

TRANSPORT: OVERCOMING CONSTRAINTS, SUSTAINING MOBILITY

Singapore's transport policies have moved in tandem with the city's development. At one level, this can be seen as a linear progression in transport infrastructure, from "mosquito" buses and "pirate" taxis to a modern bus and train system. Seen in this light, the main policy challenge is the integrated planning and development of effective transport hardware and systems. At another level, transport is about meeting the mobility needs and social aspirations of individuals, as well as addressing negative externalities such as congestion and pollution.

This Urban Systems Study presents the dynamics, processes and institutional framework involved in resolving these issues. It also provides a historical account of transport policy changes in Singapore and highlights how dilemmas such as public versus private transport and transport versus other uses of land have resulted in systemic innovation over the years.

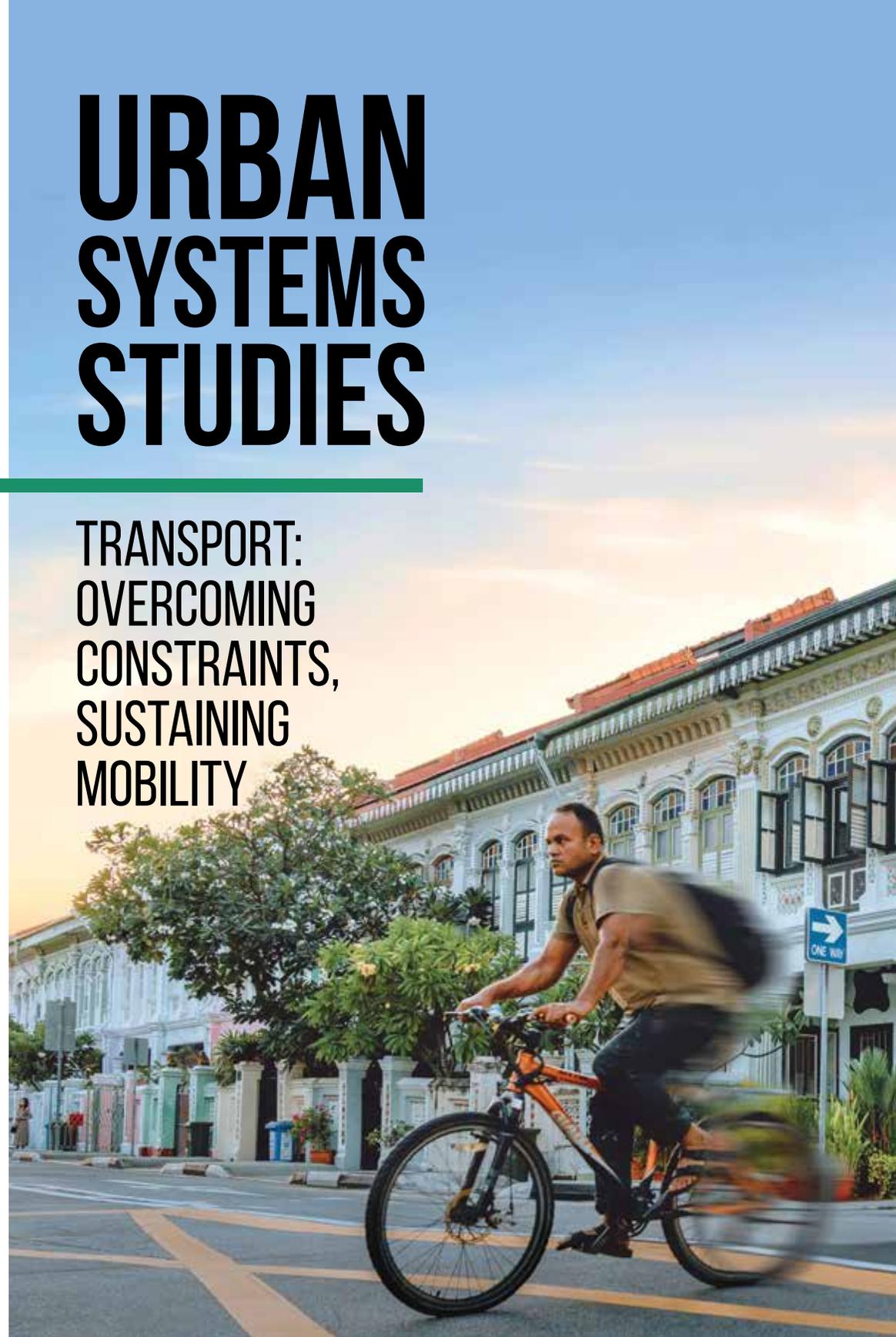
"We have only a limited amount of land on which to house our people, build factories, hospitals, roads and schools, and train the SAF. Therefore, we decided to give top priority to investments in public transport, and to put private transport in second place."

Former Prime Minister Lee Kuan Yew



URBAN SYSTEMS STUDIES

TRANSPORT: OVERCOMING CONSTRAINTS, SUSTAINING MOBILITY



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SUSTAINING MOBILITY**

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CENTRE for
LiveableCities
SINGAPORE

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CENTRE for
LiveableCities
 SINGAPORE

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Set up in 2008 by the Ministry of National Development and the then-Ministry of the Environment and Water Resources, the Centre for Liveable Cities (CLC) has as its mission to distil, create and share knowledge on liveable and sustainable cities. CLC's work spans four main areas—Research, Capability Development, Knowledge Platforms, and Advisory. Through these activities, CLC hopes to provide urban leaders and practitioners with the knowledge and support needed to make our cities better. For more information, please visit www.clc.gov.sg.

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 Cycling along Tembeling Road in Katong, Singapore.
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FOREWORD

In 2013, the Centre for Liveable Cities (CLC) published *Transport: Overcoming Constraints, Sustaining Mobility*, tracing Singapore's land transport journey from its nascent stages to today's efficient and sustainable urban transport system.

Singapore's transport landscape has evolved over time, for example, through the transition of the bus industry to the Bus Contracting Model (BCM) and the rail industry to the New Rail Financing Framework (NRFF); the advent of private-hire vehicles in the Point-to-Point (P2P) sector; the strategic push for active mobility; and the growing interest in transport innovations such as electric and autonomous vehicles. These new developments have spurred CLC to publish an updated edition of this publication.

Singapore's transformation over the past decades was not achieved by chance, but through foresight, integrated planning and sustained implementation of policies. From the unregulated, fragmented and cut-throat transport landscape that was characteristic of Singapore in the 1950s to 1970s, Singapore saw the birth of transport and urban planning.

Over the years, the Transportation Plan conceived with the Concept Plan in 1971, the 1996 White Paper and the Land Transport Master Plans of 2008, 2013 and 2019 have progressively integrated the policies and roadmaps to support the broader objective of a sustainable and liveable world-class city.

The urban landscape of today is the outcome of this integrated approach to long-term land use planning and management, undertaken in partnership with public agencies and the private sector. The way we live, work and play is anchored by public transport.

The land transport journey is faced with new challenges ahead. This edition discusses the approaches adopted to overcome past challenges and the guiding forces for the future, in a time of increased social and technological disruption.

I hope you will find *Transport: Overcoming Constraints, Sustaining Mobility* as inspiring and insightful as it was for me.

Alan Chan Heng Loon

Chairman

Land Transport Authority

PREFACE

The Centre for Liveable Cities' research in urban systems unpacks the systemic components that make up the city of Singapore, capturing knowledge not only within each of these systems, but also the threads that link these systems and how they make sense as a whole. The studies are scoped to delve deep into key domain areas the Centre has identified under the Singapore Liveability Framework, attempting to understand how Singapore has transformed itself into a highly liveable city over the last five decades, and how the country can build on its urban development experience to create knowledge and urban solutions for current and future challenges relevant to Singapore and other cities through applied research.

The research process involves rigorous engagement with our stakeholder agencies, and numerous oral history interviews with Singapore's urban pioneers and leaders to gain insights into development processes. The tacit knowledge drawn out through this process allows us to glean useful insights into Singapore's governance and development planning and implementation efforts. As a body of knowledge, the Urban Systems Studies (USS) series, which cover aspects such as water, transport, housing, industrial infrastructure and sustainable environment, reveal not only the visible outcomes of Singapore's development, but the complex support structures of our urban achievements.

Transport: Overcoming Constraints, Sustaining Mobility is a revised edition of one of the first titles in the USS series.

The Centre is pleased to publish this edition and would like to thank the Land Transport Authority and all those who have contributed their knowledge, expertise and time to make this publication possible. I wish you an enjoyable read.

Hugh Lim

Executive Director
Centre for Liveable Cities

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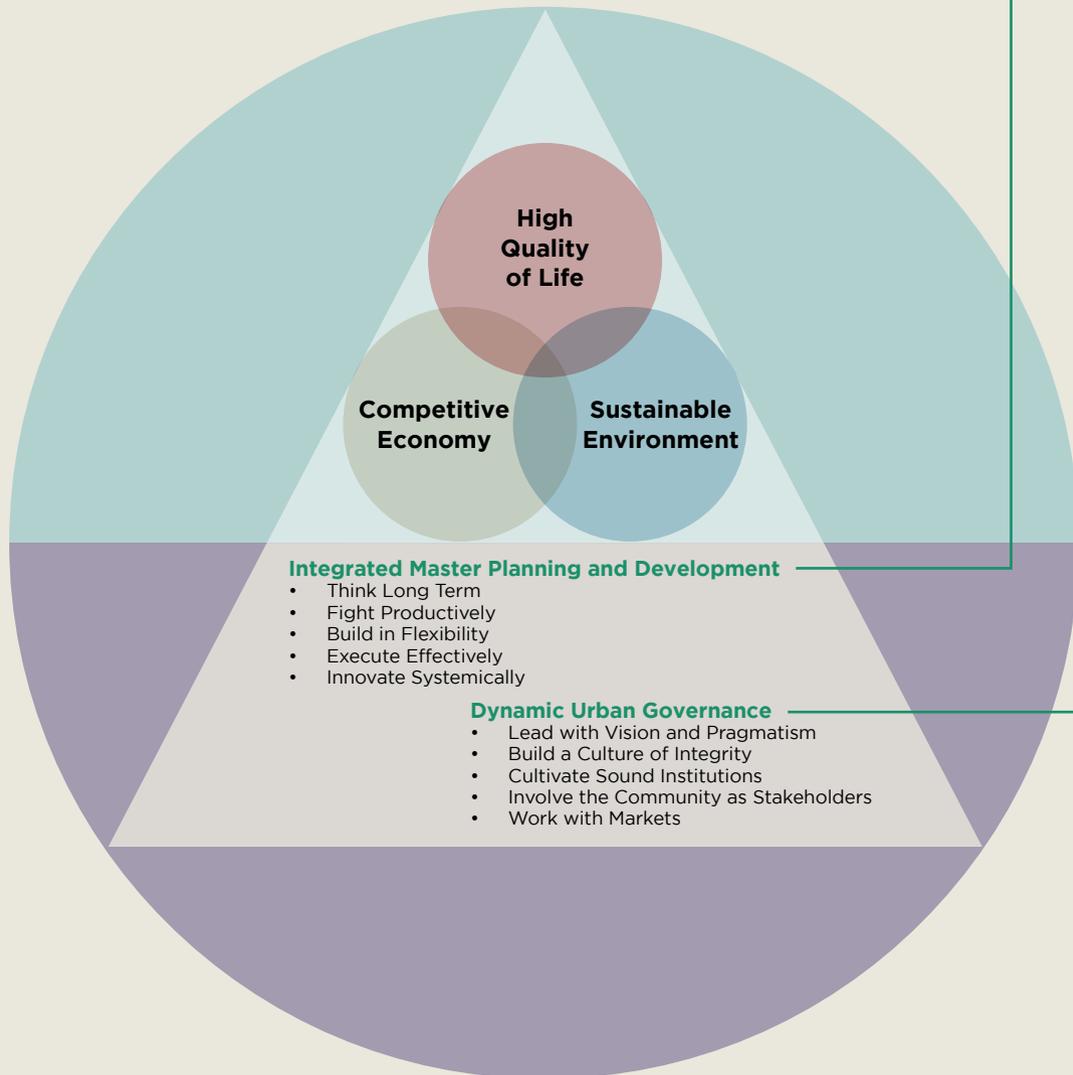
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THE SINGAPORE LIVEABILITY FRAMEWORK

The Singapore Liveability Framework is derived from Singapore’s urban development experience and is a useful guide for developing sustainable and liveable cities. The general principles under the two domains of Integrated Master Planning and Development and Dynamic Urban Governance are reflected in the themes explored in *Transport: Overcoming Constraints, Sustaining Mobility*.



Integrated Master Planning and Development

Think Long Term

Singapore’s long-term plans have prioritised strong integration of transport and land uses in responding to the economic development in a land-scarce city-state. The Concept Plan 1971 presented a strategic approach to create housing, employment and other areas linked together by a mass transit network. In addition to increasing the supply of public transport, the Plan also put forward policy guidance to restrict the supply and use of private vehicles, paving the way for a “car-lite” Singapore. See page 3.

Innovate Systemically

Alongside investments in public transport, Singapore also adopted various demand management measures over the years in view of the city-state’s limited land, which rendered road expansion impossible. A systematic approach to address these constraints resulted in the Area Licensing Scheme, implemented in June 1975, a policy innovation that used a price stick to discourage car usage. See page 43.

Dynamic Urban Governance

Lead with Vision and Pragmatism

While emerging innovations and new technology such as active and shared mobility modes can disrupt the transport sector, allowing such innovations to systematically mature over time using nimble, “light-touch” regulatory frameworks can maximise the benefits to Singapore in the long run. See page 57.

Cultivate Sound Institutions

The successful adoption of public transport modes requires integration at various levels. The establishment of government agencies like the Land Transport Authority in 1995 enabled the dovetailing of transport and land use plans for better integration as well as to support industry transformations that would result in improved public transport services. Fare integration across various modes and protection of customer interests has also been ensured through the Public Transport Council, established in 1987. See page 11.

Work with Markets

The creation of a people-centric land transport system was made possible by working with the private sector. For example, in the bus industry, working with private operators to inject additional capacity into the bus system and promote better service standards using a new bus contracting model has helped improve bus services across the island. See page 11.

OVERVIEW

The development of Singapore's transport policies has been a corollary to the economic development of the country as a whole. On one level, its progress can be seen as a simple, linear development of transport infrastructure—from trams to buses to rails and trains. Here, the main policy challenge is that of planning and integration. On another level, transport is about meeting the needs of individuals, mobility and social aspiration, as well as public needs of mass transport coupled with negative externalities such as congestion and pollution.

These needs are often at odds, and integration at this level means balancing competing land use needs—roads in Singapore have to compete with housing, industry and living space for Singaporeans.

This case presents the dynamics, processes and institutional framework involved in addressing these demands. By presenting a historical and chronological map of transport policy changes in Singapore, this study traces key developments in the transport sector while highlighting how the twin policy dilemmas between public and private transport, as well as roads and other uses of land, have resulted in policy challenges and innovations over the years.

There are four main aspects to Singapore's transport policies:

- (1) Providing for a world-class public transport system to cater for mass movement. Singapore's first challenge was to overcome land and funding constraints and increase transit capacity to meet the needs of a growing economy and population. Transportation policy and infrastructure also impacted economic and social development. As such, the government restructured the industry to ensure adequate service provision at affordable prices and a commercially viable industry.
- (2) Managing the demand for cars, including the choice and structure of public and private transport. In this, regulatory and economic institutions were established to achieve public goals of mobility, equity and development.
- (3) Carrying out market-building efforts and experimenting in institutional forms, with varying roles played by the public and private sectors in planning, regulating and operating public transport, that have shaped the public transport industry today.
- (4) Planning, particularly in recent years, to respond to various emerging innovations and technological changes that have disrupted the way people choose to travel.

These were addressed through a series of incremental changes that responded to specific industry contexts, not always coordinated, with two or three crisis points that have led to relatively larger changes. At the same time, there are a few key constants in the form of underlying principles that have informed the transformation of transport from the 1950s to today. These key ideas are to be strategic in planning (a strategic long-term view, with prudent large investments), pragmatic in implementation (iterative process, and to experiment with regulating the industry) and to work towards key social and environmental goals (affordable public transport, and balancing aspirations with the social costs of cars).

CHAPTER 1

FROM UNREGULATED MARKET TO PLANNED TRANSPORT REORGANISATION

“

Public transportation is in a chaotic condition
and something needs to be done.¹

”

THE STRAITS TIMES,
15 October 1968

Unfettered Market Forces in the Early Years

In the mid-1950s, about 90% of Singapore residents depended on public transport, which was unfortunately distinguished both by poor service and high labour unrest. Complaints over buses were commonplace in *The Straits Times*, the national broadsheet:

Public transportation is in a chaotic condition and something needs to be done.²

The Toa Payoh Housing Estate has a full quota of residents but no bus services. The only “public” transport vehicles are the pirate taxis, which poor people cannot afford.³

Adding the number of vehicles will not solve the transport problem because the grouses of the workers and passengers must be attended to.⁴

Transport improvements over the past years did not correspond with national development.⁵

Schedules were erratic, due in part to drivers who often went on strike to demand better pay and working conditions. On 23 April 1955, things came to a head when the workers of the Hock Lee Amalgamated Bus Company went on strike, supported by Chinese school students. On 12 May 1955, later known as “Black Thursday”, a major riot of more than 2,000 people broke out. Four people—two police officers, a student and an American press correspondent—died and more than 30 were seriously injured.⁶

In January 1956, a strike took place at the Singapore Traction Company (STC) for 146 days, seriously crippling Singapore’s public transportation system. In response to these crises, the government set up a Commission of Inquiry, which resulted in the 1956 Hawkins report that recommended merging all 11 transport companies into a single nationalised corporation. But, as former Chief Transportation Engineer of the Land Transport Authority (LTA) Gopinath Menon noted, the late 1950s were turbulent times with communist agitation in the trade unions (including bus unions) and strong anti-colonial feelings, and the colonial government may have hesitated in implementing the recommendations put forth in this report as it could have disturbed the status quo.⁷ The STC continued to run its services after the strike, but it was clearly an extremely unstable equilibrium.

This quagmire of the 1950s was the result of neglect in transportation planning. There was no formal transport study until the Traffic Conditions

Committee was formed in 1938. Even then, the committee’s main consideration was to facilitate motor car movements, including improving parking and reducing traffic offences, rather than meeting the transport needs of the populace.

It was only in 1958 that Singapore had its first statutory Master Plan, which regulated land use through zoning, density and plot ratio controls. However, planning focus at that time was on public housing and industrial development, as Singapore was faced with massive housing shortages and unemployment. No concrete transportation plans were laid out then. In managing transport demands, the colonial government’s primary role was in vehicle licensing and carrying out road infrastructure widening and construction. Public transport operations and planning were left to private bus operators.

Hence, from the 1950s to mid-1970s, Singapore’s transportation problems were similar to those experienced by other developing cities, such as poor traffic management and serious congestion in the city centre, inadequate and inefficient public transport services, poor infrastructure maintenance and lack of governmental plans and enforcement. These were perpetuated by uncoordinated land transport policies implemented by different agencies due to the absence of a supervisory authority to oversee Singapore’s transportation development.

The year 1963 marked the end of a 144-year period of British rule in Singapore. The city-state, alongside Sabah and Sarawak, merged with the Federation of Malaya to form Malaysia. Its subsequent independence in 1965 gave the government the impetus for a massive urban renewal programme. Slums made way for public housing and roads were built to improve accessibility. However, private operators continued to provide public transport services, with the government focusing only on controlling private vehicles.⁸ Consequently, public transport was largely uncoordinated and characterised by erratic services and frequent bus breakdowns.⁹

From Chaos to Order: Transport Planning Begins

The limitations of the 1958 Master Plan and the rapid developments in the 1960s prompted the call for a more concrete and comprehensive land use and transportation plan. The government hence commissioned a State and City Planning (SCP) project in 1967 to examine urban planning in general and transport in particular.

