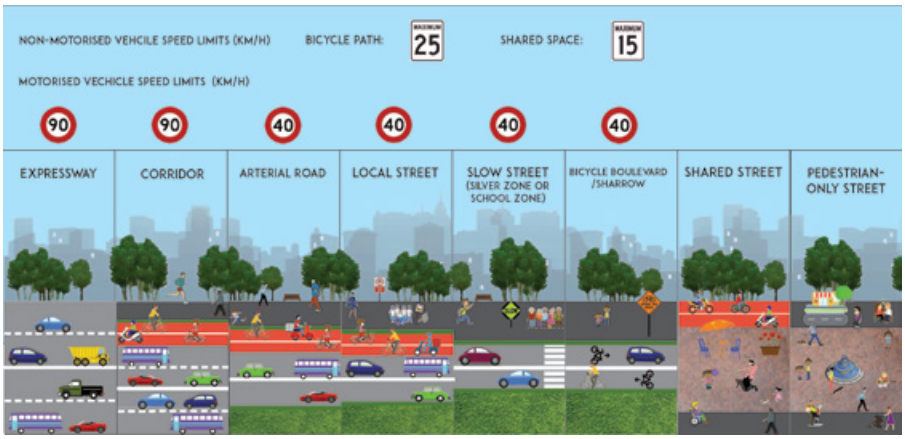

Figure 18: Singapore's new street design guidelines could set multimodal infrastructure as the norm for all street categories. This typology prototype shows the vehicular-centric expressway, which reserves all road space for vehicles, and other street types with progressively more space reserved for cyclists and pedestrians. *Source: CLC*

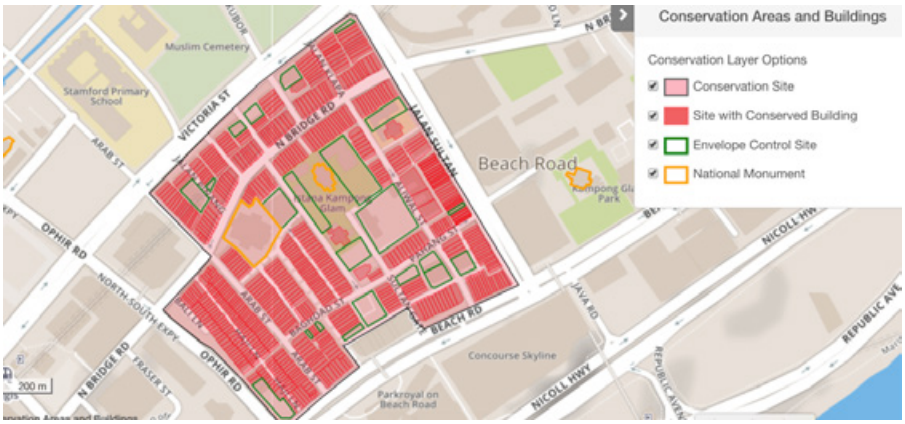

Figure 19: The Kampong Glam conservation area could benefit from multimodal street design at surrounding junctions. *Source: URA*

mobility. This can be done through intensive courses and workshops to study and adapt detailed technical designs and standards that have been developed by experts from some of the cities and countries mentioned above.

CONCLUSION

Land transport infrastructure accounts for 12% of Singapore's land area. As of 2016, there were 9,310 km of roads,[16] of which more than 50% were collector and local roads that are candidates for readjustment.[17] Furthermore, zero growth in car-ownership permits and the recent upsurge in dockless bikeshare systems present a key opportunity to redesign Singapore's streets. With only about 20% of Singaporeans driving, vehicular lanes only serve a small proportion of the population.[18]

Under a new URA/LTA requirement mandated in 2016, all new developments

A new set of street design guidelines for Singapore can ensure that the surrounding street network connects to these development-specific active-mobility routes.

Figure 20: Pedestrians have to use overheard bridges to get across Beach Road to Kampong Glam conservation area. *Source: CLC*

Figure 21: Jalan Sultan's narrow walkways discourage pedestrian journeys, especially for wheelchair-users or parents with strollers. *Source: CLC*

in Singapore must include a comprehensive Walking and Cycling Plan (WCP). The Paya Lebar Quarter development and the upcoming Funan Centre are the first two developments completed with integrated walking and cycling networks. A new set of street design guidelines for Singapore can ensure that the surrounding street network connects to these development-specific active-mobility routes. Additionally, parking stipulations in WCPs will complement multimodal streets by ensuring cyclists have parking spaces in all new developments.