Work began on the SCP project with the help of the United Nations Development Programme (UNDP) to address inadequacies of the 1958 Master Plan, which was ineffective in addressing the city’s economic and housing expansion of the 1960s. The SCP task force comprised members

The Transportation Plan, produced alongside the Concept Plan, acted as the transport master plan until 1992 and addressed aspects of transport planning in Singapore, namely, the road development programme, the role of public transport and the relative role of cars and public transport in the longer term.¹¹ The Mass Rapid Transit (MRT) network along the development corridor, together with the proposed east-west rail lines, was envisaged to link land use for industrial developments and residential new towns with the Central Area. The Concept Plan also laid down a comprehensive road network to support urbanism and economic development. Arising from the Concept Plan, there were extensive developments of road infrastructure from about 800 kilometres of roads at the end of the 1960s, to nearly 3,000 kilometres by 1990.¹² Singapore's first expressways, Pan Island Expressway (PIE) and East Coast Parkway (ECP), were located largely based on the Concept Plan. By the early 1990s, eight expressways criss-crossed the island. Between the 1980s and 1990s, the PWD also took up other road improvement works at the time.¹³ The construction of extensive road infrastructure to meet the rapidly increasing road usage in the 1980s was made possible with a key piece of legislation—the Land Acquisition Act.

The Era of Forward Planning

Taking a strategic long-term view informed the rest of the other principles of transport. For example, it was clear that Singapore's growing population and economic activities would require efficient travel, with two key elements: clear roads and a mass people-mover system.

On one hand, this meant that Singapore understood the cost of congestion, even before the roads became congested. Even when Singapore was a fledging economy in the 1970s, it had rudimentary control mechanisms in place. Having a long-term view also meant that when things did not always go according to plan, the strategic direction was nonetheless clear. Incremental change, historical planning and building legacies, a lack of foresight and the peculiarities of public transport meant that transport planners could never get things 100% right, but they were pragmatic in learning and adapting to circumstances.

The focus on long-term planning meant that the government had identified broad strokes of transport development in 1971, with main priorities of (1) integrating land use and transport development, (2) reducing and managing road congestion, (3) developing road infrastructure to facilitate movement, and (4) improving public transport.¹⁴ At that time,

plans were sketchy, with few details. Concrete proposals only came about in the 1990s with the birth of the MRT and the 1991 Concept Plan. These moved Singapore's transportation management from "problem-solving" into the era of forward-planning, which included the participation of the private sector.



CHAPTER 2

PRIVATE AND PUBLIC PARTNERSHIPS

“

We have only a limited amount of land on which to house our people, build factories, hospitals, roads and schools, and train the SAF. Therefore, we decided to give top priority to investments in public transport, and to put private transport in second place. We do not have the land to allow an unlimited growth of private cars. This means that we must put the MRT to optimal use, and the bus services must dovetail and complement the MRT. We must also keep improving the bus and taxi services and keep the growth of cars to moderate levels.¹⁵

”

LEE KUAN YEW
Former Prime Minister

The process of forward planning, adopted since the 1970s, is best illustrated by examining the development of the main transport modes within Singapore's overall land use and transport planning context. The issues that guided the development of these modes were dealt with in specific industry contexts and were the result of various dilemmas and trade-offs in transport and land use planning. They included balancing public, private and national interests, timing the implementation of rail infrastructure and urban development, and governance responses to the public transport market at the time. Even though the policy outcomes and directions were clear, there were no predetermined paths. As a result, the development of various public transport modes in Singapore—a key focus area identified in the Concept Plan—can be seen as a series of incremental changes supported by active participation of the public and private sectors.

Regulating Buses

Buses in the 1950s were described as “mosquitoes” that wove in and out of traffic. Bus routes were haphazard, service was dismal and workers poorly paid.¹⁶ These were halcyon days when the tiny colony was agitating for self-rule from Britain, and unions were leading the charge towards change and working conditions.

At that time, the Shanghai Electric Construction Company had already established the Singapore Traction Company (STC). Set up in 1925, it was given a 30-year monopoly to operate trolley and motor buses within the city. But enforcement was weak, and many privately owned Chinese bus companies started providing bus services outside STC routes. Among them were the Changi Bus, Easy, Paya Lebar, Keppel and Hock Lee Amalgamated bus companies, which vied for business and took only popular and profitable routes. This left many streets without public transport access, affecting the population living in secluded areas.

By the 1940s, the STC was already facing serious labour and bus supply problems and was a loss-making operation because of intense competition from the Chinese bus companies. By the mid-1950s, the situation had deteriorated further. A combination of low wages, high union agitation and lack of planning in transport issues culminated in tragedy. Bus workers frequently resorted to work stoppages, paralysing the whole bus system. In 1955 alone, there were 57 strikes among the Chinese bus companies.



3. Public transport in the 1950s.

From a Free Market to a Single Bus Company

The publication of the White Paper for the Reorganisation of the Motor Transport Service of Singapore in 1970 culminated in an overhaul of public transport, and the 10 Chinese bus companies were merged into 3 major bus companies with clear territorial demarcations: Associated Bus Services served the western sector of Singapore, while United Bus Company and Amalgamated Bus Company served the northern and eastern sectors respectively. The southern sector fell under the STC's area of operation.

At the same time, the bus network was revised, and a uniform fare structure was introduced across the various bus operators. The STC, which was not affected by the physical reorganisation, went into financial difficulties and eventually ceased operations. This was largely due to the fact that much of the concessions they previously enjoyed were removed when fares were standardised. The failure of the STC prompted the government to give more thought to the future of bus transport, and the three remaining bus companies merged to form the Singapore Bus Service (SBS) in 1973.¹⁷

The government then saw the need to improve the conditions of the early days' laissez-faire. It set up the Bus Service Reorganisation Committee in 1973 to resolve problems associated with the dissatisfaction of workers. The committee consisted of representatives from the workers, owner-operators and government authorities.¹⁸ This was a move towards the new “tripartite” spirit for Singapore that was to involve unions in negotiations in the years to come.¹⁹

More fundamentally, the approach towards buses as a form of public transport changed from a free market of many players into a model with a restricted number of operators. This came after a 15-member Transport Advisory Board was set up in 1968 whose reports were used to draft the 1970 white paper. Various problems of the bus operations associated with poor quality of service, inefficient management and lack of coordination were highlighted in the report.

The white paper recommended a merger of the different companies to bring about new efficiencies and economies. However, these did not come about as the new SBS management was still using methods suited to small bus companies. The problems persisted and led the government to appoint a team of officials to study its operations. Eventually some 100 civil servants, police officers and military personnel were seconded to the SBS to revamp its operations, which resulted in improvements in productivity and profitability.²⁰

In 1978, the SBS was listed on the stock exchange, demonstrating that public service and profitability were not at odds. The SBS continued to improve its operations while reducing costs and raising the quality of service. These included the introduction of air-conditioned coaches in 1984, semi-express services, and one-man operated services in 1985. However, insufficient peak-hour capacity remained a major public transport problem in the 1970s.

Market-Building Efforts from the 1980s to 2000s

Although licensed private transport such as private hire buses served as a form of competition and service benchmarking for the SBS, it was clear that the public transport structure was a monopoly. In 1981, Ong Teng Cheong, then Minister for Communications, announced the need for competition within the public bus sector to raise service standards:

*Lately, the SBS has come under fire increasingly for being a monopoly. What is worse, the public appears to think that the SBS is unashamedly profiteering at the expense of the public...At the root of all this criticism lies the notion that a monopoly is by definition bad and that we should never have let the SBS become one...*²¹

In May 1982, a second bus company, Trans-Island Bus Services (TIBS), was established for that purpose.²²

Competition also led the SBS and TIBS to consider cost-cutting and service enhancing measures, such as the introduction of feeder services in new towns and the conversion of many of their services to a driver-only operation without a conductor. To increase capacity and patronage,

double-decker and articulated (bendy) buses were introduced in the 1980s and mid-1990s, respectively. TIBS introduced the first bendy bus in 1996, with the SBS following suit in the same year.²³

The bus industry took new directions in the late 1980s, with the inauguration of the Mass Rapid Transit (MRT) in Singapore, operated by a newly formed Singapore Mass Rapid Transit (SMRT) Corporation. In 2001, when the concept of multi-modal operation of bus and train services was being promoted, SMRT became a multi-modal operator when it merged with TIBS to form SMRT Buses, which became a sister company of SMRT Trains. The SBS itself wanted to expand into other businesses such as property and was restructured into a holding company named Delgro Corporation in 1997 (which later became Comfort Delgro) with a public transport-focused subsidiary SBS, which later rebranded as SBS Transit (SBST) in 2001. One-quarter of the new SBS entity was then spun out to the company's original shareholders in this new separately listed company. SBST started operating train services in 2003.²⁴

Thus, with the second bus operator and launch of the MRT, the period from the 1980s to 2000s was characterised by the integration of the bus sector with the implementation of the rail system. During this period, regulatory oversight and public transport planning and integration efforts were also strengthened with the establishment of the Public Transport Council (PTC) and the Land Transport Authority (LTA), in 1987 and 1995, respectively.

Originally set up to regulate public transport fares and ticket payment services, the PTC's jurisdiction was broadened in 2005 to cover licensing of public transport operators, in addition to having oversight of bus routes. Under this system, all public bus services as well any bus operator running 10 or more bus services were required to have a bus service operator licence, unless exempted by the PTC. The two largest bus operators—SBS Transit and SMRT Buses—were each granted a 10-year bus service operator licence. Under this regime, the bus operators were each assigned their respective areas of responsibilities (AoRs) by the PTC. The operators were allowed to operate bus services from their AoR to the Central Area. In return for exclusive rights to operate bus services in their AoR, the bus operators were also required to comply with the universal service obligations set by the PTC, requiring them to operate bus routes with minimum service levels even if they were unprofitable.²⁵

At first glance, it would appear that this market was a duopoly, allowing the operators to reap economies of scale in bus operations such as bulk buying of diesel and maintenance costs for their fleets. However, the existence of separate AoRs was in effect a virtual wall as it marked the boundaries of two separate monopolies. This presented market incentives for the operators to maintain service standards—since commuters only

have to hop onto the next bus in a different area to compare them—but also allowed the operators some long-term predictability as their service areas were protected. Bus services at this time were also delivered commercially without any explicit government subsidies.²⁶

Shift Towards Centralised Bus Network Planning in the Late 2000s

Under the AoR-based model, the two publicly listed bus operators planned the routes. But some routes had long waiting times and were not always seamlessly integrated with the rail network to facilitate transfers that benefited customers. To address these concerns and encourage a shift to a unified, people-centred public transport system—a vision put forward in the Land Transport Master Plan 2008—the LTA took on the role of central bus network planner from the bus operators in 2009.

This evolution continued in the subsequent decade as the bus fleet shifted towards government ownership by way of the Bus Service Enhancement Programme and the Bus Contracting Model. The LTA became the central authority to regulate and enforce service standards in 2015 with the passage of the Bus Services Industry Act. This made bus network planning and operations even more responsive to customer demands.²⁷

Injecting Bus Capacity in the Early 2010s

The government introduced the Bus Service Enhancement Programme in 2012 as the two publicly listed transport companies, SBS Transit and SMRT, were unable to cope with the overcrowding of public transport and burgeoning demand for bus services as a result of rapid population and economic growth. Injecting additional capacity to the bus industry through the programme not only aimed to reduce bus crowding and improve frequency of bus services, but also targeted improving the connectivity of the overall transport system, addressing crowding on rail and complementing the planned expansion of rail infrastructure announced in the Land Transport masterplans.²⁸

The need for the government to inject buses highlighted a weakness of the privatised, asset heavy model where operators owned assets. Operators would be slow to increase capacity and service standards in response to changing demand, as they needed to be sure that they could cover capital and operating costs before doing so. This would become a consideration in the decision in 2014 to transit to the Bus Contracting Model by 2016.

The Bus Service Enhancement Programme was rolled out in partnership with the bus operators, with government funding the purchase of 550 buses and public transport operators (PTOs) purchasing an additional 250 buses, bringing the total number of buses to 800. The programme subsequently expanded to include an additional 450 government-funded

buses in later years, supported by the government's Bus Service Enhancement Fund, bringing the total number of government-funded buses to 1,000. The S\$1.1 billion set aside under this programme covered the costs of purchasing 550 buses along with operation costs such as salaries for drivers, fuel and maintenance. With calibrated reimbursement of capital and operating costs, PTOs were not expected to make any financial gains from the scheme. In return for these investments, they were also required to deliver agreed service level improvements. As a result, the Bus Service Enhancement Programme was regarded as a subsidy to benefit commuters rather than a subsidy for public transport operators.²⁹ This partnership model allowed the bus fleet to expand quickly, adding to the capacity of the public transport system before the completion of new rail lines.

As part of the Bus Service Enhancement Programme, 1,001 new government-funded buses were introduced progressively over five years to increase bus capacity. This helped increase the capacity of about 70% of the bus services through the deployment of high capacity buses or operation of more frequent bus trips. Bus service standards were also changed to ensure higher service frequency, shorter waiting times and comfortable travel. Along with the changes in the bus industry brought about by the Bus Contracting Model, the Bus Service Enhancement Programme also reduced waiting times for commuters. Some 80 new services were also rolled out, the majority of which were in the form of feeder or short-trunk services to improve connectivity to major transport nodes, community and commercial facilities in the heartlands and newly developed areas that were expected to see ridership growth, and of which some were in the form of City Direct services, which provided commuters with alternate means to reach the city centre during weekday peak hours.³⁰



4. View of Bishan Bus Interchange.

Increasing Contestability of Bus Operations

With only SBS Transit and SMRT operating public bus services, this resulted in a duopoly structure. While the privatised industry model offered peer benchmarking in terms of service standards and cost efficiency, government internal reviews during this period took the view that it was necessary to make real the threat of competition to the incumbent operators.³¹ The idea was to make the market contestable, where instead of having competition in the market, there would be competition for contracts that would be tendered out regularly.

Keeping in view that the bus service operating licences for the two operators would expire on 31 August 2016, the government in 2014 announced plans to restructure the bus industry to a government contracting model, in which the government contracts companies to operate bus services through a competitive tendering process.³² This bus contracting aimed to strengthen the government's ability to respond to changes in travel demand and service level expectations. While the Bus Service Enhancement Programme facilitated the injection of bus capacity, the Bus Contracting Model provided the government with more direct levers to manage this capacity. Under the privatised model, the two operators were awarded the right to plan and operate bus services within their designated geographic areas, subject to regulatory oversight by the PTC. The LTA plans the bus services while the PTOs bid to operate bus services according to prescribed service standards.³³

The government owns all bus fixed and operating assets, like depots as well as the fleet management system and bus ticketing system, so as to lower entry barriers for prospective operators, allowing for more competition in the market. This model was also planned to facilitate the transition of routes from an incumbent to a new operator should the former not win the tender upon contract expiry. With this model, the government takes on the revenue risk associated with bus operations—it retains the fare revenue while the operators are paid a fixed fee to run and maintain bus services. The competitive tendering process used in this model also drives competition in the bus industry, forcing operators to be more efficient and responsive to changing ridership and commuter needs. New bus operators Tower Transit Singapore and Go-Ahead Singapore were established following the transition to this model, bringing the total number of public bus operators to four.³⁴ The new model also gave the government more economies of scale when procuring state-of-the-art buses equipped with USB chargers, sensors, etc., which in turn brought added convenience to commuters.³⁵

This transition to bus contracting also raised service reliability and service levels. The Bus Service Reliability Framework, which was trialled on

selected bus services in 2014, was later applied to all bus services as part of the Bus Contracting Model. The framework aims to improve bus reliability by reducing instances of bus bunching and prolonged waiting time. Bus operators are rewarded with incentives if they improve service reliability and penalised if there is deterioration in reliability. Average additional wait times for buses also reduced, as did instances of bus bunching. Under the Bus Contracting Model, all bus services had headways of no more than 15 minutes during the morning and evening peak periods, with half or more of these operating with scheduled headways of no more than 10 minutes. Feeder services had even shorter intervals of no more than eight minutes.³⁶

To facilitate the gradual transition to this new model, bus services were bundled into 14 bus packages with about 300 to 500 buses each. Based on long-term operational efficiency and contestability considerations, some packages were renegotiated with the incumbent operators and to be operated under the new contracting model upon expiry of their existing bus service operator licence, with contract durations of 2 to 10 years. When these negotiated contracts expire, they will also be put out for competitive tendering under the new model.³⁷ As of 2020, tenders for five packages have been called and awarded. This gradual, phased transition was done to allow the LTA to refine and improve the contract management, tendering and handover process with minimal service disruption.³⁸ At the same time, the PTC continued to regulate fares.

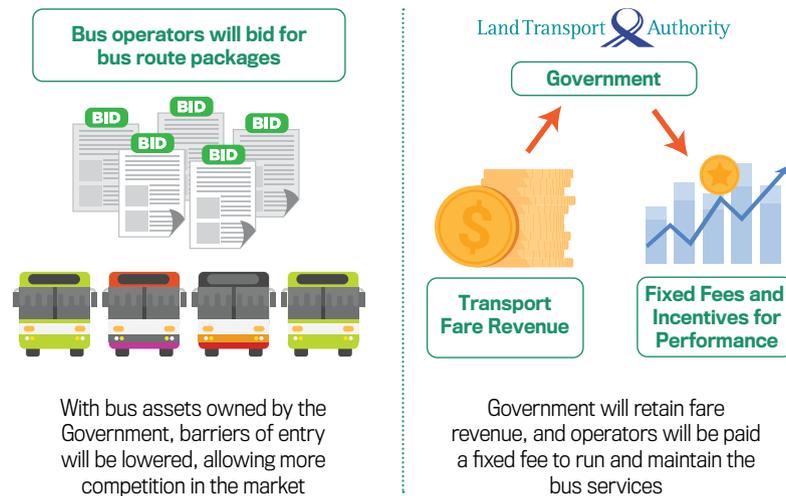
Thus, unlike the early days of mosquito buses, where different operators competed for the same market share, the new industry model strives to encourage competition for the benefit of consumers.³⁹

Reflecting on the transformations in the bus industry during this period, LTA Deputy CEO Jeremy Yap noted:

Competition brings efficiency, it brings new ideas, it injects that sense of competitive pressure. In the past, [the two incumbent bus operators] had territorial rights, almost given. But now they had to fend for their turf. So, it brings a very different dynamic. And even though [the government bore the revenue risk] in terms of the financing, subsidising and paying for the running costs, I think it has been worthwhile because bus satisfaction standards have gone through the roof as a result. We get very little bus bunching today because service controllers will be in touch with the bus drivers, to ensure better compliance with schedule. And we also make sure that service standards are maintained because we also have an incentive-disincentive programme for each operator.⁴⁰

**EXHIBIT 1
BUS CONTRACTING MODEL.**

HOW DOES IT WORK?



BENEFITS FOR BUS COMMUTERS



More reliable bus services



Shorter intervals between buses mean less waiting time



Improved service levels

Source: Adapted from Land Transport Authority, "Bus Contracting Model", https://www.lta.gov.sg/content/ltagov/en/who_we_are/our_work/public_transport_system/bus/bus_contracting_model.html

MAKING ROOM FOR BUSES ON THE ROADS

Besides improving the planning and provision of public transport services, bus usage was also encouraged through policies that gave buses priority on the roads. The first of such schemes was the reserved bus lanes introduced in February 1974. Approximately 16 kilometres of bus lanes were set up within the Central Business District (CBD). They were only installed on kerb lanes of one-way streets, and buses were given exclusive use of them during peak periods.⁴¹ The success of bus lanes in the CBD led to the installation of another 15 kilometres of bus lanes on dual carriageways outside the CBD. Travel times of buses were found to improve by 20% to 40%.⁴²

With the rapidly growing economy, the government further implemented full-day bus lanes in 2005 and the Mandatory Give Way to Buses scheme (also known as Bus Priority Boxes) in 2008 to speed up buses and enhance their reliability. Since June 2008, the network of normal bus lanes has been extended from 120 kilometres to 188 kilometres (accurate as of end 2019), and full-day bus lanes trebled from 7 kilometres to 23 kilometres.⁴³ These measures have improved bus speeds by an average of 7%. In 2016, the operation hours of the full-day bus lanes were extended to help shorten travel time for bus commuters during the late evening periods. Since 2008, 332 bus stops have implemented the Mandatory Give Way to Buses scheme. To further improve the headway of buses in the city area, the LTA also trialled the bus priority box at selected bus stops without bus bays.⁴⁴



5. Bus priority boxes help improve headway of buses.

Regulating Taxis

The taxi industry in the 1950s and 1960s was a freewheeling, lightly regulated one. Because of high unemployment, many people wanted to be taxi drivers and private cars also ferried passengers. The main issue was the rapid rise of “pirate taxis”—private cars operating as unlicensed taxis. Many pirate taxi drivers were employed by owners who controlled fleets of up to 100 vehicles. While pirate taxis had poor service standards, irregular fare structures and posed road safety problems, they served a public need, as the public bus transport services were then inadequate. While 3,800 taxi licences had been issued by 1970, pirate taxis numbered some 6,000. It was estimated that the legal taxi industry earned S\$50 million in fares in 1970, while another S\$20 million went to pirate taxis.⁴⁵



6. Taxis along North Bridge Road, 1968. By the 1960s, there were many “pirate taxis” without meters.

Establishment of Taxi Companies

The White Paper for the Reorganisation of the Motor Transport Service of Singapore in 1970 also impacted taxis by proposing the following changes: (1) raising diesel taxes on private diesel vehicles (the majority of which operated as pirate taxis) by 100%, (2) suspending pirate taxi drivers’ driving licences for one year if caught, and (3) making pirate taxi operations an offence where offenders could be arrested on the spot and charged the following day. Other new regulations that came about as a result of the white paper included establishing an age limit of 7 years for taxis and a maximum age of 63 for taxi drivers.

Providing further incentives to play by these new rules was a new spirit in labour relations. To provide employment opportunities for the former pirate taxi drivers, the Ministry of Communications provided a loan of S\$13.5 million to the National Trades Union Congress Workers Co-operative Commonwealth for Transport (NTUC Comfort) to be established in 1970. Members of the cooperative could take up vehicle loans with a four-year repayment period. With this, taxi operations improved as drivers took personal interest in maintaining their own vehicles.⁴⁶

New taxi licences were also no longer transferable and were issued only to NTUC Comfort. Pirate taxis died a quick death and, in their place, emerged several licensed companies: Singapore Airport Bus Services (SABS), Singapore Bus Service Taxi (SBS Taxi), Singapore Commuter (SC) and TIBS Taxis. The emergence of new technologies such as radiophone call booking in 1978 and the Global Positioning System in the 1990s further changed the taxi industry. SABS, SBS Taxi and SC were consolidated to form CityCab in 1995, leaving only three major operators in the taxi market.⁴⁷

The 1970s thus can be seen as a decade-long experiment in transport planning and restructuring. Prior to the 1970s, taxi licenses were issued to individuals to operate taxis, but in later years taxi licenses were issued only to bona-fide taxi companies that had the resources to manage their pool of drivers and fleet of taxis. As of 1998, NTUC Comfort, CityCab and TIBS Taxis operated a combined fleet of 15,900 taxis.⁴⁸ One important but often overlooked development is the role of the union in both bus and taxi reorganisation—they were instrumental in the political process of communicating and pushing through difficult changes. Given the high unemployment as well as the power of the unions then, the cooperation among the bus and taxi unions, as well as the umbrella organisation NTUC, were important ingredients for success.

Liberalisation of the Taxi Industry in the Late 1990s and Early 2000s

With the birth of the MRT and the shift towards creating a “world-class transport system” supported by the establishment of the LTA and PTC, the taxi industry saw further changes in the late 1990s. The 1996 white paper noted that taxis play an important role in offering personalised services and called for market forces to determine the supply and demand of taxis.⁴⁹

Thus, alongside the implementation of Electronic Road Pricing (ERP) and rationalisation of vehicle taxes in the late 1990s, taxi fares were deregulated in 1998 to allow taxi companies to set their own fares according to their costs and be more responsive to market conditions.⁵⁰ Although there were concerns that this would result in price-fixing by the taxi companies, deregulation was seen as a way to create a more efficient, competitive and responsive taxi service that better matched demand and served the interests of the public.⁵¹

In 2003, the taxi market was further liberalised to allow the entry of new companies to encourage competition in the industry. A new Taxi Service Operator Licence framework was introduced to improve the level of taxi services.⁵² Under this regime, taxi operators were made more accountable for the quality of taxi services defined under the Quality of Service standards, monitored by the LTA.⁵³ A common taxi booking telephone number was also set up in 2008 to make it convenient for the public to book taxis.⁵⁴

Enhancing Taxi Availability in the 2010s

Following persistent feedback on the inadequate availability of taxis and with a view to better utilise the taxi fleet so as to fulfil their role in the public transport ecosystem, the LTA, in consultation with the National Taxi Association and taxi operators, put forth the Taxi Availability Framework in 2013. This framework defined performance standards for taxis to better match customer demand and supply, such as the share of taxis required to be on the road during peak hours, as well as taxis with a set minimum daily mileage.⁵⁵ These measures were progressively phased over several years to allow the taxi industry to adjust to the changing policy landscape and allow drivers to cope with the changes.⁵⁶ The performance of taxi companies, measured by their ability to meet these standards, was used as a guide to allow future expansion of the taxi fleet operated by these companies. Continued failure to meet these standards resulted in penalties. As a result of these industry transformations, the share of taxis on the roads during peak hours increased from 82% in 2012 to 91% in the first nine months of 2015, meaning 2,000 more taxis were available for hire during peak hours. Daily utilisation rates also increased indicating less empty cruising and better utilisation of the taxi fleet.⁵⁷

In the last few sections, we have seen how a key idea in transport played out—pragmatism in implementation was demonstrated in the iterative process, and the continued experimentation with different regulatory forms for the bus and taxi industry.



7. Taxis along South Bridge Road.

Development of Rail

At the start of the 1980s, there was a fairly stable set of practices and expectations for businesses and commuters alike. By that time, the public transport industry had been restructured with the aim of adequate service provision at affordable prices, and a commercially viable industry, with rules covering industry structure, model of competition, regulation, pricing and service standards for buses and taxis.

As Singapore grew quickly in the 1980s, however, the need for a “mass mover” transport system came into being, which was to herald a new age of travel for Singaporeans. In the development of the MRT, disagreements about whether to proceed were played out openly.

Planning for the Mass Rapid Transit (MRT) in Singapore

The 1971 Concept Plan pushed planners to consider the best approach for the backbone of Singapore’s public transport system to cater for future demand. This led to the initiation of feasibility studies, carried out between 1972 and 1981, to study the necessity of building an MRT system supported by a network of buses, and the routes that the MRT system should take. Factors relating to cost and project viability were also studied.

The debate on the development of the MRT started as former Prime Minister (PM) Lee Kuan Yew and then Minister for Communications Ong Teng Cheong had faced formidable opposition in the Cabinet, led by then Minister for Finance Dr Goh Keng Swee.⁵⁸ PM Lee was a strong advocate for the development of the MRT as he saw how it could support future economic and social growth in the city.⁵⁹ However, Dr Goh was strongly against its development because of its projected cost of S\$5 billion, which was a large amount at that time. Dr Goh did a cost-benefit analysis on the development of a MRT and nearly rejected it, as he was not convinced of such a large and risky investment.⁶⁰

Professor Kenneth Hansen and his Harvard University team were also brought into the debate by Dr Goh, who at the end of the 1970s had proposed that an all-bus system would be sufficient and would cost some 50% less than the MRT.⁶¹ The government appointed two teams of American transport and urban planning experts to conduct independent reviews on the proposed system. They completed the Comprehensive Traffic Study in 1982, which reported that an all-bus system was not practicable as it would have to compete for road space in a land-scarce country. Lively debate ensued, even on television.

All in all, it took 9 studies and over 10 years before Singapore decided to build a rapid transit system. The breakthrough came with the reclamation of Marina South, which helped tilt the debate in favour of building the MRT.

As Marina South adjoins the city centre, Telok Ayer Basin and south of Shenton Way, the capacity of the road network to Marina South could not cater to a large travel demand, thus highlighting the need for the MRT. In addition, the construction of the MRT at Marina South was expected to pull more developments along the seafront spaces, which could help defray the infrastructure cost.

Building the Compass Line

With these sweeteners, the green light was finally given to build the MRT system after almost three years of debate, at an estimated cost of S\$5 billion in 1982.⁶² Construction was swiftly carried out in 1983. The MRT came under the newly formed Mass Rapid Transit Corporation (MRTC), which took over the roles and responsibilities of the Provisional Mass Rapid Transit Authority.

The North South Line was given priority as it passed through the Central Area with high demand for public transport. The East West Line soon followed in 1989, which together completed the basic system, also known as the Compass Line. It consisted of interchange facilities between the two lines at two stations in the Central Area. With an initial rail network of 67 kilometres and 42 stations (of which 15 were underground), the system was designed to have 40% of business and industrial areas as well as 30% of residential areas within the catchment of the MRT.⁶³



8. Commemoration ceremony at Bishan depot for the delivery of one of the first Mass Rapid Transit (MRT) trains in Singapore in July 1986.

Creating a Financially Sustainable Rail Network

The financing framework for the MRT at the time was quite different from those of buses. Trains tend to exhibit characteristics of a natural monopoly

because of the high cost of building and maintaining the necessary infrastructure.⁶⁴

The rail financing approach then involved the government funding transport infrastructure, including the first set of operating assets such as trains and signalling systems. The commuters were to share financial responsibility through fares covering operating costs. However, the second set of operating assets was to be financed by fare revenue covering only the historical cost of the first set of operating assets, with the government co-financing the balance. Operating costs as well as the cost of paying for the second set of operating assets were borne by farebox revenue, financial responsibility for which was shared by the commuters through fares. Within the fare structure and service standards, the train operators were permitted to extract efficiency dividends.⁶⁵

SMRT was set up to operate and maintain the MRT network through a licensing and operating agreement (LOA) for a period of 10 years. The financing model was structured to assist SMRT attain self-sufficiency, where the trains and infrastructure was leased to the operator at a nominal rate. While the PTC regulated the fare structure, the revenue risk lay with the operator. In addition, the operator also had to keep aside a portion of the revenue, equivalent to depreciation of the operating assets, in a reserve fund for future asset replacement.⁶⁶ Thus, while the operators got an initial leg up through the subsidised infrastructure, they had to ensure recurring efficient operations because there are no direct operating subsidies from public funds.

Financial evaluation

Before a rail line is tendered out, the LTA conducts a financial evaluation to ensure that each line is financially sustainable for both the operator and the government. This is done through a comparison of operator revenue against the required operating cost over the appraisal time period. Operating costs, such as manpower and maintenance costs would have to be covered using farebox revenue and revenue collected from commercial facilities in the Rapid Transit System (RTS) stations, such as shop spaces and advertising panels. The operators pay nominal fees to rent transport infrastructure such as bus interchanges, bus terminals and RTS stations from the LTA.⁶⁷ In other words, the total revenue of operators would have to exceed that of total operating costs plus asset replacement reserve.⁶⁸

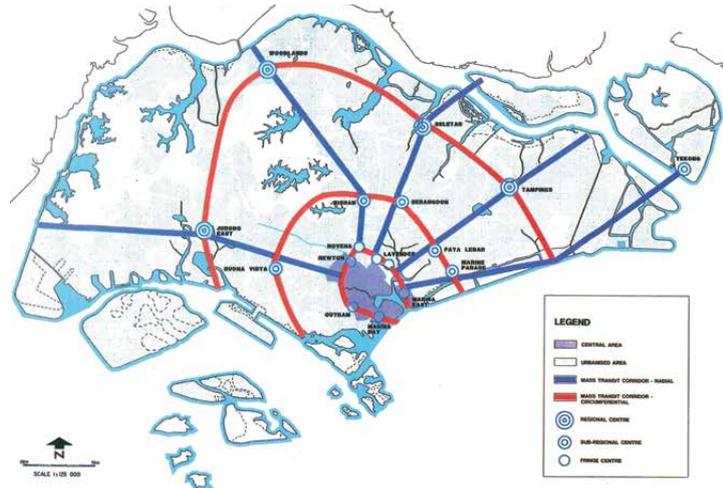
Economic evaluation

Besides financial evaluation, the LTA ensures that each rail investment justifies the resources and monies used from government coffers by using a cost-benefit analysis (CBA) framework. With the formula $Total\ Benefits > Total\ Costs$ or $Benefit-Cost\ Ratio > 1$, the framework compares a stream of transport benefits against the required costs over the appraisal period. A benefit-cost

ratio of more than 1 indicates a project's practicability and feasibility over the opportunity cost of funding the investment.

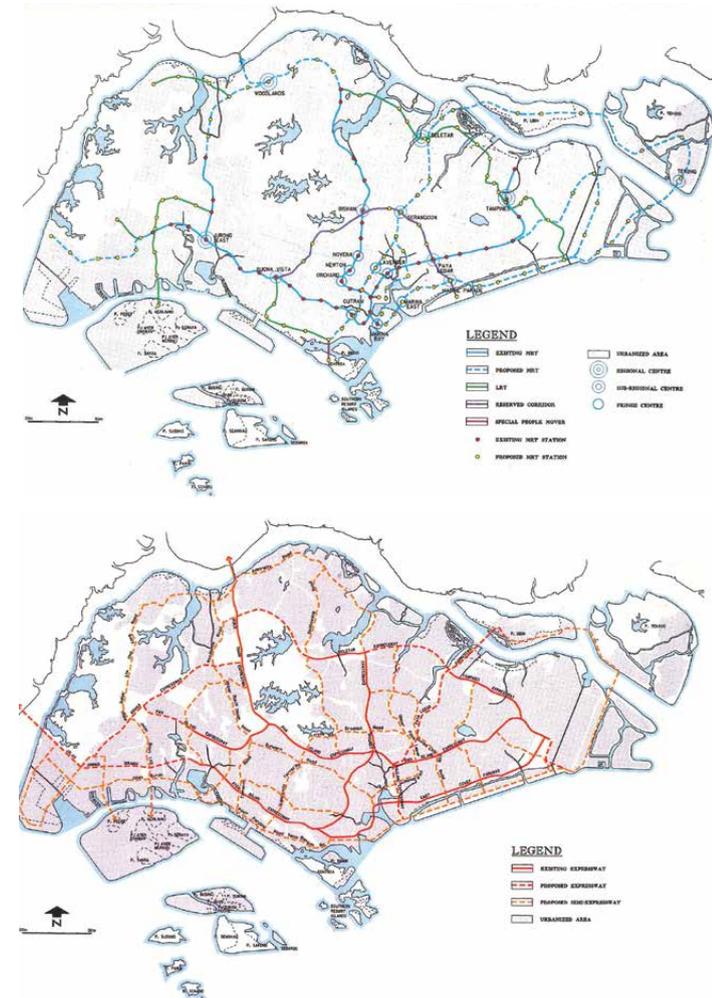
Towards a “World-Class Transport System”

The 1971 Concept Plan laid out the fundamental approach to integrate land use and transportation in Singapore. In later years, the changes in transportation came to be driven by the city's economic development strategy for 1990s—to propel Singapore to be a global city with economic dynamism, a high quality of life, strong national identity and configuration of a global city. This was reflected in the 1991 Concept Plan for a projected population of four million, which outlined a broad view of Singapore within the next 30 to 40 years.⁶⁹



9. The “constellation concept” strategy in the 1991 Concept Plan.

Transport considerations in the 1991 Concept Plan took this further in two ways. First, it adopted a “constellation concept” to decentralise commercial and other activities. This led to the creation of regional, sub-regional and fringe centres, served by MRT stations so as to facilitate better utilisation of the MRT network in both directions during peak hours. Regional centres were planned for Tampines in the east, Seletar in the north-east, Jurong East in the west, and Woodlands in the north. Second, by locating employment centres near residential areas, the plan tried to reduce the need for people to travel. To support these efforts the Strategic Transport Plan in 1995 incorporated detailed transportation proposals, including plans for a road and rail transport network to meet the travel demand of a 4 million population by 2030.⁷⁰



10. Proposed MRT and road networks in the 1991 Concept Plan.

Plans were drafted to extend the North South Line in a loop towards Jurong East. Plans to construct the North East Line (NEL) were also initiated to connect residential towns in the north-east to the city centre. Alongside the construction of these MRT lines, Singapore commenced the building of its first Light Rail Transit (LRT) system in Bukit Panjang in 1996. The decision to construct two other systems in Sengkang and Punggol that were to be connected to the NEL was also taken the same year.⁷¹

WHITE ELEPHANTS DON'T FORGET: THE DIFFICULTY OF PLANNING AHEAD

A key challenge in land use and transport planning is the difficulty in planning ahead and timing the development of rail lines and urban development so as to balance transit supply with expected commuter demand from urban development. This challenge is best illustrated by the case of Buangkok station.

Then Minister for Community Development, Youth and Sports Vivian Balakrishnan was driving to Punggol South for a visit in 2005 when he stopped his car beside the yet unopened Buangkok MRT station. Instead of the usual welcome committee of lion dances and student songs, he was greeted with silence and a peaceful scene of eight large paper elephants "grazing" on the grass. It was a protest by residents who did not see why the station should remain closed when the rest of the North East Line (NEL), besides Woodleigh, had been operational since 2003.

It was a dramatic moment, as economic considerations behind rail planning and operations and public demands came to a head. The 20-kilometre-long line was constructed at a cost of S\$4.6 billion and comprised 16 stations connecting residential areas in the north-east to Singapore's heritage areas and the city fringe.⁷² Although it was estimated that the NEL was viable in the medium to long term during the planning stages, at the time of initiating operations, it was running a deficit as the developments in the north-eastern part of Singapore were coming up slower than originally projected due to the economic outlook at the time. Due to the slowdown in the demand for flats, the building programmes for Sengkang and Punggol towns had to be scaled back significantly. As a result, there were no developments in the immediate catchment area of the station. The opening of Buangkok station was thus deferred as it was estimated that the cost of keeping the station open would result in an additional operating loss of about S\$1 million annually.⁷³

To address the issue, short-term measures like the provision of feeder buses services to connect local residents to other stations along the NEL were adopted. Over the next few years, plans to grow the population around the Buangkok station by building new residential flats around the station were also taken up so as to create sufficient traffic to justify its operations.⁷⁴ Talking to residents later, the minister said: "It's just a matter of time before you reach that critical mass when the Ministry of Transport, the LTA and SBS Transit will have no choice but to declare it open."⁷⁵ He later told reporters: "I think we are rapidly reaching the

point at which the case is so compelling that it must open. The LTA said in 2003 that there would need to be some 2,000 housing units within a 400-metre radius of the station to generate enough traffic to justify its opening. The station is part of the North East Line that was completed in June that year."

The white elephants were certainly not part of the plan, and neither was an empty station. "Planners certainly do not plan to shut down a station," said Low Tien Sio, former LTA Deputy CEO, when asked about Buangkok.⁷⁶ In the past, the work of transport planning, building infrastructure and overall master planning used to be under the PWD's purview until it split into the various present agencies. Although this demarcation of work has allowed individual agencies to be more focused in their specific areas of concern, teamwork amongst various agencies were not tightly strung to achieve the common goal. When plans were laid out for the construction of the MRT line, it was clear that the network was ready to operate to serve the public. However, overall planning that incorporated residential usage, commercial and industrial facilities were not well-integrated with transport planning, rendering certain stations non-operational in the consideration of low ridership and low-cost recovery. Buangkok station was a showcase of such unsynchronised teamwork.

A dilemma was apparent for the authorities to weigh between waiting to inject additional residential population around the station to ensure economic sustainability for private operators and providing equitable public transport access for the vicinity. Holding back the full operation of a constructed line would hurt the public's trust and provision of social equity, which would in turn affect political considerations. On the other hand, the full operation of a constructed line could mean that the fare revenue would not be able to cover the operating costs. At the time, the decision was to delay the opening of stations with low ridership.

Today, however, such decisions are usually made following the principle of supply creating demand, an approach preferred by the authorities.⁷⁷ Low said:

Initially the take-up rate is low, but as more people use it, it gets more attractive and then the line itself will encourage the commuters to go to that station. Hence it takes time for the public to accept the line and start using it.⁷⁸

The 1996 White Paper and its Impact on Rail Financing

In 1996, the White Paper for a World Class Land Transport System established three principles for the financing of public transport: (1) fares have to be realistic and revised periodically to adjust for justifiable cost increases, (2) operating revenue must be able to cover operating costs, and (3) there must be a sustainable policy on asset replacement, with each generation paying for its own consumption of services and assets.