There are ample opportunities to change the paradigm and create an environment that makes non-motorised transport modes the natural choice, building a truly car-lite Singapore.

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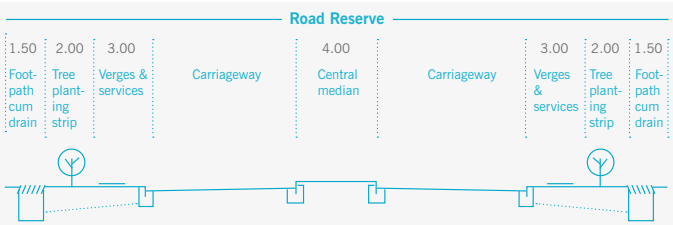
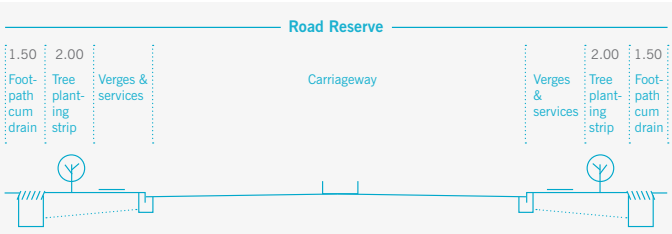
ANNEX A

Singapore's LTA provides design guidelines for different street types.
Source: LTA Street Work Proposals Relating to Development Works, Chapter 8 Appendix

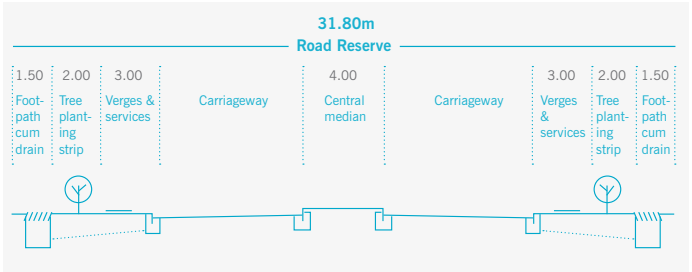


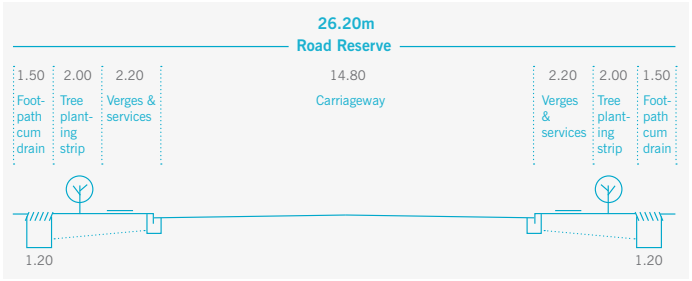
No. of Lanes	Central Divider (m)	Carriage-way (m)	Verge & Services (m)	Tree Planting (m)	Footpath cum Drain (m)	Road Reserve (m)
8	4.00	2 x 14.20	2 x 3.00	2 x 2.00	2 x 1.50	45.40
6	4.00	2 x 10.80	2 x 3.00	2 x 2.00	2 x 1.50	38.60
4	4.00	2 x 7.40	2 x 3.00	2 x 2.00	2 x 1.50	31.80



No. of Lanes	Carriage-way (m)	Verge & Services (m)	Tree Planting (m)	Central Divider (m)	Footpath cum Drain (m)	Drain (m)	Road Reserve
4	2 x (3.7+3.7)	2 x 1.90	2 x 2.00	0.60	2 x 1.50	2 x 1.20	26.20
2	10.00	2 x 2.20	2 x 2.00		2 x 1.50	2 x 1.20	21.40

No. of Lanes	Carriage-way (m)	Verge & Services (m)	Tree Planting (m)	Footpath cum Drain (m)	Drain (m)	Road Reserve (m)
2	7.40	2 x 2.20	2 x 2.00	2 x 1.50	2 x 1.20	18.80
3	11.10	2 x 2.20	2 x 2.00	2 x 1.50	2 x 1.20	22.50
4	14.80	2 x 2.20	2 x 2.00	2 x 1.50	2 x 1.20	26.20
5	18.50	2 x 2.20	2 x 2.00	2 x 1.50	2 x 1.20	29.90





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