The government recognised that the pre-1996 model of financing rail investment was financially burdensome on commuters. It exerted an upward pressure on fares and stifled the extension of the rail network.⁷⁹ Under the revised model, the government continued to pay for the infrastructure as well as the first set of operating assets. The operating costs of rail services continued to be funded by fare revenue. The revision was in the funding of the second set of operating assets, where only the historical cost of the operating assets were to be financed by fare revenue. The government would co-finance the balance through an asset replacement grant. In other words, in addition to rail infrastructure and initial operating assets, the government would now also fund the increase in cost of assets due to inflation. This rebalanced the responsibilities and interests of the government, operators and commuters.⁸⁰

In 1998, SMRT and the LTA entered into a new licensing and operating agreement to facilitate SMRT's public listing. A lease and maintenance agreement was also concluded to clarify the roles of SMRT and the LTA on the maintenance of the stations.⁸¹ Recognising the need for a second RTS operator that could support benchmarking of RTS operations and increase market competition, competitive tendering was taken up for the operation of the NEL and the Punggol and Sengkang LRTs in 1998. This resulted in the entry of SBS Transit into RTS operations. With this appointment, the SBS also became a multi-modal operator that provided integrated bus, MRT and LRT services. This was in line with the government's vision to restructure the public transport industry into a multi-modal one where operators provided seamless and integrated transport services across different modes.⁸² A licensing model for RTS operations was adopted in 2002 to replace the earlier licensing and operating agreement.⁸³

Land Transport Master Plans and the Move Towards a People-Centred Land Transport System

While the 1996 white paper guided the development of land transport in the 1990s and early 2000s, economic and demographic changes at the time called for new directions in land transport planning. Between 1995 and 2010, Singapore's GDP more than doubled in size. In addition, Singapore's population grew from 3.5 million in 1995 to exceed 5 million.⁸⁴ As a result, travel demand was projected to increase from 8.9 million journeys a day in

2008 to 14.3 million journeys a day in 2020. Although significant investments were being made in public transport at the time, public transport mode share during morning peak hours fell from 67% in 1997 to 63% in 2004.⁸⁵

Hence, to reverse this decline in public transport mode share and to ensure public transport could cater to the expected travel demand in the future, Singapore rolled out the Land Transport Master Plan (LTMP) 2008, which had a target to achieve a 70% mode share of public transport during morning peak hours by 2020. A "people-centred" approach was taken up to enhance the "total journey" experience of the commuters. A key proposal in this plan was to double the length of the RTS network to 278 kilometres by 2020. These goals were further refreshed in the LTMP 2013, which proposed expanding the rail network to 360 kilometres by 2030, with 75% of trips during peak hours made by public transport by 2030.⁸⁶

Alongside the challenges of rapidly expanding rail infrastructure, the rail industry also saw a series of high-profile disruptions in the late 2000s and early 2010s. The most severe of these disruptions occurred on the North South Line on 15 and 17 December 2011, which affected more than 200,000 commuters.⁸⁷ These developments highlighted the need for more systemic changes to ensure reliable MRT operations that could also support high public transport ridership and usage of rail assets, and have driven another round of rail industry transformation over the past decade.

New Rail Financing Framework

With the LTA's vision to expand the rail network, a new financing framework was mooted in the Rapid Transit Systems (Amendment) Act in 2010.⁸⁸ This was because new lines, being underground, would be more costly to operate and maintain. Furthermore, as new rail lines were expected to serve the less mature corridors with lower ridership, they would be initially less profitable as compared to existing lines, which serve more built-up corridors with heavier travel demand.⁸⁹ To facilitate the future expansion of the RTS network in a financially sustainable manner, a new financing framework was introduced, which was first applied to the Downtown Line.

To recognise the benefits of new rail lines, a network approach (instead of the previous line-based approach) is now used to determine whether to build the new line. Compared to the previous line-based approach, the network approach of assessing rail lines is more holistic as it takes into account benefits that accrue to existing lines. This helps to justify the implementation of new rail lines that may otherwise not be financially viable on their own. Under this network approach, rail lines that were previously deemed not viable on a line basis could be taken up or brought forward by a few years.

In addition to recognising network benefits, the new framework envisaged that the LTA, instead of operators, would own the operating

assets. This enables rail operating licences to be reduced from 30 years or more, to 15 years as operators do not need to bear the risk of recovering the cost of the operating assets. This change facilitates greater contestability to the rail industry as it allows the LTA to call for rail service tenders more often. Shortening the licence period also provides the government with additional levers to reset licensing requirements more frequently to improve service standards and drive cost efficiency.⁹⁰

In return for the use of the LTA's assets, the operator pays the LTA a licence charge that is set aside in the Railway Sinking Fund, to be used only for procuring and replacing assets.⁹¹ The licence charge mechanism also allows for risk sharing between the LTA and the operators, so that a greater licence charge is paid to the LTA when the operator does well, and vice versa.



11. Tampines West MRT Station on the Downtown Line.

As the asset owner, the LTA has to ensure that the rail operators are diligent in maintaining the assets even though the assets do not belong to them. To address this issue, the New Rail Licensing Framework (NRFF) licences set out new asset management requirements to ensure alignment of interest between the LTA and the operators.

Transition of Existing Rail Lines to the NRFF

Although the Downtown Line was the first line to be funded under the NRFF, other existing lines eventually transitioned to the framework as well—SMRT in 2016 and SBST in 2018—with the ownership of train operating assets being transferred to the LTA, and a new licence charge structure introduced to share risk with operators.⁹²

The transition of existing rail lines to the NRFF was a key part of the effort to improve rail reliability, which had emerged as a pressing issue after a series

of major train disruptions in 2011. Apart from asset management requirements, the NRFF licences included maintenance performance standards to regulate maintenance processes upstream and pre-emptively identify issues that could lead to critical rail asset failures or major service disruptions.⁹³ The LTA worked with SMRT to upgrade various assets, such as replacing wooden rail sleepers across the rail network with concrete sleepers, improving the rail signalling as well as electric power systems, replacing rolling stock as well as replacing the track circuits.⁹⁴ While SMRT provided the funding for these replacements prior to the transition to the NRFF in 2016, the LTA purchased these assets when the transition took place.

In keeping with the LTA's new role as an asset owner, the Rail Assets Operations and Maintenance group was set up to develop new structures and processes to manage asset replacements and financing. The LTA also stepped up its audits of the rail operators' maintenance processes. An integrated approach to rail operations and maintenance was also introduced, with LTA engineers being embedded within the rail operators' teams to foster a stronger maintenance culture and gain insights into operations and maintenance. Joint team meetings at the management and staff level between the LTA and the rail operators were also convened regularly to review the reliability of individual rail lines, identify causes of disruptions, develop targeted solutions and monitor outcomes to ensure better rail reliability.⁹⁵

Reflecting on the transformation of the rail sector during this period, Khaw Boon Wan, then Minister of Transport, noted in October 2019:

It has been an eventful four years. We went through two years of literally “firefighting”, as we struggled to rebuild public confidence. Followed by two years of pain and battle scars have allowed us to consolidate and stabilise our operations. In the past two years, we have begun to institute policies and processes to ensure sustainable operations going forward. The pursuit of excellence is a continuous process, obviously, with no endpoint.⁹⁶

Thus, in recent years, concerns about the reliability of the rail network and challenges to meet rising travel demand have been addressed by multiple structural changes in the rail industry. The NRFF emerged as a key policy tool in this regard. Alongside comprehensive improvements to maintenance regimes to improve rail reliability, the rail network was also expanded to provide commuters with alternative routes to reach their destinations should there be any disruptions along any route.⁹⁷ Risks were reorganised so that the public sector is better positioned to address the renewal, rebuilding and enhancement of rail assets. Most importantly, the developments in the rail sector over the past decade went

beyond just transforming an industry financing model to create a culture of collaboration and partnership in the industry—one where planners, regulators and operators were vested in creating a common outcome of increasing rail reliability for creating a world-class, people-centred land transport system.⁹⁸ Khaw said:

Whether it is the MOT, LTA, SMRT, SBST or the OEMs, we all share a common goal of delivering a reliable, safe and affordable rail service. We play different roles, we wear different uniforms, we report to different employers, but our common customer is the commuter. It was the One Transport culture which fixed the rail reliability problem. And the same One Transport culture will ensure that our rail service will remain the pride of Singaporeans.⁹⁹

Together, these policy changes laid the groundwork for the subsequent expansion of the rail network to 360 kilometres by 2030, as put forward in the LTMP 2013, with the creation of the Cross-Island Line (CRL), which is planned to provide an alternative for east-west travel in Singapore, Jurong Regional Line and extensions to existing lines.¹⁰⁰ Works are also underway to replace the first generation of 66 trains that entered service in 1987.¹⁰¹

Integrating Public Transport

Along with the development of the individual public transport modes, the creation of a robust public transport sector was made possible by long-standing efforts to integrate these various modes of transport across the network, which was supported by institutional integration at the policy level. Customer experience was also enhanced by the creation of unified ticketing systems and fare structure reforms.

“Hub-and-Spoke” Model

With the MRT network in place in the late 1980s, Singapore needed a strategic place for buses and other forms of transport. The LTA planned for a system with defined roles for each mode of transport. The MRT would form the backbone of Singapore’s public transport system, serving the heavy transit corridors primarily for long-haul travel, and would be supported by buses and the Light Rapid Transit (LRT), which would serve lighter corridors and provide intra-town feeder services to connect residential towns to MRT stations and bus interchanges. This concept is known as the “hub-and-spoke” model.



12. Interchanges like City Hall MRT station are well-integrated with other transport modes.

It was a simple yet effective design, but implementation required careful calibration. First, the government needed to move people from buses, which were familiar and cheap, to a new and more expensive form of transport. To do so, the bus routes were either stopped or rerouted so that they would not duplicate train routes. Not surprisingly, some commuters were unhappy as these meant longer or more expensive journeys. In the end, this unhappiness led to some bus routes being reinstated.

Nevertheless, over the years, a rising population has led to an increase in the demand for public transport, with the annual MRT ridership growing from 396,390,000 in 2000 to 791,409,000 in 2010.¹⁰² Buses running the same routes as the MRT are now seen as providing additional capacity to trains, which has made buses a complementary transport service rather than a competitive one.

Institutional Integration

Even as Singapore’s land-transport system grew more complex, efforts were made to simplify the regulatory framework. This began in the late 1980s with institutional integration. According to former MRT executive director Low Tien So: “[This] is what differentiates [Singapore] from the rest of the world...It provides a drive, it provides the initiative, and it influences perspective and eventually the end delivery.”¹⁰³

As a result of this, SMRT was established in 1987 to operate the first urban trains. In 2001, when the concept of multi-modal operation of bus and train

services was being promoted, SMRT became a multi-modal operator when it acquired TIBS to form SMRT Buses, which became a sister company of SMRT Trains. The SBS was also renamed as SBS Transit and started running train services in 2003. TransitLink, an integrated fare collection system, was set up in 1989.

Most importantly, the LTA was established in 1995 to integrate different areas of land transportation, including planning and regulatory functions for both public and private transport. It was formed through the merger of (1) the PWD's Roads and Transportation Division,¹⁰⁴ (2) Registry of Vehicles, (3) MRTCL,¹⁰⁵ and (4) the Land Transport Division of the then Ministry of Communications. This merger formed a single agency focusing on land transportation to coordinate planning for private and public-transport infrastructure, formulate vehicle-restraint policies, as well as evaluate trade-offs between alternative infrastructure and policy options.

Although it appeared to be a sensible idea, the formation of the LTA was not easy. It took six months for this new authority to be launched. Liew said that being a politically salient issue, politicians also weighed in on the development of the LTA. "They sent all the right messages to the public and were very supportive of the policies implemented," he said.¹⁰⁶ He later added:

In Singapore, [the government] put together land policy, vehicle registration, road transport, rail transport, all into one organisation. That is a significant move because it means that they have brought together many diverse ideas into a central body that is tasked to envision Singapore's land transportation in the next decade.¹⁰⁷

For Low, this institutional integration was more than mere organisational changes. He said:

Integration must come from all levels—between the guy who plans, the guy who builds and the guy who uses.¹⁰⁸

Integration of Customer Experience Through Common Ticketing Systems and Fares

Regulating public transport fares is a crucial and politically salient function as public transport ridership accounted for 59% of all daily transport trips during the morning peak period in 2008.¹⁰⁹ Historically, the government regulated bus fares. Whenever there were cost increases, operators would apply to the government to adjust fares to cover their costs.¹¹⁰ But leading up to the launch of the MRT, the PTC, an independent body, was set up in 1987 to regulate transport fares for buses, trains and taxis, promote and facilitate integration

of bus and train fares, advise the government on transport matters, and obtain public feedback on matters relating to public transport.

Under the public transport financing framework at the time, PTOs were expected to cover operational costs using farebox revenues, without any direct operating subsidies from the government. As such, a salient role of the PTC then was to also safeguard commuters' interests by keeping prices and standards from manipulation, while at the same time, ensuring the long-term viability of public transport operations. To ensure a wide range of views were represented in fare review decisions, PTC members were appointed from a wide cross section of society, including professional services, businesses, academic institutions, labour unions and grassroots organisations.¹¹¹

The integration of the customer experience that led to the creation of TransitLink, an integrated fare collection system, in 1987 was a natural one. The three public transport operators at the time—the SBS, TIBS and SMRT—jointly established this common ticketing system for buses, the MRT and the LRT, thus supporting integration across these three modes. As Low noted:

You need to ensure that the commuter gets to travel on bus, on rail and on all the different modes without the fuss of changing payment methods. And all the discounts or rebates are all captured in one database.¹¹²

An integrated ticketing system and farecards were introduced to provide a common fare payment system on both bus and rail, so that people could switch between them without changing payment modes. This ticketing system also allowed for the introduction of transfer rebates in 1991.¹¹³

In addition to fare integration, TransitLink also helped to ensure network and information integration. It took on the role of central planning and coordination of the bus network and MRT and LRT systems before the LTA took over as the central bus planner in 2009.¹¹⁴ In 2010, the LTA acquired TransitLink from the public transport operators, as it would be in a better position to plan the public transport network in line with commuter interests while balancing system costs, given that it was the central bus planner and agency in charge of land transport planning. Today, TransitLink provides integrated services and solutions to authorities such as the LTA and PTC, and PTOs and card managers (EZ-Link and NETS). As a service company, it plays an important role in Singapore's public transport system as the Transit Acquirer, processing transit transactions and apportioning revenue to PTOs, as well as providing card sales, refunds and replacements, and top-ups for stored value cards for customers.¹¹⁵

The success of fare regulation in Singapore can also be attributed to its embrace of advances in ticketing technology to create a unified customer experience. The first integrated ticketing system for buses and trains, which used a stored value magnetic card, was launched in 1991. This was replaced in 2002 with contactless smart card technology, which enabled better fare regulation as the fare adjustment quantum could be set at 1 cent (as compared to the 5-cent denominations earlier). As boarding and alighting points were also captured accurately for both buses and trains under the new system, these innovations provided new means of collecting transport data on fares and ridership by the transport regulator, thus reducing the problem of information asymmetry.¹¹⁶



13. General ticketing machines, located in all MRT/LRT stations, allow for topping up of stored value travel cards.

Although the structure of the public transport industry appears to be simple, the regulatory details are complex. The current structure is the result of continuous adaptation, starting first from lessons derived from the experience of the bus industry, where 11 private bus companies had competed freely, resulting in poor public transport. Today, with the element of contestability introduced, the threat of competition is real for the multi-modal public transport operators.

DETERMINING PUBLIC TRANSPORT FARES

In 1996, the White Paper for a World Class Land Transport System established three principles for the financing of public transport: (1) Fares have to be realistic and revised periodically to adjust for justifiable cost increases, (2) operating revenue must be able to cover operating costs, and (3) there must be a sustainable policy on asset replacement. In addition, the 1996 Cost Review Committee recommended that fare increments be small and regular. These changes marked the start of a more transparent and predictable formula-based process of fare revisions.

Under the then prevalent industry model based on the concept of partnership, the government provided the transport infrastructure while the public transport operators provided transport services under the regulatory oversight of the LTA and PTC. The fares paid by commuters helped cover the operating costs of the PTOs. This presented the policy challenge of balancing fare revisions to cover fare increases to sustain PTOs' business operations, and encouraging them to maximise productivity and keep fares affordable.

To allow PTOs to recover operating costs and plan for growth while ensuring that fares remained affordable, the PTC announced that it would implement a "CPI + X" formula to cap annual fare adjustments by the PTOs beginning from 1998, where the CPI was the change in the Consumer Price Index over the preceding year and "X" was the rate determined based on historical data and set ex-ante for a number of years considering inflation rate, wage changes and national productivity gains—a factor intended to compensate the operators for net cost increase beyond inflation.

But it was felt that this review mechanism was not responsive to changing macro-economic conditions. The CPI + X formula also appeared to the public to be a cost-plus formula where cost increases (X) were passed on to the commuters. These concerns led to a revision in the fare review formula in the 2000s.

In March 2004, then Minister for Transport Yeo Cheow Tong requested the Chairman of the Government Parliamentary Committee for Transport, Chay Wai Chuen, to form a committee to review the public transport fare adjustment mechanism. This committee, chaired by Chay, consisted of Members of Parliament, PTC members, a union representative and an academic. After much discussion, the formula for a fare-cap was refined in 2005 to be $Maximum\ Fare\ Adjustment = Price\ Index - X$, where $Price\ Index = 0.5CPI + 0.5WI$,¹¹⁷ and X, the productivity component was set at 0.3%

from 2005 to 2007, and later revised to 1.5% from 2008 to 2012. The fare structure also changed in 2010 with the introduction of a distance-based fare regime that ensured that commuters paid the same fare irrespective of whether they travelled the distance directly or transferred between various modes.¹¹⁸

In recent years, while the price index minus productivity extraction model has been retained, tweaks have been made to better track costs and ensure that public transport operations are sustainable, while continuing to be affordable to the public. The general CPI was replaced with a core CPI that excludes housing and private transport costs in the calculation of the Consumer Price Index. Metrics like the Energy Index (EI) were introduced in the price calculation to better track the changing electricity and diesel costs for operating public transport, given the volatility and increase in energy prices.¹¹⁹ In 2018, the Network Capacity Factor (NCF) was also introduced to reflect the operating costs due to capacity adjustments. The NCF measures the extent to which capacity is added beyond actual commuter demand—a key consideration as Singapore has been aggressively expanding its public transport network capacity. The fare revision formula, valid from 2018 to 2022, is $0.5 \text{ cCPI} + 0.4 \text{ WI} + 0.1 \text{ EI} - 0.1\% \text{ Productivity Extraction} + \text{NCF}$.¹²⁰

These changes reflect the social need and public purpose of the public transport system. Together with industry service standards for various modes, the price cap model encourages PTOs to adopt sustainable business operations to support a competitive public transport market while ensuring that public transport service quality does not suffer and that commuters get value for money. Pegging the fare cap formula to macro-economic factors and sharing of productivity gains protect commuters' interest, while encouraging operators to be cost efficient.¹²¹ A Public Transport Fund was also set up to support lower income families against the impact of fare increases, alongside public transport vouchers and fare concession schemes.¹²²

CHAPTER 3

PRIVATE TRANSPORT

“

You've got to look ahead and forestall or pre-empt the problems. I mean, if we did not introduce the Certificate of Entitlement [a vehicle quota system introduced in 1990] at a time when the public could not afford cars as much, you could not do it now without a big row—because you can't get people to give up their cars. But we did it when the cars were few. Today, it is accepted as a fact. If you want the roads to be free [uncongested], you've got to pay for the right to use the road.¹²³

”

LEE KUAN YEW
Former Prime Minister

Rapid economic growth, a growing population and the rising affluence of Singaporeans have resulted in burgeoning demand for travel over the years. A world-class public transport network is paramount for making Singapore a thriving, modern city that is people-centric, sustainable, and promoting economic growth, especially with a growing population that expects high service and infrastructure standards.

Nevertheless, given the convenience and comfort private transport offers, a high-quality public transport network may be insufficient to shrink the modal share of private transport. Furthermore, the rising affluence of Singaporeans has resulted in growing car ownership aspirations. This has presented the government with a familiar big city conundrum: meeting the aspirations of motorists while having less scope to increase the road network in years to come.

Given its high carrying capacity, speed and reliability, the Mass Rapid Transit (MRT) is crucial in reducing congestion and enhancing mobility in Singapore. However, rail lines are expensive infrastructural investments, and cannot be constructed quickly. Alternative measures are therefore necessary to ameliorate congestion while the rail network grows.

With this in mind, the government has put in place a combination of vehicle ownership and road usage measures. Although ownership measures are effective in controlling vehicle population growth, usage measures such as Electronic Road Pricing (ERP) are needed to counter what behavioural economists term the “sunk-cost effect”. With high-ownership costs, car owners tend to maximise the value of their cars by driving whenever possible. Thus, relying on high-ownership costs is not enough. Usage charges are equally important in managing the demand for road space.

Fiscal Measures to Manage Demand

Since the late 1950s, Singapore has had in place fiscal measures to control vehicle population. Originally intended as a revenue-raising measure, the Additional Registration Fee (ARF) acts as a vehicle ownership tax. The ARF is an ad valorem duty on a vehicle’s open market value and is payable by buyers of new motor vehicles. The ARF, which increased from 10% to 25% of the vehicle’s purchase cost in 1972 to 175% in 1983, discouraged vehicle owners from replacing their cars and encouraged new car buyers to buy used cars. In addition to the ARF, import duties, registration fees and a road tax on private vehicles were also levied.

The government also introduced a Preferential Additional Registration Fee (PARF), which incentivised car buyers to purchase a new vehicle by

refunding them a portion of the ARF if they de-registered an old vehicle of the same engine-size category that was less than 10 years old at the time of the purchase.¹²⁴

The car population continued to rise despite these fiscal measures. From 1962 to 1973, the average annual growth rate of motor vehicles was 8.8%.¹²⁵ Traffic congestion worsened, especially within the Central Business District (CBD), and little expansion could be done to the road network due to the old city layout. It was also environmentally unacceptable and physically impossible to continue building road infrastructure to accommodate the increasing private vehicle growth. The State and City Planning (SCP) project in 1971 then recommended that restraints on car ownership and usage in the city area were clearly necessary.

Furthermore, the SCP noted that congestion around the Central Area was reaching unacceptable levels. Traffic flow along major arterials such as Kallang Road was 85,000 vehicles per day. New Bridge Road had 60,000 vehicles per day, and Orchard Road had over 70,000 vehicles per day. Anderson Bridge, which links Collyer Quay to Nicoll Highway, carried an astonishing 93,000 vehicles per day.¹²⁶

According to Joseph Yee, former Director of Planning and Transportation at the Land Transport Authority (LTA) from 1999 to 2003, the government took the SCP’s recommendations very seriously.¹²⁷ Since October 1972, the government began introducing a series of tax measures on car ownership growth in the form of very steep import duties on cars and stiff road taxes.

Pay-For-Use Schemes

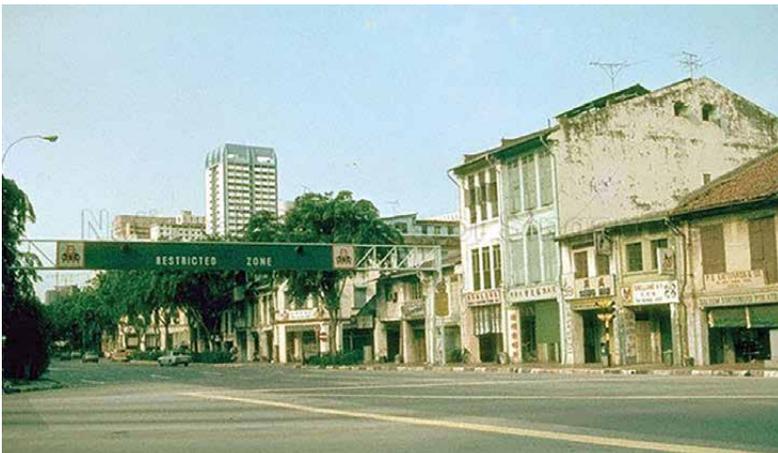
To improve accessibility and ameliorate the severe congestion problem in the Central Area, an inter-ministerial Road Transport Action Committee (RTAC) was formed in 1973 to coordinate transport planning measures and formulate transport policies. Comprising technical staff from the Public Work Department (PWD) and helmed by permanent secretaries of several ministries, the committee highlighted the pressing need for restraints on car use in the Central Area.¹²⁸

The RTAC examined and experimented with a series of measures that included the staggered work hours scheme, carpooling, toll roads and parking fees. Some of these measures, however, had inherent problems that resulted in their limited success. For example, the carpooling measure contradicted the staggered work hours scheme as it was difficult to gather a suitable pool of commuters with different reporting times. Finding carpoolers with reasonably close origins and destinations was also rather

challenging. In January 1975, the Ministry of Communications set up a Car Pooling Management Unit to alleviate the problems faced with carpooling. It also recommended rates of financial compensation for drivers and assisted with the formation of carpools.¹²⁹

Area Licensing Scheme and Road Pricing Scheme

The RTAC concluded that more could be done to mitigate the rapid rise in traffic flow in the Central Area. The committee adopted several guiding principles when considering the various measures to limit traffic. First, motorists should easily understand the scheme. Second, its enforcement should not require a burdensome administrative structure. Third and most critically, it had to be effective in reducing peak-hour traffic while being equitable to all users.¹³⁰



14. An Area Licensing Scheme gantry at Eu Tong Sen Street in the early 1980s.

The Area Licensing Scheme (ALS) was implemented in June 1975. It was a moment that launched Singapore into the transport world as the first country to use a price stick to discourage car usage. The scheme featured entry cordons around the most congested parts of the Central Area, called the Restricted Zone. The original boundary of the Restricted Zone was chosen based on the location of employment centres, but it was not possible to exclude all residential areas from the zone. Its boundary was demarcated to ensure there were “escape routes” that allowed vehicles to turn off without being forced to enter the Restricted Zone unwittingly. This boundary was subsequently expanded in later years.

During the Restricted Hours (7:30 a.m. to 9:30 a.m. from Monday to Saturday), certain categories of vehicles, initially private vehicles and company-registered cars, had to purchase and display an area licence. Alternatively, they had to form carpools, with a total of four passengers including the driver, to gain free entry into the Restricted Zone. Licence fees varied by vehicle type. For example, a daily permit for a private car was pegged at S\$3, while the monthly permit was priced at S\$60.

Over the years, inflation and growing incomes resulted in higher licence fees. For example, in 1980, cars were charged S\$5 for a daily licence, while a monthly licence was set at S\$100. In addition, ALS boundaries were extended further as the Restricted Zone became more developed and congestion prone. In June 1989, the increasingly heavy traffic flow during the evening peak-hour period made it necessary for the authorities to impose the ALS from 4:30 p.m. to 7:00 p.m. In addition, to ameliorate the heavy traffic flow into the Restricted Zone, car-pools and motorcycles were no longer exempted from the scheme. Restraints on these users meant that a milder levy was enough to restrict traffic. As a result, ALS fees for cars were reduced to S\$3 per day and S\$60 per month in 1989.

At the time of planning for the ALS, given the poor state of public transport, the government felt it was necessary to provide transport alternatives to motorists affected by the ALS as the public transport system then could not meet the travel demands of car-users displaced by its introduction. As an alternative, a Park-and-Ride scheme was developed. As part of this, nine surface car parks were built at the periphery of the Restricted Zone, and four other existing car parks were included in the scheme. These fringe car parks had low parking fees for the whole day and special shuttle buses that ferried commuters to three major destinations within the Restricted Zone. Both schemes were publicly announced at the same time on 29 May 1974. The operations of this Park-and-Ride scheme started on 16 May 1975, two weeks ahead of the implementation of the ALS.

In spite of this, the Park-and-Ride scheme failed to take off. Parking lots were under-used, as were the shuttle bus services. As a result, the bus services were extended to serve nearby housing estates and new towns. Although the scheme might have been a failure from an operational point of view, it was a political win as the scheme showed that the government provided options for motorists to reach destinations in the Restricted Zone.

From the outset, carpools were exempted from the ALS scheme. Although the intent of this was to encourage multiple car-users to use one car, there were instances when this exception was used as a way to get around the ALS—drivers often picked up three potential passengers or hitchhikers to form the required number to enter the restricted zone free of charge. As a result, certain places became popular pick-up spots, which resulted in haphazard traffic situations.

In addition to the Park-and-Ride scheme, alternative express bus services charging flat fares were also introduced to encourage car drivers to switch to public transport. The SBS introduced six Blue Arrow bus services, which connected the CBD to private housing estates. Road improvements were also taken up to along inner and outer rings roads skirting the ALS area to improve road capacity. Car parking charges in the Restricted Zone were also set to complement the operation of the ALS. Parking regulations were amended to require all privately owned car parks to be licensed. A surcharge on the parking licence fee per lot was imposed to influence private car park operators to raise parking fees.¹³¹

The ALS was continuously tweaked in subsequent years. Congestion in the CBD continued to worsen in tandem with Singapore's economic growth during the early 1990s. The government therefore fine-tuned the ALS in 1994 by imposing a whole-day restriction period between 7:30 a.m. and 6:30 p.m. and implementing two sets of rates for the period between the morning and evening restricted hours. The implementation of the ALS saw an immediate 44% decrease in the number of motor vehicles entering the Restricted Zone during restricted hours, from about 74,000 to 41,500. In addition, the ALS led to the increase in travel speed in the Restricted Zone during restricted hours.

The experience of the ALS led to the implementation of the Road Pricing Scheme in June 1995. This passage pricing system was progressively introduced and started with a section along the East Coast Park expressway before extending to other expressways such as the Central Expressway and the Pan Island Expressway in 1997. The Road Pricing Scheme charged motorists for taking a certain route, thus encouraging those who did not want to pay the extra charges to look for alternative routes or times. This resulted in better traffic distribution among the expressways that led into the CBD during morning peak hours. It was also a pilot of road pricing before the implementation of the ERP system in 1998.

Implementing Electronic Road Pricing

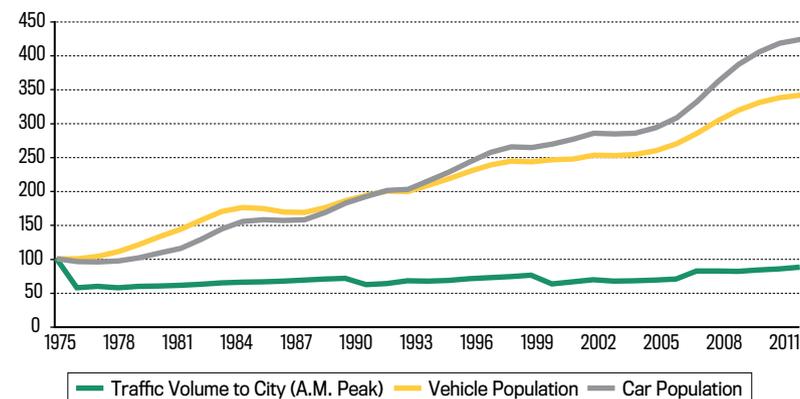
The ALS served Singapore's traffic situation over the years. But despite its success and practical low-cost means of managing road usage, it had its limitations. Being a manual system, ALS charges were fixed regardless of changes in travel speed during the year. While traffic conditions fluctuate depending on the hour, day and location, it was technically and administratively impossible then to provide a flexible system with shoulder-peak charges in accordance with traffic volume for each road in the

Restricted Zone. With the introduction of various licenses over the years for different areas, different times of the day (peak/non-peak) and for various vehicle types, the ALS was also getting increasingly cumbersome and unwieldy. Enforcement was also labour-intensive making it difficult to expand and modify the scheme. As it was a cordon system, it gave vehicles with a valid license unlimited entry to the Restricted Zone. This meant that the charges were not commensurate with the congestion caused, as vehicles were not being charged based on the use of roads.

Thus, in 1989, the government noted the technical limitations of manual pricing schemes and approved the implementation of a technologically advanced road pricing system. The contract for supplying the system was awarded to the Philips/Miyoshi consortium in October 1995.¹³² In 1998, the ALS evolved into the automated ERP scheme, which was introduced alongside the Vehicle Tax Rationalisation programme. This brought down upfront vehicle taxes such as a registration fee, ARF and road taxes of vehicles to reflect the reliance on usage measures to control traffic congestion.¹³³ A year after its implementation, traffic volumes in the Restricted Zone fell by 15% for the whole day and 16% during the morning peak hours.¹³⁴

Despite the lower ERP charges compared to the ALS, the sharp fall in traffic volume was likely a result of the per-entry charging which led to the reduction of multiple trips in the Restricted Zone.¹³⁵ This suggested that ERP made motorists more aware of the true cost of their journeys, thus encouraging them to make travel-related decisions based on cost, necessity of the trip, alternative routes and alternative transport modes available.

EXHIBIT 2 TRAFFIC VOLUME INTO THE CITY (A.M. PEAK) WITH ALS AND ERP IMPLEMENTATION (1975-2011).



Source: Land Transport Authority.

FLYING PROJECTILES AND CAREFUL PLANNING: REGULATING CARS

It is hard to imagine an instrument of public policy turning into a lethal flying weapon but for the LTA's first CEO, Liew Heng San, this was a serious issue to be addressed. The year was 1997, and he was implementing the ERP system, which required a small electronic device—known as an in-vehicle unit (IU)—to be fitted into each car. The system worked by deducting a small fee each time the car entered high-congestion areas. In effect, it was an additional tax on road usage, with the premium meant to discourage the use of cars in certain areas during peak hours, using prices to regulate congestion.

The idea was simple and effective. The implementation, however, required months of planning and public engagement. Recalling the difficulties, Liew said: “There was a debate—‘What would happen in a car accident, when the IU gets dislodged and turns into a flying projectile, knocking off the braces and the jaws of the driver?’ This is really melodramatic! I thought to myself, ‘How am I going to argue against that?’”¹³⁶

This challenge came on top of many others. Being electronic, the public had many fears and issues with the ERP's central computer system. Firstly, there was the issue of privacy. Many motorists feared that their vehicle movements were being tracked. The government assured the public that records of all ERP transactions were kept in the IU's memory chip. Furthermore, all records required to secure payments from the banks were deleted from the central computer system within 24 hours.

Motorists were also concerned about radiation coming from the antenna controller installed in the ERP gantries and the IUs in the vehicles. The LTA explained that the IUs are non-radiating and only reflect what they receive from the antenna controller of the ERP gantries. Similarly, the antenna controllers do not pose a threat to motorists. Positioned 6 metres above the road surface, the radiation power of the antenna controllers are 1,000 times less than the acceptable radiation power allowed by the international agencies on radiation protection.¹³⁷

Then came the “flying projectile” fear—motorists argued that the IUs posed a threat to them during an accident. They were afraid that the IUs could dislodge and injure drivers on impact. To prove this untrue, the LTA planned to stimulate a crash. However, three days before the simulation, a newspaper article on an accident displayed a photograph of a smashed car

with only the IU intact. Former LTA Chief Transportation Engineer Gopinath Menon recalled:

There was a photograph of a car in an accident in the newspapers, and the IU was the only one standing. So, we spent a lot of money for nothing. But what I'm saying is, the whole idea was people were not happy with the system and anything was chosen to part...but I think we did a lot of experiments to make sure that it's reliable because we wanted to make sure that people will not complain.¹³⁸

ERP was finally implemented later that year. It was, and remains, a tough measure whose trade-off for roads was felt keenly in Singapore. Today, land transport infrastructure already takes up 12% of total land use on an island of about 710 square kilometres—a considerable figure when compared to the 14% used for housing.¹³⁹



15. ERP gantry at North Bridge Road.

The Vehicle Quota System

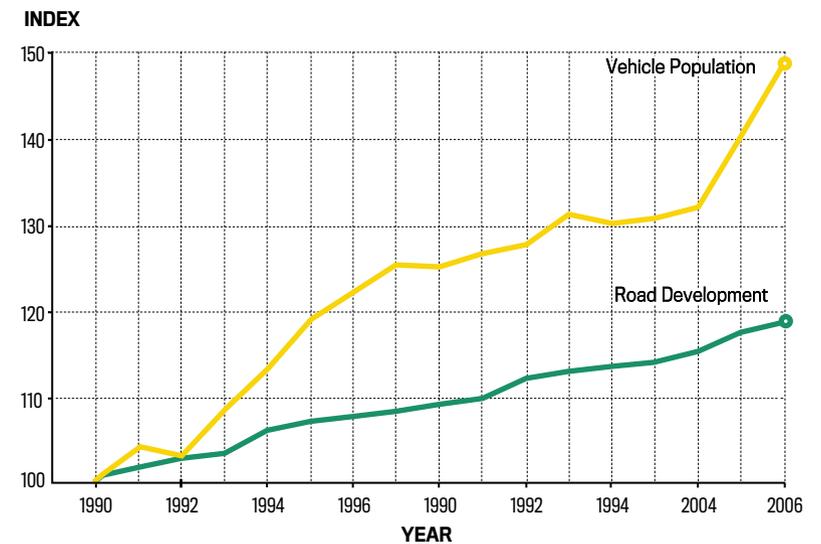
While the ALS and vehicle taxation efforts were successful in keeping roads free of serious congestion, in the late 1980s, economic growth and increasing incomes meant that a growing number of Singaporeans viewed car ownership as an integral part of life—a trend that could not be sustained in the land-scare city-state. As a result, in 1990, the Select Committee on Land Transport Policy proposed recommendations to control and limit the number of vehicles at a level “below that a free market in vehicles would create”. The report noted that usage restraints should be viewed as a supplementary instrument to sharpen the efficacy of ownership restraint measures and that indirect pricing systems such as import duties and the ARF were insufficient in controlling the car population in times of rapidly rising incomes. This led to the birth of the Vehicle Quota System (VQS) in 1990.¹⁴⁰

The VQS places a quota on the number of new vehicles that are registered in Singapore each year, based on the allowable growth rate in vehicle population that is sustainable for the long-term. Under the VQS, anyone who wants to register a new vehicle would need to first bid for a Certificate of Entitlement (COE), which entitles them to own and use the vehicle for 10 years. COEs are allocated through a market mechanism, which provides the most efficient and equitable means of allocation. The quota is released twice a month and bidding for COEs is done through an electronic auction system. The successful bid price for the COE thus reflects the market-clearing price that people are willing to pay to own a car. There are provisions for a rebate of the COE if the car is scrapped before its expiration date.

In 1998, the Government Parliamentary Committee (Communications) was appointed to conduct a review of the VQS. The committee presented its findings (published in the Report of the Vehicle Quota System Review Committee) to then Minister for Communications Mah Bow Tan in March 1999. After seeking the views and participation from various interest groups, academics and members of the public, the committee affirmed the effectiveness of the VQS as one of the key pillars of Singapore’s traffic management strategies and recommended that the scheme be retained. The committee also concluded that competitive bidding was the most efficient and equitable means of allocation of quota.¹⁴¹ Over the years, the VQS has also been revised to better respond to public expectations and increasing demand for vehicle ownership. For example, the Open Bidding System was implemented in 2001 to provide greater transparency for bidders, resulting in smaller fluctuations of month-to-month COE quota premiums.¹⁴²

A key rationale for the introduction of the VQS was to control the vehicle growth rate at a rate that could be sustained by the road network in a land-scare Singapore.¹⁴³ By 1999, the growth rate of the vehicle population was capped at 3% per annum.¹⁴⁴ However, it was felt that this rate could not be sustained as road expansion was expected to slow down from 1% per annum in 2008 to 0.5% per annum over the next 15 years. Hence, the LTMP 2008 proposed to limit vehicle growth to 1.5% per annum from 2009.¹⁴⁵

EXHIBIT 3 VEHICLE GROWTH AND ROAD DEVELOPMENT.



Given the rising social costs of car ownership and the inherent trade-offs in determining the use of land for other uses such as housing, healthcare and schools, it was also felt that the conventional wisdom that more cars could be allowed as long as they do not contribute to congestion was true only to a limited extent. As a result, the vehicle growth rate was further reduced to 1% in August 2012 and 0.5% in February 2013.¹⁴⁶

Significant improvements to the transit network through the expansion of the rail system under various land transport master plans and an injection of additional bus capacity through the Bus Service Enhancement Program and the Bus Contracting Model have been taken up in recent years. In view of this as well as Singapore’s land constraints, the vehicle growth rate was further reduced from 0.25% to 0% for motorcycles and cars from February 2018. For commercial vehicles, the growth rate of 0.25% was retained to allow businesses time to improve the efficiency of their logistical operations.¹⁴⁷

Parking Management

Singapore has primarily relied on ERP to manage road use. Besides ERP, parking management is increasingly being used to restrain car usage by controlling parking at trip destinations. Since 1965, developments have been required to provide a minimum parking provision as stipulated in the LTA's Car Parking Standards. Car park operators and individual building owners were allowed to determine the parking charges based on market demand. This approach has ensured adequate parking provision while regulating the use of parking spaces through pricing.¹⁴⁸ The Car Parking Standards were lowered in 1990 and further tightened in 2002.¹⁴⁹

Range-based car parking standards were introduced in December 2005 to allow developers greater flexibility to reduce parking provision. Under this standard, developers could allocate up to 20% fewer parking spaces than the prevailing standard so as to better match parking provision with market assessment of demand based on operational and business considerations.¹⁵⁰

More recently, in line with Singapore's move towards a car-lite society, new standards in the form of Range-based Parking Provision Standards (RPPS) were introduced in February 2019 to replace earlier standards and allow developers greater flexibility in managing parking in areas well-connected to the public transport system so as to free up more land for other uses. While the earlier standards stipulated a minimum parking provision and allowed developers to reduce this minimum by up to 20% subject to approval by the LTA, under the RPPS, developers were allowed to determine their desired level of parking provision within the stipulated range without the LTA's approval. In view of improvements in public transport, an "upper bound" for parking provision was introduced as a new tool to prevent the over-supply of parking spaces. Both lower and upper bounds for parking provision were defined based on the parking zone in which the development was located and land use of the proposed development.

As part of the RPPS, a new parking Zone 4 for car-lite areas was introduced.¹⁵¹ These areas are planned to have strong public transport connectivity, walking and cycling travel options. Vehicle parking provision for development applications within these areas will be determined by the LTA on a case-specific basis. As of August 2020, 10 car-lite areas—Marina South, Kampong Bugis, Woodlands North, Bayshore, Jurong Lake District, Jurong Innovation District, one-north, Punggol Digital District, Springleaf and Woodlands Central have been gazetted. These areas include growth

areas identified and developed by the government as new mixed-use districts that will support the decentralisation of commercial activities away from the city centre.



16. Occupied public car park lots along Keong Saik Road in the CBD.

As many of the older buildings in the CBD were developed during earlier times when more generous parking standards were in place, the supply of parking spaces in the CBD have been higher than what would have been permitted under recent, more stringent standards. For example, in 2008, 49,000 parking spaces were available in the CBD compared to 29,000 that should be present based on the then Gross Floor Area (GFA) of buildings. As such, a key thrust in recent years has been to allow the supply of parking spaces to reduce over time with the application of new parking standards to new developments and conversion of some excess parking spaces in older buildings so as to reduce parking supply in the city.¹⁵² For example, Market Street Car Park, built in the 1960s with 704 parking spaces, was planned to cater to a shortfall of parking spaces at a time when public transport services were inadequate in the CBD and Telok Ayer Conservation Area. Given investments in public transport over the years, the car park was closed in 2011 to be redeveloped as a commercial building.¹⁵³ Policies to allow temporary and permanent conversion of surplus parking spaces in the central area were also taken up to convert parking to more valuable land uses.¹⁵⁴ These approaches were

further expanded to cover other existing developments with convenient access to public transport, including residential developments within the central area as well as commercial, mixed use, hotel and business parks located within 400 metres of an MRT or LRT station. To prevent an over-supply, parking spaces provided beyond the stipulated maximum limits were computed as part of the GFA of the development and subject to the developer's payment of the development charge or differential premium.¹⁵⁵

Thus, Singapore's approaches to restrict private vehicle use evolved from relying on "blunt instruments" such as upfront taxes and fiscal measures to a more calibrated system of policy options to manage both private vehicle ownership and usage in recent years. The 1990s saw the implementation and revisions of major travel demand management policies, anchored by the twin pillars of the ERP system and the VQS. Continuous experimentation and adaptation of these policy levers have been crucial to reducing reliance on private vehicles. Rather than being stand-alone tools introduced to curb private vehicle use, Singapore's approach to travel demand management is part of a coordinated approach that integrates land use and transport planning to support higher public transport use and enable the shift to a more car-lite society.

CHAPTER 4

A TRANSPORT ECOSYSTEM THROUGH WALK-CYCLE-RIDE

“

We cannot achieve car-lite simply by decree. A more enlightened approach is to work towards making car ownership and private car usage unnecessary, because there are alternative transport modes that are superior. And this is what we are aiming to achieve.¹⁵⁶

”

KHAW BOON WAN

Coordinating Minister for Infrastructure and
Minister for Transport (2015–20)

By the turn of the century, Singapore had an established set of policy levers in place to manage the supply and use of private vehicles. Transport and land use roadmaps were also being developed to enhance public transport capacity and improve public transport reliability to meet the travel demands of a growing economy.

As these policies matured, there was a parallel increase in the country's focus on improving first and last-mile connectivity for commuters so as to encourage public transport use. Approaches to improving accessibility through walking and cycling were also compounded by new industry innovations and technological developments around the world that resulted in the proliferation of new mobility modes. These developments called for innovative and nimble public policy responses that maximised the benefits offered by these modes, while reining in the disamenities and avoiding the pitfalls of untested technology and a rapid evolving industry landscape. This is best examined by tracing the evolution of active and shared mobility modes in Singapore.

Active Mobility

In Singapore's early years, along with pedestrians, trishaws and bicycles were prominent features of the streetscape. For example, the 1938 report on traffic conditions noted that there were no fewer than 52,000 bicycles alongside 6,533 tricycles in 1937.¹⁵⁷ By 1960, it was estimated that Singapore had 268,000 bicycles compared to 63,000 cars and 19,000 motorcycles.

In later years, with rising car and motorcycle ownership, cycling became a mode of transport used for last-mile connectivity for short trips, and for recreational purposes. With the opening of the Mass Rapid Transit (MRT) in 1987, commuters used cycling for first and last-mile connectivity, which prompted the building bicycle parking stands at MRT stations. In 1991, between 20 to 80 such bicycle parking stands were constructed at 24 MRT stations.¹⁵⁸

Promoting Intra-Town Cycling in the 2000s

One of the first efforts to have paths for active mobility uses like cycling started not within the transport industry, but in the creation of park connectors—a network of linear open spaces and greenways meant to improve connectivity between parks. Conceived in 1990 and approved by the Garden City Action Committee in 1991, this network makes use of areas that are not suitable for other purposes (e.g. drainage reserves originally set aside for the maintenance of canals, or spaces under MRT viaducts) to provide added recreational options. The first of these park connectors,

along Kallang River opened in 1992, linking Bishan-Ang Mo Kio Park with Kallang Riverside Park. By 2015, more than 300 kilometres of park connectors had been built to provide more opportunities for nature-based recreation and active mobility.¹⁵⁹



17. The park network system at Kallang River/Bishan Road in 1992.

Beyond cycle parking facilities and recreational links, plans to create cycling infrastructure were not introduced until the mid-2000s, when then Member of Parliament for Tampines, Irene Ng, raised the issue of safe cycling in 2005. She noted that there was a need to “take a serious view of the vulnerability of this group of road users, especially as their numbers are increasing”, adding “because it is an issue that cuts across several different Ministries, and requires coordinated action, it seems to fall between the cracks, with no real progress”.

Noting that it is hard to make Singapore's roads safer for cyclists if urban planners or transport policymakers do not factor cyclists into their plans, Ng called for an inter-ministerial taskforce to be set up to address the issue. In addition, she noted that a number of cyclists were riding on footpaths as the roads were deemed to be too dangerous and called for a review of the ban on cycling on footpaths that was in place at the time.¹⁶⁰

This resulted in a tripartite study between the Land Transport Authority (LTA), Traffic Police and the Tampines Grassroots Organisations in 2007 to explore the feasibility of allowing cyclists to share footpaths with pedestrians. Footpaths were widened by the Town Council to accommodate both pedestrians and cyclists. Education programmes and enforcement drives were also held to guide cyclists and encourage responsible behaviour.¹⁶¹

In 2010, by-laws were enacted to allow pedestrians and cyclists to share footpaths in Tampines.

In the late 2000s, cycling became increasingly popular in Singapore and started to make its way into the country's transport plans. Acknowledging the role of cycling in catering to different needs, the Land Transport Master Plan (LTMP) 2008 noted that cycling “can be a non-motorised transport option to bring commuters to major transport modes”. The plan also noted that Singapore's limited land did not allow for the provision of a comprehensive network of dedicated cycling tracks islandwide at the time. As such, the approach then was to leverage the National Parks Board's (NParks) nationwide Park Connector Network (PCN) to bring cyclists to transport nodes, with additional street design interventions to close the gaps between the park connectors and transport nodes as needed.¹⁶²



18. Cyclists waiting to cross a road at Bishan Town.

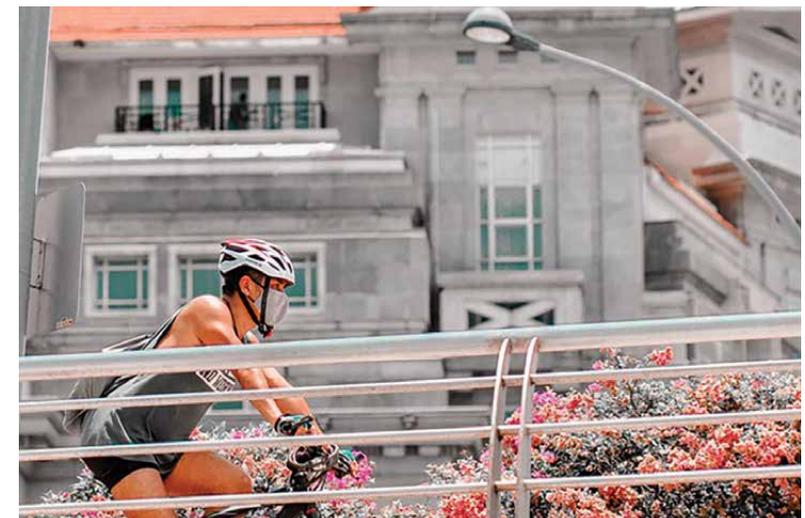
This led to the promotion of cycling for intra-town journeys in the early 2010s with a S\$43-million plan to build cycling paths in HDB towns. A collaborative effort involving multiple agencies, the National Cycling Plan aimed to create a network of cycling paths totalling 700 kilometres by 2030, combining intra-town and inter-town routes as well as park connectors and round island routes.¹⁶³ Tampines was the first HDB town to have such a network. Together with the cycling paths constructed by the Tampines Town Council and park connectors, Tampines residents were able to use a total of 11.3 kilometres of cycling paths in 2013 to access local amenities such as the MRT station and town centres in the neighbourhood.¹⁶⁴

Today, cycling path networks are present in nine HDB towns—Tampines, Sembawang, Changi-Simei, Pasir Ris, Yishun, Punggol, Ang Mo Kio, Jurong Lake District and Bedok.

Besides cycling paths in HDB towns, the LTA also started work with agencies to implement cycling paths in Marina Bay in tandem with the development of the area, as part of an initiative proposed under the Sustainable Development Blueprint in 2009 that called for an overall sustainable transport system in Marina Bay.¹⁶⁵ To support closer integration of cycling with the MRT, the LTA also worked with transit operators to install bicycle racks at various stations. Rapid Transit Systems Regulations were also amended to allow foldable bicycles on trains and buses in late 2009.¹⁶⁶

Improving Pedestrian and Cyclist Comfort and Safety

Given Singapore's tropical climate, pedestrian and cyclist comfort is a key factor influencing broader adoption of active mobility modes. Earlier efforts to improve comfort, starting from 2000, resulted in the provision of covered linkways between MRT stations and bus stops to schools, and healthcare facilities within 200 metres of public transport nodes. These efforts got a boost in the LTMP 2013 with the introduction of the Walk2Ride scheme to expand the network of covered linkways from 46 kilometres to 200 kilometres by 2018.¹⁶⁷ Rolled out with an estimated budget of S\$330 million, covered linkways were built to connect schools, healthcare facilities, and other public amenities within a 400-metre radius of MRT stations, and within a 200-metre radius of bus interchanges, LRT stations and selected bus stops with high commuter volumes, where feasible.¹⁶⁸



19. Cycling across the Esplanade Bridge in the City Centre.

A Paradigm Shift Towards a Car-Lite Singapore

These efforts to promote active modes of transport gained new momentum in 2014, when Prime Minister (PM) Lee Hsien Loong announced the car-lite vision for Singapore at the launch of the Sustainable Singapore Blueprint for 2015 as part of a collective vision to make a cleaner and greener Singapore. He said:

...we will aim for a car-lite Singapore by promoting and developing other modes of transport, making them convenient. We have to rely less on cars on the roads because we cannot keep on building roads—more roads for more cars. So we will provide more options for Singaporeans that are better than cars. Buses, more of course. Expanding the MRT network—that is happening everyday—but also other modes of transport, for example, bicycling. It is something we have not made enough use of in Singapore but I think we can do more.¹⁶⁹



20. Cycling path near Ang Mo Kio MRT station.

Ang Mo Kio was selected to be developed as a model walking and cycling town. Jointly developed by the LTA and Urban Redevelopment Authority (URA) along with support of agencies like NParks, a 4-kilometre-long cycling path connecting the Ang Mo Kio MRT station, swimming complex and AMK Hub, a commercial development in the town, was developed to enhance connectivity for residents. Cycling paths, which were integrated with new parks created in the town, were developed with a distinctive red colour to demarcate it from other public areas.¹⁷⁰

The town also featured various design interventions that prioritised safety for cyclists and pedestrians. For example, pedestrian priority zones were created in areas, such as behind bus stops, used by both pedestrians and cyclists. These zones featured rumble strips and contrast markings to slow down cyclists and enhance safety for all road users. New approaches to junction design were adopted to reduce pedestrian-cyclist and vehicular conflicts. Road safety for active mobility users at informal crossings and traffic junctions were improved through better signage and the use of slips roads were reduced where possible, and legibility and wayfinding were improved with new map boards. Many of these features were co-created with residents through a series of community exhibitions and focus group discussion. Another 16 kilometres of cycling paths were subsequently developed, bringing the total length to 20 kilometres, with plans underway for additional expansion.¹⁷¹

Alongside these efforts to realise a car-lite vision in residential towns, projects were also taken up to make walking, cycling and riding public transport more pleasant in the city centre. As part of the construction works for the Bencoolen MRT station serving the Downtown Line 3, two of the original car lanes were reclaimed for public use and converted into wide footpaths lined with trees and pedestrian amenities. A dedicated cycling path and bus lane were incorporated into the design of Bencoolen Street to transform it into a Transit Priority Corridor.¹⁷² Covered linkways were built, connecting the MRT station to the facilities and developments in the vicinity.¹⁷³ To add vibrancy to the streetscape, the LTA and URA collaborated with artists to design and install unique street furniture. In addition, 125 new bicycle parking spaces were also installed at key destinations along the street.¹⁷⁴ This and similar projects to create a car-lite city centre were also supported by large-scale outdoor events such as Car-Free Sunday, which was initiated in 2016 to transform the Civic District and parts of the CBD into a pedestrian and cyclist-friendly precinct.¹⁷⁵

Efforts to make streets and roads car-lite extended to include planning and design of future road infrastructure, such as the 21-kilometre North-South Corridor (NSC), which was originally announced in the LTMP 2008 as Singapore's 11th expressway to connect the growing towns in the north of Singapore with the city centre and alleviate the traffic load along the Central Expressway and nearby arterial roads.¹⁷⁶ In view of the car-lite vision, the NSC was redesigned as a Transit Priority Corridor,¹⁷⁷ with dedicated and continuous bus lanes as well as a cycling trunk route to connect to the city.¹⁷⁸ These changes are expected to reduce bus journeys from Woodlands, Sembawang, Yishun and Ang Mo Kio to the city centre by up to 30 minutes, and also make bus connections between residential towns along the NSC faster. The trunk cycling route also plans to improve

connectivity by linking the PCN and the cycling path network within HDB towns along the entire corridor to the city centre.¹⁷⁹



21. A cycling path along Bencoolen Street in the CBD.

The private sector was also engaged to create walking and bicycle-friendly developments. The Walking and Cycling Plan (WCP) was launched in May 2016 to identify opportunities to cater to the needs of active mobility early in the design process. Developers of large-scale projects were required to incorporate various design elements such as covered pathways, traffic calming features, signage, cycle parking facilities and end-of trip amenities as part of their development plans to cater to the needs of active mobility users. Compliance with WCP requirements was evaluated as part of the Traffic Impact Assessments in the development control process.¹⁸⁰ In 2019, these requirements were expanded to cover other development types.¹⁸¹ The Walking and Cycling Design Guide was also published to provide developers, the building industry, consultants and government agencies a common set of design guidelines to develop active mobility infrastructure supplementing existing engineering and development standards.¹⁸²

Reflecting on the transport-planning paradigm during this period, former LTA CEO Chew Men Leong noted:

If you want to get people to actually adopt public transport as a main means of getting to and from work or other places, then we need to have a system that was essentially more seamless and more connected especially when it comes to the first and last

mile. Only with that can you persuade people to rely less on their private cars and be in favour of public transport. Walk-Cycle-Ride (WCR) captured the options available that will enable you to have a seamless, multi-modal journey from point A to point B. If you can do it efficiently, it is potentially a good replacement for the desire to own and take a private car trip. WCR was also about going down to the details of what were the options available, making sure that there were sheltered walkways, and new paths for cycling so that it became a mode that people could rely on, and having the right regulatory regime so that we could have the city of commuters well taken care of. I think what it did create was a philosophy in which we put the commuter first in trying to work out all the options to go from point A and point B without using the car. And that actually changed the way we actually look at things.¹⁸³

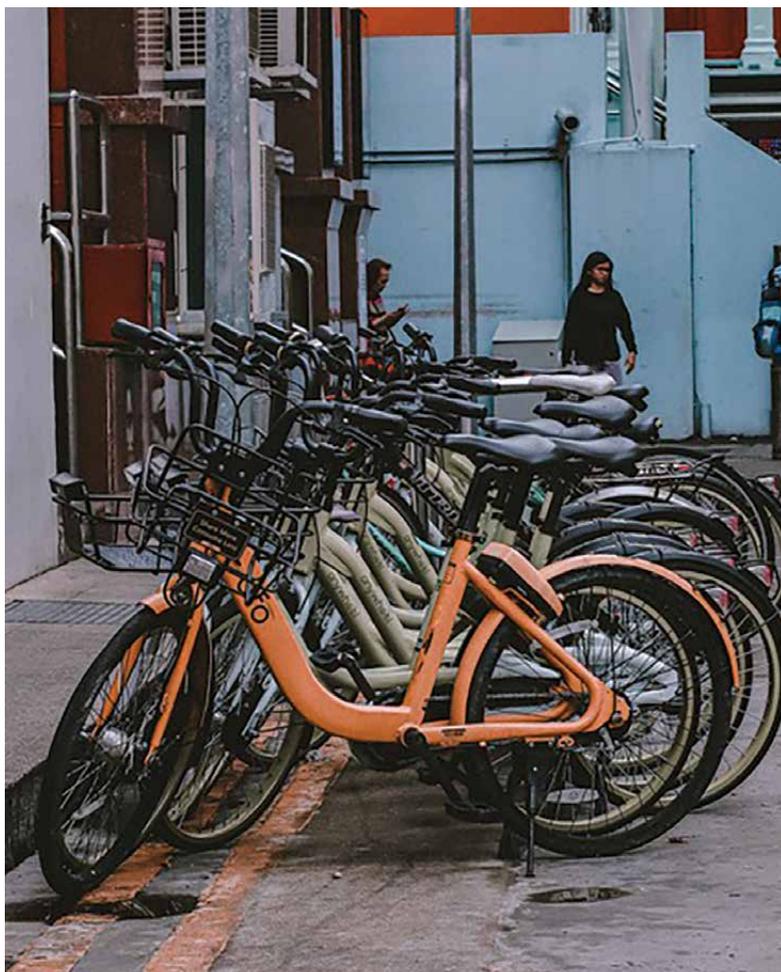
Policy Responses to Shared Active Mobility Modes

In July 2016, to improve the first-and-last-mile connectivity using cycling, the LTA called a tender for an operator to build, own, operate and maintain a bicycle-sharing system in Jurong Lake District. The inauguration of this system was timed to coincide with the completion of cycling paths in the district, where cycling infrastructure and the presence of a mix of different land uses was expected to provide strong demand for the shared bicycles throughout the day. The proposed business model included public sector funding for the system, with tenderers allowed to bid for grants from the LTA. Although the tender attracted 13 bids from local and foreign operators to set up docked or dockless bicycle sharing systems, the LTA decided in March 2017 not to award the tender as by then, a number of privately funded dockless bicycle sharing systems had emerged in Singapore, removing the need for a publicly run system subsidised with government grants.¹⁸⁴

However, soon after the entry of private bicycle sharing operators, public disamenities caused by shared bicycles arose. Town councils reported receiving complaints about shared bicycles blocking pathways and dry risers. Damaged bicycles were also a common sight.¹⁸⁵ Indiscriminate parking of the bicycles at bus stops, footpaths and in public areas was also noted. Although the LTA created new parking spaces and made various efforts to curb such practices, such reports continued to surface.¹⁸⁶

As a result, in October 2017, the LTA, NParks and 16 Town Councils entered into a memorandum of understanding (MoU) with the five bicycle-sharing operators in Singapore that outlined a set of mutually agreed guidelines to reduce disamenities and public safety concerns arising from bicycle sharing services. Under the MoU, operators were required to remove illegally parked bicycles within half a day and to use geo-fencing technology by end 2017 to detect whether bicycles were parked within

designated parking zones. Operators were also required to remove faulty or broken bicycles from public spaces within a day. To educate the public on the use of bicycle-sharing systems, operators were required to co-fund public education initiatives and provide public liability insurance for all users and victims of accidents. The MoU also paved the way for operators to share anonymised trip data with the LTA to facilitate the planning of active mobility infrastructure. To facilitate bicycle parking, plans were rolled out to provide additional parking spots in HDB estates, parks, park connectors and transit stops. The MoU also applied to the operation of other shared active mobility devices, such as shared personal mobility devices (PMDs) and power-assisted bicycles (PABs).¹⁸⁷



22. Shared bicycles parked along the back lane of a row of shophouses in the City Centre.

In March 2018, a licensing regime for operators that provided dockless sharing of active mobility devices (including bicycles, PMDs and PABs) was introduced via amendments to the Parking Places Act, which helped the LTA to better address the problem of indiscriminate parking. Under this licensing regime, the LTA was allowed to set the maximum fleet size of each operator, reviewing it regularly to allow the growth in fleet size based on operator performance (i.e., ability to manage disamenities) and take into account factors such as user demand and availability of parking spaces. It also equipped the LTA with powers to enforce performance standards and address indiscriminate parking. For example, operators were required to implement a QR-code-enabled geo-fencing system, whereby users were required to scan a unique QR-code at designated parking locations to end a trip. Operators were also required to adopt practices to encourage responsible user behaviour. Users who parked indiscriminately could also be charged until they returned the shared devices to a designated parking space. Users caught parking shared bicycles indiscriminately more than three times a year could also be temporarily banned from renting from all bicycle-sharing operators. Operators not following these standards were subject to financial penalties, fleet size reduction, or a suspension or cancellation of their operating license.¹⁸⁸

These new regulations saw further changes in the shared active mobility industry, with the exit of players like OBiike, Ofo, Mobike and others, and the entry of new players like Anywheel and SG Bike to the market in 2019.¹⁸⁹

The bicycle-sharing licensing regime regulated under the Parking Places Act was further expanded in July 2020 with the Shared Mobility Enterprises (Control and Licensing) Act. The new regulatory regime looks beyond indiscriminate parking to address public safety, and expands the licensing regime to cover all active mobility sharing devices that can be used on public paths. Under the regime, operators are regulated based on the characteristics of their business operations, taking into account factors such as the scale of operations, whether they use docked or dockless systems, or motorised or non-motorised devices. For example, a class license regime will be introduced from April 2021, where operators whose business model or operations pose fewer safety or parking concerns may be subject to a smaller set of regulatory requirements.¹⁹⁰ All operators are required to provide third-party liability insurance for users.¹⁹¹

Regulatory Responses to New Active Mobility Modes

Along with cycling, the 2010s also saw the emergence of new active mobility modes in the form of PABs, PMDs, such as kick-scooters, e-scooters, hoverboards, unicycles, as well as personal mobility aids (PMAs), such as wheelchairs or mobility scooters, which were popular with the elderly and those with walking difficulties. To oversee governance of these modes,

the Active Mobility Advisory Panel, comprising representatives from all key stakeholder groups including seniors, youths, cyclists, PMD users, motorists and grassroots leaders, was set up in July 2015 to deliberate and develop a clear set of rules and code of conduct, so that common spaces like footpaths and cycling paths could be shared safely and harmoniously among users. The panel has been instrumental in reviewing active mobility regulations in 2016, 2018 and 2019 to enhance safety on public paths.¹⁹²

While early efforts to govern these modes focused on enforcement, following extensive public consultation and focus group discussions, the Active Mobility Advisory Panel in 2016 made recommendations in three key areas: types of devices to be allowed on various types of public paths (footpaths, shared paths and cycling paths), rules and a code of conduct for users, including speed limits, and the setting out of various criteria on the weight, width and speed of devices allowed in public.¹⁹³ These recommendations were formalised as part of the Active Mobility Act 2017, which came into force in May 2018. The Act also provided the LTA with legislative and enforcement powers to regulate the sale of motorised PMDs, PABs and PMAs. Subsequent reviews by the panel saw further revisions to the regulatory landscape. Following a review in 2018, mandatory registration of e-scooters and a lower speed limit on footpaths were introduced in early 2019.¹⁹⁴



23. Riding an electric mini-bike, a type of Personal Mobility Device (PMD), at East Coast Park.

Nonetheless, these efforts did not resolve the issues brought out by these transport modes. As Lam Pin Min, then Senior Minister of State for Transport, noted at the time, PMDs helped many Singaporeans save time and costs, and many used them to improve their livelihoods through new employment opportunities and, in the case of older Singaporeans with mobility challenges, found new freedom with personal mobility aids. Nonetheless, reckless PMD users were increasingly seen to threaten the safety of vulnerable path users such as the elderly and young children. Some users also illegally modified their active mobility devices to travel at high speeds, which endangered the lives of other path users. Fire hazard was also a key concern—there were 228 accidents involving PMDs on public paths reported in 2017 and 2018, along with 52 PMD-related fires in 2018 and 49 in the first half of 2019.¹⁹⁵ Lam said:

*We have had a year of experience regulating PMDs. It has not been all smooth sailing and we did not expect any new tool's introduction to be a rosy journey. But the experience has helped us to review our regulatory measures and to see how they can be tightened to further enhance safety.*¹⁹⁶

To address these concerns, both regulatory and infrastructure changes were put in place alongside education and enforcement efforts. Deadlines to ensure compliance of motorised PMDs with the UL2272 safety standard were brought forward.

Mandatory inspection regimes for registered e-scooters were scheduled to ensure compliance. Incentive schemes for early disposal were also rolled out, under which owners of motorised PMDs non-compliant with the UL2272 safety standard were given cash incentives to dispose their devices. On the infrastructure front, to ensure path safety, active mobility infrastructure improvement plans to install warning signs and speed-regulating strips were proposed to tackle accident hotspots. Trials to develop pedestrian-only zones in town councils, where cyclists and PMD riders had to dismount, were also planned. As there were many blind spots in housing estates that could not be overcome through infrastructure improvements, PMDs, bicycles and PABs were banned from the void decks in 15 HDB towns from September 2019.¹⁹⁷

These efforts notwithstanding, following a safety review in view of rising accidents and the death of an elderly cyclist due to a collision with an e-scooter rider in September 2019, e-scooters were prohibited on all footpaths from November 2019. This ban was subsequently extended to prohibit the use of all motorised PMDs, such as motorised unicycles and hoverboards, on footpaths from April 2020.¹⁹⁸

A key demographic affected by this ban was food delivery riders, who relied on PMDs for work. The government rolled out transition assistance packages to support them and delivery workers working for key food delivery companies. The government also introduced a S\$7-million e-scooter trade-in grant to allow food delivery riders affected by the ban to replace their e-scooters and switch to bicycles, PABs or PMAs. Under this scheme, food delivery riders who traded in their existing e-scooters received up to S\$1,000 to buy a PAB, or S\$600 for a bicycle.¹⁹⁹

Going forward, the Active Mobility (Amendment) Bill, passed by Parliament in February 2020, is expected to strengthen the regulatory framework. The bill introduced new measures to govern the active mobility landscape. These include online theory tests for PMD and PAB riders to ensure awareness of active mobility regulations, along with an age limit prohibiting those less than 16 years from riding e-scooters on public paths. Along with a mandatory periodic inspection regime to ensure compliance of PMDs with device standards by users, retailers are also required to submit their devices for inspection. Third-party liability insurance was also required for both device-sharing operators and businesses that employ riders who use active mobility devices for work. This was aimed at enhancing access to compensation for accident victims.²⁰⁰

Collectively, these efforts mark a significant step towards a unified regulatory framework for a safer and more sustainable active mobility landscape in Singapore.

Facilitating Resurgence of New Mobility Through the Islandwide Cycling Network

In 2020, the government announced accelerated cycling infrastructure improvement plans in the form of the Islandwide Cycling Network (ICN) programme, estimated at a cost of S\$1 billion. The programme aims to enhance safety by increasing the space for pedestrians and users of mobility devices and bicycles, and plans to expand the current 460-kilometre cycling network to 1,320 kilometres by 2030.²⁰¹ LTA Deputy CEO Jeremy Yap noted:

What the expansion of the cycling network does is give ample space so that the cycling paths become closer to residential houses. This is to facilitate even the resurgence of [new active and shared mobility modes], in the fullness of time when these cycling paths are put in place.²⁰²

New processes to engage and work with various agencies were also put in place to balance competing land use priorities and enable the rapid implementation of active mobility infrastructure proposed under the ICN programme.²⁰³

Point-to-Point Services

Disruptions driven by technological innovations and new business models were also noted in other areas of the mobility landscape, notably the taxi industry. In the past, taxi services complemented public transport systems, providing door-to-door services for customers. For example, before 2013, 28,000 taxis provided street-hail services. Customers could also call or text a hotline to make an advance booking.²⁰⁴ As outlined in Chapter 2, various efforts had been taken up in the past to reform the taxi industry so as to improve taxi availability and better match taxi supply with customer demand. Although these efforts had helped minimise the gap, a mismatch between consumer demand and taxi supply remained. During off-peak hours, many taxi drivers cruised around for customers or queued at taxi stands to pick up passengers, while long wait times and a lack of availability of taxis during peak hours were common complaints.²⁰⁵

Entry of Private-Hire Cars and Taxi Booking Services

The mismatch between taxi supply and demand changed with the influx of private-hire cars (PHCs) and third-party taxi booking service providers like Uber and Grab, which started operations in Singapore in 2013. Offering cheap and convenient ways of booking PHCs, these operators disrupted the traditional taxi industry and changed the way commuters travelled.

As a result, the number of PHCs rapidly outgrew taxis in Singapore, from under 500 to nearly 10,500 in 2015 and 32,000 in 2016.²⁰⁶ This resulted in the reduction of the market share of taxis. The rise of the gig economy, combined with flexible working hours and incentives provided by these companies at the time, meant that many drivers who were not licensed under the regulations governing taxi drivers were providing PHC services.²⁰⁷ As these companies functioned as technology service providers rather than traditional taxi operators, they did not fit neatly into the regulatory framework at the time.



24. Pick-up and drop-off point for private-hire cars at an Orchard Road shopping centre.

Regulatory Responses to the Point-to-Point Sector

In light of these developments and noting that these apps facilitated more efficient matching of taxis with commuters—an issue that had been the focus of past reforms in the taxi industry—the LTA announced that all third-party taxi booking apps would be subjected to a basic regulatory framework as part of the Third Party Taxi Booking Service Providers Act, announced in November 2014 and enacted in 2015.

Under this “light-touch” framework, all third-party taxi booking services were required to register with the LTA. Checks and balances were put in place to ensure commuter safety. Only licensed taxis regulated under the Taxi Quality of Service standards and authorised drivers holding valid Taxi Driver’s Vocational Licences were permitted to provide such services. Fare-related safeguards, such as up-front communication of fares payable for the journey were also put in place to protect commuter interests.²⁰⁸ New regulations, such as requiring a Private Hire Car Driver’s Vocational Licence (PDVL) and requiring PHCs to be registered with the LTA, were introduced in 2016.²⁰⁹



25. Private-hire cars and taxi booking services have helped address the mismatch between taxi demand and supply.

The entry of operators such as Grab and Uber resulted in a significant improvement in the commuter experience. The waiting time for taxi bookings fell from nine minutes in 2016 to just under seven minutes in 2018. Dynamic fares, with higher prices during peak hours and lower prices during off peak hours, also allowed better matching of supply and demand and commuters to have a range of options at different price points. Industry innovation, such as pricing strategies, trip incentives and value-added services, also resulted in better choices for customers. These applications also benefitted drivers as they had a higher chance of finding commuters and could reduce the amount of time spent cruising while looking for a passenger.²¹⁰

To maintain the current balanced position that commuters enjoy, a review of the regulatory framework for the point-to-point (P2P) sector was taken up in consultation with operators, drivers, the National Taxi Association, the National Private Hire Vehicles Association and the public.²¹¹ New legislation, in the form of the Point-to-Point Passenger Transport Industry Act, was passed in Parliament in August 2019.

The regulatory regime brought about by the new act adopts a calibrated approach to regulate operators based on the type of service provided (i.e., street-hail or ride-hail services). Ride-hail and street-hail operators with more than 800 vehicles have to apply for a licence from the LTA. The framework also brings in enhanced commuter safety through the inclusion of basic safety regulations for both drivers and vehicles.

To facilitate an open market to support the development of responsive P2P services, the LTA will also prohibit operators from offering exclusive arrangements that prevent drivers from driving for other operators.²¹² Other regulations that benefit drivers include the extension of offences of fare evasion to PHC trips booked on licensed ride-hail service operators. Furthermore, the LTA has regular engagements including tripartite meetings with taxi and PHC operators and driver associations—the National Taxi Association and the National Private Hire Vehicles Association—to identify and discuss strategies to address drivers’ key concerns. To ensure that fares across the P2P sector are clear and transparent, the Public Transport Council (PTC) will also be given the power to oversee PHC fare regulations.²¹³ The new framework is a step towards achieving Singapore’s long-term vision for a well-connected and convenient land transport network. Senior Minister of State Janil Puthuchery said:

...our regulatory frameworks must also be flexible enough to guide the flow of technology without constricting it. We must strike a balance between protecting public interest, achieving our broader transport policy objectives, allowing innovations to thrive, meeting the needs of commuters, and creating jobs for transport workers. We need to

be clear about what, why and how we want to regulate. How we have evolved our planned regulatory framework for the P2P sector is a good example.²¹⁴

Thus, in the last few years, public transport has been complemented by rapid changes in the active and shared mobility sector. In addition to walking and cycling, other modes such as PMDs have influenced how people commute, especially for short distances. With the emergence of new services such as bicycle-sharing, third-party taxi booking and PHC services, the suite of transport options available to the public has also increased. Collectively, these are referred to as WCR modes.²¹⁵

Policy responses taken to govern WCR modes have been underpinned by a combination of infrastructure plans together with regulatory and governance reforms that have addressed the needs of users, operators, businesses and other stakeholders. The rapidly evolving nature of both the market and the technology associated with these modes has required a nimble approach to policy to respond to changes in a timely manner. The balanced regulatory approaches in place today to govern these modes is the result of continuous calibration of policy tools that not only enabled the evolution of these sectors without stifling market innovation but also addressed public safety risks and negative externalities generated by these modes.

CHAPTER 5

DRIVING FORCES FOR THE FUTURE

“

Long-term sustainability has to be a key planning consideration for our transport system.²¹⁶

”

DR JANIL PUTHUCHEARY

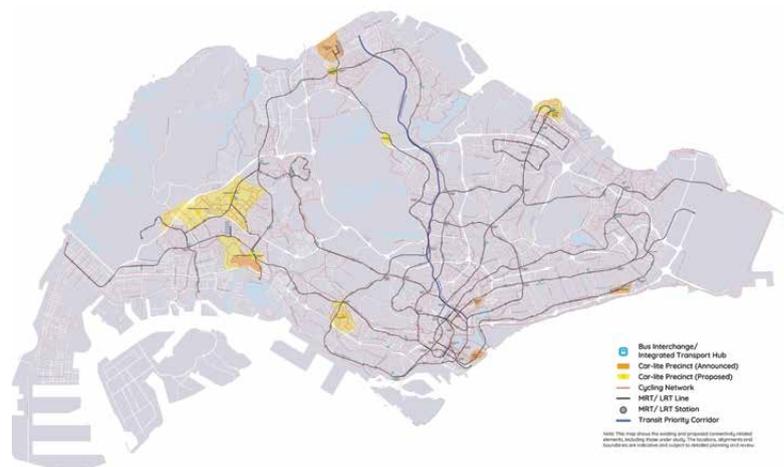
Former Senior Minister of State for Transport and Communications and Information

Multi-pronged efforts to improve the public transport ecosystem and rein in private vehicle use over the past decades have helped to deliver a more integrated transport system in Singapore. Some 64% of households are now within a 10-minute walk of a train station, compared to 57% in 2012. The share of peak-period journeys undertaken on public transport has also grown from 63% in 2012 to 67% currently. With greater use of active mobility modes, the number of daily active mobility journeys grew from 2.2 million to 2.6 million from 2012 to 2016.²¹⁷

Moving forward, the maturing land transport system is expected to bring a different set of challenges, as trade-offs between competing priorities become increasingly difficult to manage as Singapore deals with tighter land, manpower and fiscal constraints.²¹⁸

Towards a Future-Ready Transport System

The Land Transport Master Plan 2040 envisions Singapore to be a 45-minute city with 20-minute towns by 2040, where all journeys to the nearest neighbourhood centres using Walk-Cycle-Ride (WCR) modes will be completed in less than 20 minutes and 9 in 10 peak hour journeys using WCR will be completed within 45 minutes, as commuters have more public, active and shared modes to transport choices to facilitate their journeys. These goals were embedded as part of the Master Plan 2019 to ensure that transportation plans dovetail with land use policies.



26. Transport plans included in the 2019 URA Master Plan.

In existing towns, active road repurposing and integration of active mobility initiatives will further support WCR modes. For instance, transit priority Corridors (TPCs) will continue to enhance bus priority. Infrastructural plans to expand rail networks, develop TPCs and active mobility infrastructure are also supported by plans to bring jobs closer to home through key developments such as Jurong Lake District, Jurong Innovation District, Woodlands North Coast and Punggol Digital District.²¹⁹

To facilitate closer integration of land use and transportation, car-lite approaches are being adopted in new developments. For example, Tengah, which is expected to have 42,000 homes, is being developed as Singapore's first smart and sustainable town. It features nature-centric neighbourhoods connected by walking and cycling networks and MRT lines. Tengah's town centre will also be "car-free", with roads running underground, thus freeing the ground level for walking, cycling and recreational uses. It will also be EV-ready, with charging stations installed at car parks to benefit EV owners.²²⁰

In the future, new technologies supported by big data will continue to disrupt urban transport systems by giving rise to solutions like on-demand transport services and autonomous vehicles (AVs). In recent years, testbeds to trial untested technology have been adopted to cultivate these emerging and new technologies and facilitate the creation of a future-ready transport system in Singapore.

CULTIVATING INNOVATION: A COLLABORATIVE APPROACH TO DEVELOP AUTONOMOUS VEHICLE TECHNOLOGIES

Singapore is no stranger to the use of technology in public transport. For example, the North East and Downtown Mass Rapid Transit (MRT) lines and the Light Rail Transit (LRT) have been using driverless technology to improve punctuality and reduce manpower needs. The people mover systems in Sentosa and the airport are also driverless.²²¹ In the future, fleet-based autonomous vehicles (AVs) are seen as a potential solution to address the two key constraints of land and manpower faced by Singapore in its transport journey. These could also impact the costs of public transport operations.²²²

Concrete steps to realising the benefits of AVs were taken in 2014, with the Committee on Autonomous Road Transport in Singapore set up to chart the strategic direction for self-driving vehicles.²²³ The Singapore Autonomous Vehicle Initiative, set up by the Land Transport Authority (LTA) and research and development agency, A*STAR, also helps to drive the adoption of AV technology by overseeing and managing research, development and test-bedding of AV technology, as well as unpacking applications and solutions for industry partners and stakeholders.²²⁴

Testbeds to develop AVs in partnership with government agencies, universities and firms have also been set up. One of the first such trials to develop and test AV technology started at one-north, an innovation district in Singapore, in 2015. In 2017, the length of public roads used for testing AVs was expanded from 12 kilometres in one-north to 67 kilometres, covering parts of the National University of Singapore, Science Park 1 and Science Park 2, Dover and Buona Vista, so as to allow the technology to be tested across a variety of urban contexts, including more dynamic mixed-use and residential areas.²²⁵ To ensure the safety of road users, stringent safety assessments for all AVs were put in place before being permitted for on-road trials. A two-hectare AV Test Centre was set up at the Jurong Innovation District in 2017 to provide facilities to test the security, operations and functional safety of self-driving vehicles.

AVs trials were also started in other parts of Singapore, such as Nanyang Technological University, Clean Tech Park, Sentosa and Jurong Island. In 2019, all of western Singapore was announced to be an AV testbed, thus opening nearly 1,000 kilometres of public roads for testing under a wide variety of road and traffic conditions. This is expected to support the robust testing of AV capabilities to provide inter-town and long-haul services, paving the way for pilot deployment in the early 2020s.²²⁶

As there were no international technical standards to govern the testing of AV systems, the LTA, in partnership with the Singapore Standards Council and industry partners, academics and government agencies, developed a Technical Reference (TR) for AVs. Launched in January 2019, TR 68 focuses on vehicle behaviour, functional safety, cybersecurity and vehicular data types and formats.²²⁷ These efforts reflect some of the ways technological innovation in transport is being nurtured to meet emerging transport needs.



27. Autonomous vehicle on trial at the National University of Singapore.

Environmental sustainability benefits inherent in Singapore's car-lite approach are complemented by efforts to encourage widespread deployment of electric vehicles (EVs). The greening of the transport fleet for both buses and taxis is underway, with a target of a 100% cleaner energy public bus fleet comprising electric or hybrid vehicles by 2040.²²⁸ Taxi companies have also committed to 100% cleaner energy vehicles by 2040. For example, HDT Singapore Taxi trialled its first fleet of e-taxis in 2016. Following this, the company was issued with a full-fledged taxi service operator licence in 2018.²²⁹ Other taxi operators such as Comfort, CityCab, SMRT Taxis, Trans-cab, Premier and Prime have introduced energy-efficient and eco-friendly petrol-electric hybrid taxis in efforts to generate more positive environment footprint on roads. Electric car-sharing programmes have also been implemented to create greener transport options for commuters. BlueSG, an electric car-sharing operator appointed by the LTA and Economic Development Board, rolled out its first batch of 80 electric cars and 120 charging points in 2017, which then expanded to 490 electric vehicles and 935 charging points a year later. BlueSG has committed to opening up 20% of its charging points to privately owned electric vehicles, laying the foundation for a nationwide public EV charging infrastructure to support the future proliferation of EVs.²³⁰



28. Electric vehicle deployed under BlueSG's car-sharing programme.

Summary

From the 1950s to the 1970s, changes in the transport system tended to be large-scale and high-speed, or “quick and dirty”, as these changes were taken to resolve urgent problems faced both by operators and users. Public transport operators competed in a messy, cut-throat marketplace, with rules that were either nascent or not properly enforced. As a result, they paid workers poorly, leading to strikes and poor service. Commuters, meanwhile, were stranded without recourse as cars were too expensive and public transport was both unreliable and uncomfortable.

Singapore's approach to addressing the crisis was to make the public transport industry a controlled market with fewer players, which would allow authorities to better respond to clear and present problems. It worked, but only for a period of time, as the public transport sector continued to evolve in the 1980s with market maturity and more sophisticated regulations and enforcement. With this, the complexity of transport issues also increased, with three crucial factors—public transport use, affordability, and the needs of the industry—at odds with one another. Resolving this required political intervention and the resolution of familiar dilemmas and trade-offs so as to balance the interests of the government, operators and commuters.

But the extent of usage for public transport is not just a function of affordability—it is also of a matter of the level of service offered by transport modes, and commuter preferences—whether people choose to be drivers or commuters. In influencing this, a key policy approach for Singapore has been to develop the public transport system while simultaneously presenting a clear and economic proxy for the cost of congestion, pollution and other social costs arising from high levels of car ownership. Between the 1970s and the 1990s, the price mechanism, although blunt, was sufficient to deter private vehicle ownership. As the country's affluence grew and questions of equity and access to private transport became more salient, the balance between public and private aspirations became more complex. Consequently, the policies were fine-tuned incrementally, with constant changes to the vehicle tax structure, ownership quotas and user charges, as seen in the evolution of the Vehicle Quota System, the Area Licensing Scheme and the Electronic Road Pricing system.

As Singapore became a more developed economy in the 1990s, land transport progressed on three key fronts: (1) development of an extensive rail network picked in the late 1990s, (2) more measures to curb both ownership and usage of cars, and (3) institutional integration through the establishment of the LTA and Public Transport Council, which connected disparate parts of the transport planning and execution processes.

In the 2000s and 2010s, transport planning expanded to focus on the creation of a holistic, people-centric transport system to better support the needs of Singapore's economy. Rapid expansion of public transport capacity in both buses and trains was taken up to create a more resilient and reliable public transport system. This was supported by industry transformations that not only introduced greater contestability in public transport operations, but also recalibrated the roles of the government, operators and commuters.

In recent years, with the infrastructure largely in place, the driving forces for transport planning in Singapore have evolved further, with transport planning and governance focusing on future-proofing investments while achieving broader policy objectives and positioning the city to allow innovations to thrive.

At each stage, the driving forces for the evolution of the transport sector were different but the cumulative effect has been to deliver an integrated transport network that is increasingly embedded into the lives of Singaporeans.



29. The MRT has played a critical part in building up Singapore's people-centric and efficient transport system.

POST-SCRIPT

Singapore's land transport landscape has evolved rapidly over the past 60 years.

Land, manpower and fiscal constraints remain the central challenge of Singapore, as we work towards the Land Transport Master Plan goal of a 45-minute city with 20-minute towns. The COVID-19 pandemic has added a new challenge by causing a significant drop in ridership and reshaping travel patterns. Telecommuting is expected to be the new norm. Government subsidies to the public transport sector, already substantial, may grow further. With disruptive technological innovations and growing concerns on climate change and the environment, there remains much more work to be done.

But along with the challenges come opportunities for novel and creative solutions such as on-demand transport services through the use of autonomous vehicles, and reducing emissions through facilitating the adoption of electric vehicles.

Singapore will have to continue to be responsive to new circumstances, and to strike the right balance between meeting the aspirations of its residents and ensuring the sustainability of its resources.

I look forward to a Singapore where people are connected to places, communities and activities which enable them to lead healthy and high-quality lives. It is my hope that our growing transport system will play a pivotal role in Singapore's progress and continuing its status as a global and liveable city.

Ng Lang

Chief Executive

Land Transport Authority

TIMELINES

LAND USE AND PUBLIC TRANSPORT POLICIES (BUSES, TRAINS, TAXIS AND POINT-TO-POINT SERVICES)

1958

Master Plan 1958 is published.

1970

Government white paper recommends the merger of 10 Chinese bus companies into 3 companies.

1971

The Concept Plan 1971 lays the foundation for integrated land use and transport planning.

1972–81

Government conducts the Mass Rapid Transit (MRT) feasibility studies.

1973

Merger of three bus companies to form the Singapore Bus Service (SBS).

1982

Trans-Island Bus Services Pte Ltd (TIBS) is established.

Government approves the construction of the MRT.

1987

The Public Transport Council (PTC) and Singapore Mass Rapid Transit (SMRT) are established to oversee MRT operations.

1991

The Concept Plan 1991 is published.

1995

The Land Transport Authority (LTA) is formed to spearhead land transport developments.

1996

The White Paper for a World Class Land Transport System is published.

1998

Deregulation of taxi fares.

2001

SMRT acquires TIBS to become a multi-modal operator.

2003

The Taxi Service Operator License framework is introduced.

2008

The Land Transport Master Plan 2008 is published.

2009

The LTA takes on the role of the central bus network planner.

2010

The New Rail Financing Framework is mooted in the Rapid Transit Systems (Amendment) Act.

2012

The Bus Service Enhancement Programme is introduced to increase bus capacity.

2013

The Land Transport Master Plan 2013 is published.

The Taxi Availability framework is introduced to better match taxi availability and demand.

Private-hire cars (PHCs) and third-party taxi booking services start operations in Singapore.

2014

Plans to restructure the bus industry using the Government Contracting Model are announced.

2015

The Third-Party Taxi Booking Service Providers Act is announced.

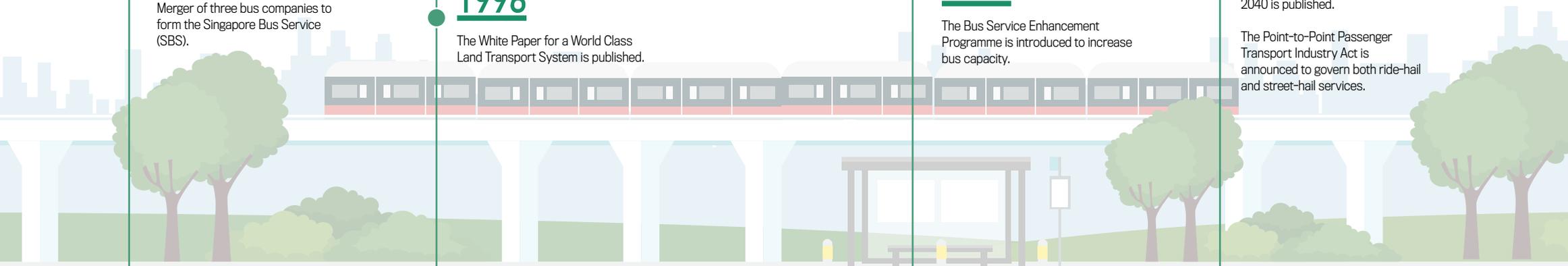
2016

New regulations for PHCs, such as requiring a Private Hire Car Driver's Vocational Licence (PDVL), are introduced.

2019

The Land Transport Masterplan 2040 is published.

The Point-to-Point Passenger Transport Industry Act is announced to govern both ride-hail and street-hail services.



PRIVATE VEHICLE OWNERSHIP AND USAGE CONTROL MEASURES

1968

Fiscal measures are taken to curb vehicle population growth. Import duties for cars increase from 10% to 30% of the open market value (OMV).

1972

Increase in the import duty of cars to 45% of the OMV, together with additional registration fees (ARFs) of 25% ad valorem, and changes in road tax structure and petrol tax rates.

1974

The ARF increases to 55% ad valorem and increase in road tax.

Severe congestion is noticed in Central Business District (CBD) areas. The Road Transport Action Committee introduces the staggered work hours scheme and carpooling scheme. Both do not respond well to positive changes.

1975

The Area Licensing Scheme (ALS) is introduced to restrict peak hour traffic flow in the CBD. The Park-and-Ride scheme is introduced as a support measure for the ALS and the Singapore Shuttle Bus/City Shuttle Service (CSS) company is set up to provide shuttle services from the fringe car parks into the Restricted Zone.

The Preferential Additional Registration Fee (PARF) is introduced to encourage the scrapping of cars that are more than 10 years old. It ranges from 35% to 55% ad valorem to induce owners to replace old cars with new ones.

1976

The ARF increases to 100% ad valorem. A progressive surcharge on road tax is introduced.

The Park-and-Ride scheme, which is unpopular, is abandoned; routes for the CSS extend into housing estates.

1978

The ARF increases to 125% ad valorem.

1980

The ARF increases to 150% ad valorem.

1983

The ARF increased to 175% ad valorem, with the PARF ranging from 45% to 65% ad valorem.

1990

The ARF drops to 160% ad valorem, but the PARF is fixed at 80% of OMV at the point of registration.

The Vehicle Quota System (VQS) is introduced to manage the vehicle population growth rate; would-be car owners must now first bid for a Certificate of Entitlement (COE) in monthly public tenders.

1995

The Road Pricing Scheme is introduced along East Coast Park expressway. Motorists buy paper licences to enter the expressway.

1997

The road tax structure is revamped to impose more charges for using roads, rather than using cars.

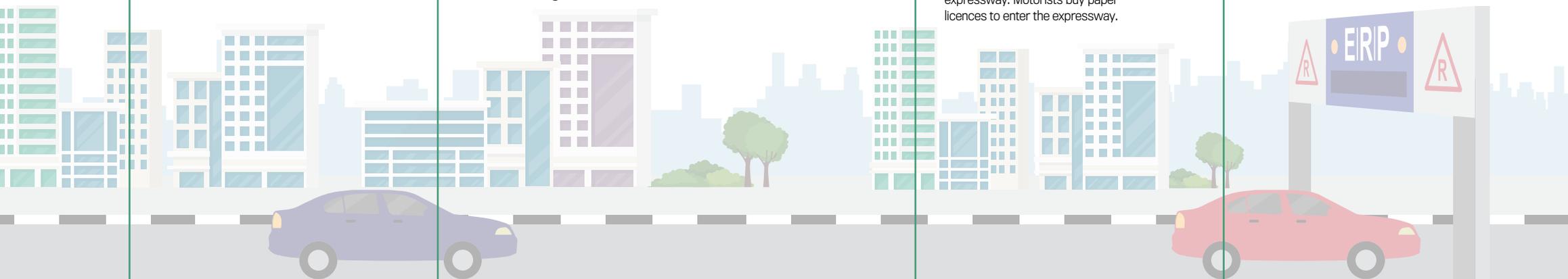
1998

Electronic Road Pricing (ERP) is implemented on East Coast Park expressway, Central Expressway (CTE), Pan Island Expressway (PIE) and CBD areas.

The PARF and COE schemes are revised to allow rebate balance to offset the Registration Fee, Additional Registration Fee (ARF) and COE.

1999

The Government Parliamentary Committee (Communications) submits the report by the VQS Review Committee, resulting in a reduction from four car categories of COE to two (besides goods vehicles, motorcycles and the Open category) and a revision of the annual COE car quota.



2003

Graduated pricing for ERP is introduced to smoothen and optimise traffic flow at the boundaries of two successive ERP periods.

2005

Evening ERP operating hours are introduced at the northbound CTE; a separate ERP cordon is introduced for Orchard Road to allow the traffic there to be managed independently from the rest of the CBD (allowing Orchard to commence Saturday ERP).

Range-based car parking standards are introduced.

2008

Cross cordon ERP gantries are introduced along the Singapore River Line to manage through traffic in the evening hours through the CBD, and to demarcate the Bugis-Marina Centre cordon from the Shenton Way-Chinatown cordon. With this, the Bugis-Marina Centre cordon commenced Saturday ERP.

2009

The LTA limits the annual vehicle growth rate (VGR) to 1.5%, down from 3%.

2011

ERP operating hours at all four gantries along the Singapore River (southbound) and CTE gantry (northbound before the PIE Exit) are shortened.

2012

The LTA limits the annual VGR to 1%, down from 1.5%.

2013

The LTA limits the annual VGR to 0.5%, down from 1%.

2015

The LTA limits the annual VGR to 0.25%, down from 0.5%.

2017

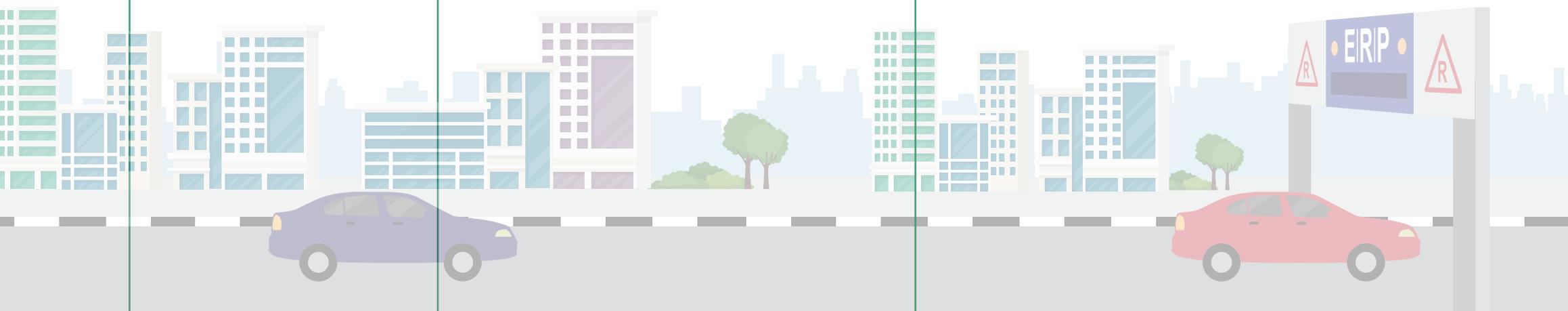
The number of ERP gantries reaches the current total of 78, with progressive implementation over the past years.

2018

The LTA drops the annual VGR from 0.25% to 0% for cars and motorcycles. The VGR for goods vehicles remains at 0.25%.

2019

Range-based parking provision standards are introduced.



ACTIVE MOBILITY POLICIES

1977

The Walkway Unit is tasked with constructing pedestrian facilities along roads.

1991

Bicycle parking stands are constructed at 24 MRT stations.

1992

The first park connector opens along Kallang River.

2007

Tripartite study between the LTA, Traffic Police and the Tampines Grassroots. Organisations to explore the feasibility of allowing cyclists to share footpaths with pedestrians in Tampines.

2009

Rapid Transit Systems Regulations are amended to allow foldable bicycles on MRT trains and buses.

2010

Footpath sharing between pedestrians and cyclists is legalised in Tampines Town.

2011

First of the cycling paths under the National Cycling Plan is implemented in Tampines.

2013

The Walk-to-Ride Programme is introduced.

The Inter-Agency Committee on Pedestrian and Cyclist Safety is set up to oversee road safety.

2014

The car-lite vision for Singapore is announced at the launch of the Sustainable Singapore Blueprint 2015, with Ang Mo Kio to be developed as a model walking and cycling town.

2015

The Active Mobility Advisory Panel is set up to oversee the governance of new active mobility modes.

2016

Launch of the Walking & Cycling Plan to ensure active mobility supporting features in private developments.

Car-free Sunday is initiated in the Civic District.

A call for tender for a pilot public cycle sharing system in Jurong is published.

2017

Privately funded dockless shared bicycle services launch in Singapore.

The Active Mobility Act 2017 is formalised.

The LTA, NParks and 16 Town Councils sign a memorandum of understanding to reduce disamenities arising from cycle sharing.

2019

New rules to oversee the safe and responsible use of personal mobility devices (PMDs) are introduced. The use of e-scooters is prohibited on footpaths from November.

2020

The use of motorised PMDs on footpaths is banned.

The Islandwide Cycling Network programme is introduced to accelerate the construction of cycling infrastructure to support active mobility.

The Active Mobility (Amendment) Bill and Shared Mobility Enterprises (Control and Licensing) Bill are passed to govern the active and shared mobility landscape.



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